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Groundwater Resources in the Yorkton Aquifer Management Plan Area: Final Report

Prepared for Saskatchewan Watershed Authority

By H. Maathuis and M. Simpson
Saskatchewan Research Council
Environment and Forestry Division

SRC Publication No. 10419-1E06

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1.0 INTRODUCTION

1.1 Background

Groundwater has played a vital role in the socio-economic development of the City of Yorkton since the turn of the century as it constitutes the most available source of water for the City. The Villages of Saltcoats and Willowbrook, and the Whitespruce community, also depend solely on groundwater for their water supply as do the rural domestic water supplies in the RMs of Orkney, Cana, Wallace and Saltcoats. The Yorkville Public Utility, established in 1997, provides drinking water to potential rural domestic users in several Rural Municipalities (RMs), including the RMs of Orkney, Cana and Wallace. Within the RM of Orkney, the utility provides drinking water and sewage service to a number of residents of the Collacott and Pleasant Height subdivisions. The utility obtains its drinking water from the City of Melville.

Despite numerous groundwater studies prior to the late 1980s, little was known about the groundwater resources in the Yorkton area and in particular about the various aquifers used by the City for its municipal water supply. In addition, the City of Yorkton production wells were not formally licensed at that time. Concerns about the availability, the potential for contamination and sustainability of the groundwater resources in the Yorkton area emphasize the need to establish an aquifer management plan. The major components of an aquifer management plan are a groundwater allocation and protection plan. Patterned after the Regina aquifer management plan, the Yorkton Aquifer Technical Committee (YATC) was established in September 1988 to guide the technical work needed to provide the knowledge base for an aquifer management plan. The YATC initiated a database study (Clifton, 1989) which was subsequently used for a comprehensive evaluation of the groundwater resources (Maathuis, 1991). In addition, a water demand study was conducted (Pentland, 1989). The comprehensive evaluation of the groundwater resources indicated many gaps in knowledge. Numerous studies were conducted in the 1990s and early 2000s. These studies mainly focused on the Logan aquifer system and south well field and little was done on the Collacott aquifer system. A detailed review of these studies has been provided by Shaheen (2000). The City also initiated additional studies, primarily focused on the Sturdee aquifer system (*e.g.,* Famulak, 2000; Pasloske, 2001, 2002, 2003).

The present report is an update of the interim report by Maathuis (1991), and forms the basis of finalizing the aquifer management plan. The study was funded by the City of Yorkton, the Saskatchewan Watershed Authority (SWA) and the Saskatchewan Research Council (SRC).

1.2 Study Area

As defined by the YATC, the Yorkton study area is enclosed by 50° 57' and 51° 18' North Latitudes and 102° 9' and 102° 51' West Longitudes. This area (Figure 1) corresponds to the area covered by Ranges 2 to 6, Townships 23 to 26, West of the Second Meridian. It includes most of the areas of the RMs of Cana, Saltcoats, Wallace and Orkney.

1.3 Climate

The mean annual precipitation at the Yorkton Airport for the period 1942-2003 (61 years) is 443 mm/a. The mean annual precipitation is based on 57 years of records since values for the annual precipitation in 1979, 1983, 1993 and 1997 are incomplete.

The historical precipitation record for the Yorkton Airport (Figure 2) shows that annual precipitation ranged from 735 mm (1953) to 237 mm (2001). Typically, 70% of the precipitation falls as rain and 30% as snow. The highest monthly precipitation occurs in the months June - August (Bergsteinsson, 1976). Morton (1983a, Figure 12) estimates that the actual aerial evapotranspiration in the Yorkton area is in the order of 350 to 400 mm/a. Lake evaporation in the study area is estimated to be in the order of 600 to 650 mm/a (Morton, 1983b: Figure 6). The calculated mean annual lake evaporation (May – September) for the period 1971 - 2000 is about 686 mm (Environment Canada website).

1.4 Topography

The topographical setting of the area is shown in Figure 3 (see also Map 1), in the form of a digital elevation model. The topographical elevation ranges from 577 m asl in the southwest of Rg 6, Tp 24 to 482 m asl north of the City of Yorkton. The overall topographical setting can be described as two highs, along the western and eastern edge of the study area, separated by a central low.

1.5 Drainage

Virtually the entire study area falls within the Yorkton Creek drainage basin, except for the extreme southeast which is part of the Cutarm Creek drainage basin. The topographical drainage basins within the study area are shown in Figure 4. The area is characterized by poorly integrated drainage systems since large areas within these sub-basins do not contribute to surface water runoff in a "normal" runoff year. Major creeks are the Yorkton, Crescent, Willowbrook and Cussed Creeks. The Yorkton drainage basin discharges into the Whitesand River which in turn flows into the Assiniboine River. The ultimate destination of the runoff is Hudson Bay.

The area directly south of Yorkton is characterized by the presence of a series of lakes. Major lakes are Rousay, York, Leech and Crescent Lakes. Discharge from York Lake is controlled by a structure at the south end of the Lake. A ditch connecting Rousseau Lake and York Lake allows for control of inflow into the latter lake. Water from Leech Lake can be released through a tributary of the Yorkton Creek.

The water levels of York Lake (SW-02-21-25-04-W2) and Crater Lake (NW-08-02-23-04-W2), located in a small internal drainage basin, have been monitored continuously by SRC since the early 1970s (since April 2005 operated by SWA).

1.6 History of Groundwater Development

Due to the location of the City, far away from any major body of surface water, groundwater has played a vital role in the development of Yorkton. Since 1890, when the City became firmly established at its present location, after initially being located about 4 km to the northeast, groundwater has been the sole source of its municipal water supply. The development of Yorkton's groundwater supply was described by Toth (1989) and is summarized and updated below. The location of present wells is shown in Figure 1.

From the early 1900s till 1909, the water supply consisted of a number of private wells which were located throughout the City. A central water supply may have been started in 1909 when, at least some, private dwellings and businesses were hooked-up to a common water line.

The first two wells, presumably drilled for establishing a central water supply, were located at the site of Yorkton's first public works yard (Broadway Avenue at Power Street). These wells, referred to as Broadway Wells #1 and #2, may have been used from the early 1900s till the early 1930s.

The first of the presently existing well sites was established in the early 1920s near the present Borden Treatment Plant, when a well was drilled by the Fairbanks Morse Company. Since then this well has been referred to as Well #3. The first pumping records for this well date back to 1927. Well #3 was equipped with a liner in June 1964 and was rebuilt in April 1984. The well was decommissioned in November 2001 (Pasloske, 2002). In this report, the No. 3 wells are referred to as Well #003.

Construction of wells in the Logan Flats area (Logan West well field) started in 1928 with the construction of the Layne #1 well. This well was put into production in 1931, or shortly thereafter. In September 1957, a new well was constructed very close to the Layne #1 well. It is assumed that the Layne #1 well was abandoned shortly thereafter. The new well was referred to as Well #001A and was reconstructed in September 1964 (Well #001B). In this report, the No. 1 wells are referred to as Well #001A. The Layne #1 well was formally decommissioned in November of 2001 (Pasloske, 2002).

The Layne Well #2, also located in the Logan Flat area (Logan West well field), was constructed in 1928, but was not put into production until March 1941. In November 1957, a new well was constructed very close to the Layne #2 well. It is assumed that the Layne #2 well was abandoned shortly thereafter. The new well was referred to as Well #002A and in this report is referred to as Well #002A. The Layne #2 well was formally decommissioned in the fall of 2001 (Pasloske, 2002).

In the mid to late 1940s, extensive testhole drilling was carried out to locate additional potential well sites. Located close to the water distribution system, Well #004 was constructed in 1947 on what has been referred to as the Dalmage farm. In the period 1947 -1952, water produced from this well may have been pumped directly into the distribution system, but officially the well was not put into production until after the construction of the West Broadway Treatment Plant in 1952. The well was rehabilitated in 1987 (Well #004A). In this report, the No. 4 wells are referred to as Well #004.

Well #005 was constructed in 1952, but may not have been put into production until 1956, the first year for which withdrawal records are available.

In 1962, a well referred to as the Hopkins Lake Well was constructed. Since construction, this well has been used solely during the summer months in order to maintain the water level at the recreational site known as Jaycee Beach (Hopkins Lake). In recent years it has also been used to supply the Deer Park Golf Course with water.

Studies in the early 1960s indicated potential well sites at the present locations of Wells #006 and #007. Well #006 was constructed in 1964 and was put into production in early 1965. The well was rebuilt in 1979. Well #006 was replaced in 2000 by Well #006A (Pasloske, 2001). Well #006 was decommissioned in November 2001 (Pasloske, 2002).

To meet summer peak demands, Well #007 was constructed and put into production in 1967. An extensive program of testhole drilling and piezometer installation was conducted in the mid

1960s to locate potential sites for high capacity production wells. The study on the following areas: (a) area west of Well #005, (b) area east of Yorkton, along Yorkton Creek, (c) north shore area of York Lake, and (d) area between York lake and Leech Lake. As a result of this program, the Well #008 site was located in what is referred to as the South Well Field. Well #008 was constructed and put into production in 1969.

Another major program of testhole drilling was carried out in 1975 (Toth, 1977). This program focused on an area near Sturdee, and the Logan Flats and South well field areas. In the South well field, Well #009 was drilled in 1975 and was put into production in 1980.

In the period 1976 - 1979, testhole drilling indicated three additional sites for construction of high capacity wells. In the Logan Flats area, Well #010 was constructed in 1981 as a standby well. In the area along Yorkton Creek just east of Yorkton, Well #011 was constructed in 1981 and was put into production in 1983. Well # 013, located near Well #005, was constructed in 1981 and was intended to function as a standby well for Wells #004, #005, #006 and #007. Well #012, located in the East well field, was drilled in 1987 and was put into production in April 1988. This well was constructed as a backup to Well #011.

Well #014 was constructed in October 2001. The well serves as a backup/replacement to Wells #011 and #012 but also can be used if additional water is needed.

Well #015 was constructed in the Sturdee aquifer system. The purpose of the well is two-fold: (a) to provide the City with additional water if needed at the present time and (b) to provide an additional water supply to accommodate the future growth of the City.

1.7 Well Field Naming

In many of the studies carried out for the City of Yorkton well field names and aquifers names appear to be used interchangeably (*e.g.*, Toth, 1982, Figure D82-773). Such a practice may lead to confusion, in particular when a complex system of wells, aquifers and aquitards are involved. Typically, a well field consists of a number of relatively closely spaced production wells. Boundaries of well fields tend to be arbitrary, but commonly a well field area is much smaller than the area over which the aquifer or aquifer system occurs.

To allow for a clear distinction in this report between well field and aquifer names, the well field names used in this report are shown in Table 1 together with the associated production wells and aquifer names. The locations of the well fields are shown on Figure 1.

Table 1 Well field, aquifer and associated production well names

Aquifer Name	**Collacott**	**Logan Valley**	**Leech Lake**	**Sturdee**
Well Field Name				
West	004, 005, 006A, 007, 013			
Logan West (Logan Flats)		001A, 002A, 010 003[note 1]		
Logan East		011, 012, 014		
South			008, 009	
Sturdee				015

Note[1]: Well #003 was decommissioned in 2001

1.8 Water Use: Past, Present and Future

The history of annual groundwater use by the City of Yorkton is graphically illustrated in Figure 5. This figure shows that the use of groundwater increased only slightly from the early 1900s until the mid 1940s. After the mid 1940s, groundwater use started to increase significantly. This increase is likely due to a complex set of factors including economics, population growth, increase in water consumption per capita, and weather conditions. In the ten years from 1995 to 2004, the annual groundwater use by the City averaged about 2,409 dam^3/a, with a standard deviation of 120 dam^3/a. In the period 1999 – 2003, about 56% of annual volumes produced by the water treatment plants were for residential use and 44% for commercial use (Buchholzer; personal communication, 2005). During the period 1994 – 2003, about 93% of the water produced annually by the wells was treated and pumped into the distribution system. The 7% difference between the raw water input into the plants and the volume treated reflects in-plant water usage. Volumes of treated water produced and water sold indicate that during this period 10% of the treated water was not sold. This volume represents water lost in the distribution system (*e.g.,* leakage, firefighting).

The distribution of groundwater production within a year is shown in Figure 6. The long-term (1985 – 2004) average monthly groundwater withdrawal is about 201 dam^3. Figure 6 shows that the largest monthly usage occurs in the period May to August and in December.

1.9 Management of Well Fields

The relative contributions of the well fields to the total annual production (Figure 7) are closely related to the history of groundwater development which, in turn, is related to the growth in demand.

Table 2 lists the long-term average contribution of the various well fields to the total annual groundwater withdrawals.

Table 2 Average contribution of well field to total annual withdrawals, for the period 1983 – 2002

Well Field	Contribution of well field to total annual groundwater withdrawals (%)
West	23.0
Logan West	3.8
Logan East	32.4
South	40.7

Figure 7 shows that since 1967 the relative contribution of the Collacott well fields has decreased over time as a result of the development of the South and Logan East wells fields. Since 1983, when the Logan East well field was taken into production, the contributions of the various well fields have been fairly constant. The Sturdee well field was taken into full production in 2004. As a result, in 2004 all major well fields contributed about the same amount to the total volume withdrawn in that year. It is not known if the well fields will continue to be operated this way in the future.

To facilitate management of individual wells in a well field, the volumes of groundwater that the City of Yorkton can withdraw annually have been allocated on a well field rather than on an individual production well basis. The volumes that the City can withdraw annually from its well fields are shown in Table 3. The total amount allocated is 4,660 dam^3/a.

Table 3 Allocated groundwater withdrawals by well field

Well Field	Wells	Groundwater withdrawal allocation (dam^3)
West	004, 005, 006A, 007 and 013	1,300
Logan West	001A, 002A and 010	500
Logan East	011, 012 and 014	800
South	008 and 009	1,060
Sturdee	015	1,000

Figures 8 and 9 show the annual volumes produced by the individual wells in each of the well fields. These figures show that within a particular well field the use of a particular well is variable due to factors such as pumping capability and capability of the treatment plants. At this time, due to the configuration of the raw water piping from the wells and the conditions of the water treatment plants, hydrogeological considerations such as the impact of pumping on water levels in the aquifer play a minor role in aquifer management but are taken into consideration.

In Table 4, the actual long-term withdrawals and allocated volumes are shown.

Table 4 Groundwater allocations versus actual withdrawals from the City of Yorkton well fields

Well Field	Groundwater withdrawal allocation (dam^3/a)	Actual long-term withdrawals (dam^3/a)	Period
West	1,300	687 ± 235	1983 - 2004
Logan West	500	135 ± 111	1967 - 2004
Logan East	800	731 ± 133	1983 - 2004
South	1,060	819 ± 187	1970 - 2004
Sturdee	1,000	Not applicable	

Table 4 shows that the actual long-term withdrawals are lower than the allocated volumes and that withdrawals from well field might be possible, subject to careful water level and water quality monitoring.

2.0 GROUNDWATER DATA

2.1 Introduction

The principal types of geology/groundwater data used in this report are:

- geological data for testholes and wells
- location and elevation
- water levels
- groundwater quality
- groundwater withdrawals

The data are briefly discussed in general terms in the sections below.

2.2 Maps and Cross Sections

A significant component of the present study was to develop and populate a GIS compatible database. Maps presented in this report were prepared using the Geographic Information System (GIS) ESRI ArcInfo (version 9.0). These digital maps are composed of a number of map layers in ESRI shapefile and grid format. Shapefiles are made up of features composed of points, lines, or polygons. Each feature has information attached to it via the shapefiles attribute table/database. Grids (or rasters) are used to represent surfaces. A grid is a regular array of adjoining cell and each cell is assigned a value. Gridding algorithms were used to interpolate values between known points to produce a continuous surface. A digital elevation model is an example of a grid that represents ground elevation values.

The GIS software enables data attached to the features to be queried and displayed based on its location or attribute. New attributes can be calculated by performing arithmetic calculation. For example, the elevation of the bedrock surface can be calculated and attached to the attribute table of a point file, by subtracting the depth to bedrock attribute, from the surface elevation attribute.

The cross sections presented in this report were prepared using AutoCad. The geological information for testholes/wells shown on the cross section is based on the stratigraphical picks (see section 2.2) in the GIS database. On these cross sections the ground surface elevation along the section lines was extracted from the digital elevation model (CDED grid). The bedrock surface elevation was extracted from the bedrock surface grid.

2.3 Geology Data

The major sources of geological data used were: E-logs (spontaneous potential and single-point resistance log) and associated lithological data in the SWA and SRC data files, E-logs in consultant reports and lithological logs for wells and testholes drilled by International Water Supply and the Prairie Farm Rehabilitation Administration. A limited number of oil logs were also used.

Geological data for a total of 1,988 sites have entered into the GIS database. The geological data entered are limited to stratigraphic and aquifer picks. The stratigraphic picks are limited to the depth to the top of bedrock units. The two bedrock units in the Yorkton study area are the Cretaceous Pierre Shale (Kp) and the younger, Tertiary “Bredenbury Formation” (Tb). With regard to the Quaternary sediments, only the depth to the top of the Empress Group has been included in the database. There are insufficient data to separate the different till units in the Yorkton area.

Where possible the stratigraphic setting of the aquifer was indicated as: Bredenbury (Tb), Empress Group (Qe), or intertill (Qit). If named, the aquifer name was also included in the database. If a testhole did not intersect an aquifer, the term "no_aqu" was used to indicate that an aquifer was not indicated at that location.

An aquifer thickness value was calculated for those testholes/ wells that indicated a top and bottom depth. For those testholes where only the top was indicated, and no aquitard was identified below the aquifer, a minimum thickness value was assigned equal to the depth of the testhole minus the depth to the top of the aquifer (*i.e.,* depth to top = 10 and testhole is 15 m deep, the minimum aquifer thickness was entered to be "5+" meters).

2.4 Borehole Location and Elevation

The locations of all wells/testholes used in the study have geographic coordinates expressed in Universal Transverse Mercator (UTM), zone 13, North American datum (NAD) 1983. Unless determined otherwise (*e.g.,* GPS or survey), these coordinates represent the centroid of the legal land location as provided in the well/testhole location provided in the provincial database.

Elevation data for testholes, domestic wells and monitor wells are a mixture of elevations determined by surveys (*e.g.,* GPS or conventional surveys) and calculated elevations. Unless determined by means of a survey, the elevation for each testhole/well was determined by extracting the surface elevation value from the corresponding location of the surface elevation grid file (Canadian Digital Elevation Data, CDED 1:50,000 scale).

2.5 Water Level Data

In the past four (4) decades, a large number of monitor wells have been constructed. Most of these monitor wells were constructed by International Water Supply as part of their investigations in the Yorkton area. In recent years, new monitor wells were installed as part of studies conducted for the YATC. The investigations conducted by Pasloske (2001, 2002, 2003) also resulted in the construction of numerous new monitor wells. Over time many of the older monitor wells we lost (*i.e.*, destroyed) and as new wells were being constructed, many of the older wells were decommissioned. A listing of the monitor wells and their current status is provided in Table A-1, Appendix A. Water level data for these monitor wells typically were obtained several times per year.

In addition to the monitor wells, there are 12 groundwater level observation wells (monitor wells equipped with a recorder) and two surface water monitor stations in the Yorkton study area. The observation wells and surface water monitor stations are part of the provincial network and are operated and maintained by SWA. A listing of these wells is provided in Table 5. The location of these observation wells are shown in Figure 10. Hydrographs for these wells are included in the supplement accompanying this report (Maathuis, 2006).

Table 5 Provincial groundwater level observation wells and surface water monitor stations in the Yorkton area

Observation well name	Location	Aquifer
Groundwater level observation wells		
Crater Lake	NW-08-02-23-04-W2	Surficial - Till
Yorkton 517	SW-02-21-25-04-W2	Unnamed – Empress Group
Yorkton 519	SW-02-21-25-04-W2	Surficial - Till
MW93-03	NW-13-31-25-03-W2	Logan North – "Bredenbury Fm"
MW93-04	SW-12-31-25-03-W2	Logan Valley
MW93-07	02-35-25-04-W2	Logan Valley
MW93-08	NE-09-27-25-04-W2	Logan Valley
MW95-04B	S-14-31-25-03-W2	Logan Valley
YRK99-01	SE-09-34-24-04-W2	Leech Lake
YRK99-02	SE-09-04-25-04-W2	Leech Lake
YRK99-03	SW-01-33-24-04-W2	Leech Lake
YRK99-04	NW-14-33-24-04-W2	Leech Lake
Surface water stations		
Crater Lake (man)	NW-08-02-23-04-W2	Crater Lake
Yorkton 518 (man)	SW-02-21-25-04-W2	York Lake

With regard to interpretation of water level records (*i.e.*, hydrographs), it must be noted that a groundwater level is never at rest due to a variety of influences. The hydrographs for wells are the cumulative result of the superposition of several different types of fluctuations, longer term, seasonal and short-term fluctuations. Longer-term trends are those lasting over a period of several years, superimposed on which are seasonal fluctuations and short-term fluctuations (such as those caused by changes in barometric pressure). In the case of the aquifers used by the City of Yorkton, it is the long-term impact of the pumping on the water level in these aquifers that is of importance.

2.6 Water Quality Data

An important question concerning groundwater resources is the water quality and changes in quality which may have occurred since withdrawals started. Groundwater quality data for the Yorkton study area are presented in Table A-2, Appendix A. Table A-2 is based on the table presented by Maathuis (1991), augmented with data, from various sources, that have been collected since 1990.

The term sum of ions is used throughout this report to denote the sum of the concentrations of the dissolved major ions. It is the sum of the following constituents: Ca, Mg, Na, K, Fe, Mn, CO_3, HCO_3, SO_4, Cl, and NO_3.

The error in ionic balance, expressed as a percentage, is calculated by the equation:

$$Error\ (\%) = 100 * \left(\frac{sum\ cations - sum\ anions}{sum\ cations + sum\ anions} \right) \qquad [1]$$

In equation 1, both the sum of cations and sum of ions are expressed in milliequivalents. From an analytical point of view, an analysis with an error of less than 5% is considered a reliable analysis (e.g., Freeze and Cherry, 1979). Based on the present knowledge, Table B-1 also indicates from which aquifer or aquifer system the sample was taken.

2.7 Groundwater Withdrawal Data

In Table A-3, Appendix A, the annual groundwater withdrawals from the production wells are presented.

2.8 Pump Test Data

Since 1943, a total of 27 pumping tests have been carried out in the study area by International Water Supply. These tests were carried out mainly to determine yield or potential yield of wells and commonly were not analyzed in terms of hydraulic properties of aquifers and aquitards. Several pumping tests have been conducted recently as part of testing of Wells #014 and #015 (Pasloske, 2002, 2003). The results are incorporated in this report.

3.0 GEOLOGICAL AND HYDROGEOLOGICAL SETTING

3.1 Introduction

The geological setting of the Yorkton area was discussed and shown in the form of cross sections and maps by Cherry (1966), Cherry and Whitaker (1969), Christiansen (1971a), Meneley and Christiansen (1975), Maathuis (1977), Christiansen (1981), Schreiner and Maathuis (1982), Millard (1992), and Maathuis *et al.,* (1999). The history of deglaciation has been described by Christiansen (1979, 1981). Maps showing the surficial geology have been presented by Cherry (1966), Christiansen (1981) and Saskatchewan Research Council (1986a, b). Soils in the study area have been described by Mitchell *et al.,* (1944). The history of deglaciation, the surficial geology and soils are not further discussed in this report.

The geological setting of the Yorkton area, the stratigraphical units and their lithological characteristics, and the hydrogeological setting, are illustrated schematically in Figure 11.

The location of testhole logs and cross sections are shown on Map 2. The geological framework, from a hydrogeological point of view, is shown in the form of 17 cross sections. Ten (10) cross sections (A - A1 to J - J1) show the regional hydrogeological setting. These sections were constructed at a horizontal scale of 1:50,000 and a vertical scale of 1:1,000 (vertical exaggeration 50x). To show the (hydro) geological setting in the area of interest in more detail seven (7) "local" cross sections were constructed. Five (5) cross sections (LL1 – LL1' – LL5 – LL5') show the (hydro) geological of the northern part of the Leech Lake aquifer in more detail. In addition, a longitudinal cross section through the Collacott (Col1 – Col1'), Logan Valley (LV-LV') and Sturdee (ST-ST') aquifers have been prepared. The "local" cross sections have a horizontal scale of 1:10,000 and a vertical scale of 1:5,000 (vertical exaggeration 20x).

3.2 Bedrock Stratigraphy

The relevant bedrock units in the Yorkton study area are, in ascending order: the Cretaceous Mannville Group, the Ashville Formation, the Favel Formation, the Niobrara Formation and Morden Shale, the Pierre Shale and the Tertiary "Bredenbury Formation" (Figure 11). These Cretaceous bedrock units have been described by Cherry and Whitaker (1969), Christiansen (1971a, 1981), and Schreiner and Maathuis (1982).

The silts and clays of the Ashville Formation to the Pierre Shale are important because they form a major aquitard. This aquitard is between 250 m and 300 m thick and separates the saline-water yielding aquifer formed by the Mannville Group sediments from the fresh-water yielding aquifers above the aquitard. Since the silts and clays probably have a low hydraulic conductivity, the top of the Pierre Shale is the most important bedrock unit. The top of the Pierre Shale can be considered as the impermeable lower boundary as far as groundwater flow above it is concerned.

3.2.1 "Bredenbury Formation"

The "Bredenbury Formation" was informally named by Christiansen (1981) to define a sequence of sediments between the top of the Pierre Shale and the bottom of the Quaternary deposits. In the study area this formation, in ascending order, may consists of:

- a basal gravel layer of up to 1 metre thick which is composed of well rounded chert, quartzite, siderite and limestone

- a fine- to medium-grained sand, with some interbedded thin silt layers. These sands are characterized by a salt and pepper appearance and locally may be greenish in color.
- a layer of gray or light brown, calcareous to slightly calcareous silt.

On E-logs the "Bredenbury Formation" is characterized by a high resistance at the bottom of the formation when the basal gravel is present and an extremely uniform resistance of the fine-to medium-grained sands. Many E-logs exhibit an upward decrease in resistance, representing the upward fining of the sands and transition to the silts.

Christiansen (1981, p. 8 and 9) suggests that the formation is preglacial for the following reasons:

- the presence of chert and quartzite at the bottom of the formation.
- the absence of till between the formation and the underlying Pierre Shale.
- the presence of the formation on the upland of the Pierre Shale, well above the Hatfield Valley which is located south of the study area.

Because the formation is considered preglacial (Tertiary) in age, it has been considered a bedrock unit and has been mapped as such (Christiansen, 1981; Schreiner and Maathuis, 1982).

3.3 Bedrock Topography

The bedrock surface is defined as the uppermost preglacial deposits. Subcrops of "Bredenbury Formation" and Pierre Shale make up the bedrock surface in the Yorkton area.

The bedrock surface topography is shown in Figure 12 and on Map No. 3. The surface was generated from bedrock elevation data as determined from testholes drilled in the area. The bedrock top elevation was determined by subtracting the depth to bedrock from the ground surface elevation. An "inverse distance weighted" gridding algorithm was used to interpolate bedrock surface elevations between the known bedrock elevation points. The bedrock surface grid was corrected with reference to the surface elevation grid. No bedrock surface cell value may be higher in elevation than the ground surface cell at the same location. Where the value of a calculated bedrock surface grid cell was higher than the ground surface grid cell value, the ground surface value was assigned to that bedrock surface cell.

Processes which shaped the top of the bedrock surface include fluvial and glacio-fluvial erosion, glacial erosion, and collapse. In the study area it is very difficult to differentiate between the processes of erosion and collapse, in particular because there is not a near surface stratigraphical marker.

The main topographic features of the top of the bedrock surface are:

- depressions in the eastern (Tp 23 and 24, Rg 6) and western (Tp 24, Rg 3) parts of the study area. These depressions are probably due to glacial erosion.
- several large depressions along the eastern boundary of the study area where glacial erosion has removed the "Bredenbury Formation" (TP 34 and 25, Rg 2).
- a major linear depression east of Yorkton. This linear depression is believed to be a valley incised into the Pierre Shale. This valley has been encountered in a few testholes only and is filled with sediments of the Empress Group, predominantly silts and clays.
- a topographic low at the north end of York Lake, believed to be related to collapse.
- bedrock highs related to the presence of the "Bredenbury Formation".

3.3.1 Collapse Structures

Collapse structures are important from a hydrogeological point of view because they may result in lateral interruption of aquifers or may create vertical pathways for groundwater flow. Solution-collapse structures are considered to be due to the dissolution and removal of salt from the Devonian Elk Point, Prairie Evaporite Formation, and the subsequent collapse of the overlying strata. In the study area, the Prairie Evaporite occurs at a depth of about 900 m below the ground surface.

The Crater Lake collapse structure (NE-08-02-23-04-W2) is a classical example of a narrow diameter, chimney-like, collapse structure. It has been documented by Christiansen (1971b) and Gendzwill and Hajnal (1971). Meneley and Christiansen (1975, pp. 6) reported that the hydraulic head beneath the lake decreased with increasing depth, indicating a downward groundwater flow.

3.4 Quaternary Stratigraphy

The sediments between the bedrock surface and ground surface are referred to collectively as "drift". The drift, in ascending order, may include the Empress, Sutherland and Saskatoon groups (Figure 11).

The Empress Group is composed of sand, gravel, silt and clay of fluvial, lacustrine and colluvial origin that overlies Cretaceous bedrock and non-marine Tertiary bedrock, and underlies till of Quaternary age in southern Saskatchewan (Whitaker and Christiansen, 1972). Compared to the gravels and sands of the "Bredenbury Formation", sands and gravels of the Empress Group show a much larger variation in grain size and include igneous and metamorphic rock fragments. The differentiation between the "Bredenbury Formation" and Empress Group depends to a large extent on the detailed lithological characteristics. An attempt has been made to separate the sediments of the Empress Group from those of the "Bredenbury Formation" in the cross sections and on the maps. However, for many testholes in the study area detailed lithological descriptions, and E-logs, are not available. Consequently, the delineation is an interpretation only and likely subject to changes as more detailed information becomes available.

The Sutherland and Saskatoon Groups, and the Floral and Battleford Formations of the Saskatoon Group, have been defined by Christiansen (1992; 1968a, b). Both Groups mainly consist of till, but sands and gravels may occur within Groups and between the Groups. The Sutherland Group can be distinguished from the Saskatoon Group on the basis of carbonate content and electrical resistance. Typically, tills of the Sutherland Group have a lower electrical resistance and a lower carbonate content than the tills of the Saskatoon Group.

It is not possible to systematically trace the Group division throughout the study area, as for most of the testholes no E-log or carbonate data are available. Consequently, the sediments above the Empress Group are shown on cross sections as undifferentiated drift, mainly till. Sands and gravels within the drift form aquifers. Aquitards are formed by tills, silts and clays.

The drift thickness is shown in Figure 13 and on Map 4. The drift thickness grid was obtained by subtracting the bedrock surface elevation from the surface elevation. The thickness of the drift ranges from a few metres to 120 metres. In general terms, the drift is the thinnest in areas where the “Bredenbury Formation” forms the bedrock unit and is the thickest in depressions.

3.5 Identification and Naming of Aquifers and Aquifer Systems

An aquifer is a saturated geologic unit that is permeable enough to transmit significant quantities of water under ordinary hydraulic gradients, or as the term is commonly used in the water-well industry: an aquifer is a saturated geologic unit that is permeable enough to yield economic quantities of water to wells (*e.g.*, Freeze and Cherry, 1979; Kruseman and de Ridder, 1990). Aquifers can be part of a geological formation, the entire formation or group of formations. The term aquifer system refers to a complex hydrogeological unit composed of at least two individual aquifer units and associated aquitards which hydraulically act as a single system.

An aquitard is a saturated geologic unit which is permeable enough to transmit water in significant quantities when viewed over large areas and long periods, but does not yield economic quantities of water to wells (Kruseman and de Ridder, 1990).

Within the study area, principal aquifer zones are formed by the sediments of the "Bredenbury Formation" and the Empress Group, and by intertill sands and gravels of the Sutherland and Saskatoon Groups. The extent of the main aquifers and aquifer systems formed by these sediments is shown in Figure 14 (Map 5). Map 6 shows the depth to these aquifers. Aquitards are formed by tills, silts of the "Bredenbury Formation", and by surficial silts and clays.

The following names for aquifer systems and associated aquifers are used in this report:

- Aquifers formed by the “Bredenbury Formation”: Otthon, Bredenbury and Willowbrook, Orcadia aquifers and unnamed aquifers
- Logan aquifer system: Logan Valley and Logan North and South aquifers
- Collacott aquifer system: Empress Group and intertill
- Leech aquifer system: Leech Lake and Otthon aquifers
- Sturdee aquifer system
- Unnamed aquifers formed by Empress Group sediments

The Logan aquifer system consists of an intertill aquifer of the valley-type (Logan Valley) which is hydraulically connected to aquifers formed by sands of the "Bredenbury Formation". The aquifers formed by the “Bredenbury Formation” sands are referred to as the Logan North and Logan South aquifers.

The Collacott aquifer system is a complex, multi-layered, system which includes aquifers formed by sediments of the "Bredenbury Formation" and Empress Group, and intertill sands and gravels. The individual aquifers of this system have not been named. To the north, the Collacott system may be hydraulically connected to an aquifer formed by sands of the "Bredenbury Formation". The latter aquifer is referred to as the Orcadia aquifer (Maathuis, 1991).

The Leech aquifer system is composed of two aquifers, known as the Leech Lake and Otthon aquifers (Maathuis, 1991). The northern portion of the Leech Lake aquifer is formed by interglacial sands and gravels, but the southern portion consists of sands and gravels of the Empress Group. Sands of the "Bredenbury Formation" adjacent to the Leech Lake aquifer form the Otthon aquifer.

The Sturdee aquifer system is a complex system composed of an intertill aquifer of the buried-valley type which is hydraulically connected to aquifers formed by the “Bredenbury Formation”

Outside the areas of the major aquifer systems, minor aquifers are found at various depths and of various extents. These aquifers are not further considered in this report but are important sources for rural domestic water supplies.

The major aquifer systems and aquifers are discussed in detail in Chapters 5 to 9.

4. AQUIFER VULNERABILITY MAPPING

4.1 Introduction

Protecting the quality of groundwater from contamination is increasingly becoming a priority throughout the world as remediation of polluted groundwater and development of clean-up technologies is highly expensive.

Vulnerability can be defined as follows:

> *Intrinsic (or natural) vulnerability is the vulnerability solely dependent on the characteristics of an aquifer and the overlying soil and geological materials. It differs from the specific (or integrated) vulnerability in that the latter includes the potential impact(s) of specific land uses or contaminants (Vrba and Zaporozec, 1994).*

While there are various methods, the ultimate objective of vulnerability mapping is protecting the quality of groundwater by means of the development of land use guidelines or hazardous chemical restrictions.

Actual protection of water supplies requires decisions as to how much to protect. Typical approaches are:

- protection of the entire aquifer(s)
- protection of the capture area from each well (or well field) (commonly referred to as well head protection)
- protection of a subset of the entire area

While protection of the entire aquifer might be desirable from a point of view of protecting present and future water supplies, it may not be feasible, or in some cases, desirable. Typically, a sensible compromise will have to be reached. Compromises generally involve some form of well head protection, and protection of the recharge zone, including surface water drainage basins. Surface water drainage basins may have to be protected when there is active surface water - groundwater interactions. The area to be protected thus may extend well beyond the boundaries of the aquifer. In many countries this has lead to defining zones around a well head, based on travel time considerations.

4.2 Examples of Aquifer Vulnerability Mapping

It is important to note that there is no vulnerability mapping method which has been accepted universally. Various mapping methods have been used, each of which have their advantages and disadvantages. Consequently, interpretation of vulnerability maps requires an understanding of what they are based on. Typically, in terms of land use management, regional scale aquifer vulnerability maps are useful for initial screening of areas of interest. Local, and more detailed, studies are required to assess the potential impact on groundwater of a specific land use.

A vulnerability mapping method used widely is the 'DRASTIC' method (Aller *et al.,* 1987). DRASTIC includes factors such as depth to water (D), (net) recharge (R), aquifer media (A), soil media (S), topography (T), influence of vamoose zone (I), and hydraulic conductivity of aquifer (C). The DRASTIC pollution potential is determined from:

$$\text{Pollution potential} = D_R D_W + R_R R_W + A_R A_W + S_R S_W + T_R T_W + I_R I_W + C_R C_W \qquad [2]$$

where: R = rating and W = weight.

The weights are constants, whereas the ratings are based on ranges. Although DRASTIC is physically based, the DRASTIC pollution potential is a numerical ranking value, with no real physical meaning. There is an acknowledged overlap or redundancy in parameters (Callers *et al.*, 1987); for example, the soil media and the vamoose zone parameters overlap, since the soil zone is a subset of the vamoose zone. The (net) recharge parameter assumes a uniform recharge over the area considered. It has been well established that depression-focused recharge plays a major role in the recharge to aquifers in the prairie hydrogeological environment.

Several variations of DRASTIC have been introduced. For example, DRASTIC PESTICIDE provides a vulnerability to pollution by pesticides. DRASTC PESTICIDE differs from DRASTIC only in the assignment of different weights. In assessing the aquifer vulnerability in structurally-controlled aquifer in British Columbia, Denny *et al.,* (undated) extended the DRASTIC method by adding a fractured media parameter to DRASTIC.

Foster (1987) developed a method referred to as GOD. This method takes into account:

- **G**roundwater occurrence: *i.e.,* whether the aquifer is unconfined or semi-confined
- **O**verall aquifer class in terms of grade of consolidation and lithological character
- **D**epth to groundwater table or strike

Ross Keller, *et al.,* (2004) introduced the DAT (**D**ownward **A**dvective **T**imes). DAT values were estimated using 3D geological modeling. This method was applied to the St. Lawrence Lowlands.

In Saskatchewan, Roeper (1990) mapped the sensitivity to pollution of aquifers in the Regina area. The sensitivity rating was based on thickness of the materials overlying aquifers in the area and indirectly considered the hydraulic conductivity of materials. Extreme and high sensitivities were assigned when an aquifer was present at a depth of less than 5 m below ground surface and overlain by clay or till, or occurred below 10 metres but was overlain by undifferentiated materials including silts and sands. The sensitivity was low when the top of the aquifer started at a depth more than 10 metres from ground surface and was overlain by clay or till. The mapping was largely based on the known extent of aquifers (Maathuis and van der Kamp, 1988), but the surficial geology was also taken into consideration.

The Aquifer Vulnerability Index method (see section 4.3) was developed in Saskatchewan. It has been applied to areas along the Alberta and Manitoba borders (Grove and Androsoff, 1994 and 1995), and the Rosetown NTS map sheet area (Van Stempvoort, 1995).

With respect to a specific contaminant, McRae (1989) presented a 1 : 2,000,000 scale map for Saskatchewan showing areas vulnerable to groundwater contamination by pesticides.

4.3 Aquifer Vulnerability Index (AVI)

4.3.1 Introduction

Considering the complexities of the DRASTIC method, the Aquifer Vulnerability Index (AVI) method was selected for mapping aquifer vulnerability in the Yorkton area. The AVI method was developed as a tool for regional-scale mapping of the vulnerability of aquifers to contamination from potential sources at or near the ground surface (Van Stempvoort *et al.*, 1992, 1993).

The AVI method is based on two parameters:

- the thickness D of the confining layer above an aquifer
- the vertical hydraulic conductivity K_v of the confining layer

These two parameters can be combined into a single factor, referred to as the hydraulic resistance (*e.g.,* Kruseman and de Ridder, 1990):

$$c = \frac{D}{K_v} \qquad [3]$$

where: c = vertical hydraulic resistance (time), D = thickness of aquitard overlying aquifer, K_v is the vertical hydraulic conductivity (length/time). The vertical resistance is commonly expressed in days or years.

For a sequence of layers, the total resistance to flow becomes the sum of the c values of individual layers:

$$c_T = \sum_{i=1}^{n} D_i / K_{v_i} \qquad [4]$$

where: c_T = total vertical resistance (time)
D_i = thickness of layer i (length)
K_{v_i} = vertical hydraulic conductivity of layer i
n = number of layers

The hydraulic resistance characterizes the resistance of an aquitard to vertical flow, either upward or downward. While it has the dimension of Time, it does not represent the travel time of water or contaminants. The time for water to flow through a confining layer further depends on the porosity and vertical hydraulic gradient. Additional factors such as diffusion, density, decay and sorption will have to be taken into account when considering migration of a contaminant.

Representative hydraulic conductivity values are listed in Table 6.

To facilitate plotting and contouring of the hydraulic resistance data, the AVI has been defined as:

$$\text{AVI} = {}^{10}\text{Log (c)} \qquad [5]$$

The standard codes in Table 1 have no physical meaning and are used only in spreadsheets to facility calculation on the AVI value.

The relationship between the AVI and hydraulic resistance is shown in Table 7.

Table 6 Hydraulic conductivity estimates for various sediments in the Canadian Prairies (from Van Stempvoort et al., 1992)

Sediment type	Standard Code	Hydraulic Conductivity (m/day)
Gravel	A	1000 *
Sand	B	10 *
Silty sand	C	1 *
Silt	D	10^{-1} *
Fractured till, clay or shale (0 to 5 m from ground surface)	E	10^{-3} **
Fractured till, clay or shale (10 to 15 m from ground surface)	F	10^{-4} *
Fractured till, clay or shale (10 m from ground surface, but weathered based on colour)	F	10^{-4} *
Massive till or mixed sand-silt-clay	G	10^{-5} *
Massive clay or shale	H	10^{-6} *

Notes: the values shown are approximate mean values for each sediment type
* estimate based on Freeze and Cherry (1979)
** estimate based on Keller *et al.*, 1988

Table 7 Relationship between aquifer vulnerability index (AVI) and hydraulic resistance

Hydraulic Resistance (years)	Log (hydraulic resistance)	Vulnerability Index (AVI)
0 to 10	< 1	extremely high
10 to 100	1 to 2	high
100 to 1,000	2 to 3	moderate
1,000 to 10,000	3 to 4	low
> 10,000	> 4	extremely low

It is important to point out the assumptions and limitations of the AVI vulnerability mapping as originally envisioned (modified after Van Stempvoort *et al.*, 1992):

- The method ignores certain parameters such as: climate, hydraulic gradient, porosity, water content of the porous media.
- The AVI method only considers the nearest-to surface aquifers, and considers each aquifer to be of equal value. It does not distinguish between surficial and bedrock aquifer, nor can it deal with multi-layered aquifer - aquitard sequences.
- Any gravel, sand or silty sand greater than 0.6 m thick and deeper than 5 m below ground surface was considered an aquifer.
- Any gravel, sand or silty sand greater than 0.6 m thick but less than 5 m below ground surface was only considered an aquifer if water level data indicated that it was saturated.
- Contouring of AVI values gives the impression of lateral continuity of aquifers and gradation of the index. Neither lateral continuity nor gradation of the AVI values is realistic since hydrogeological settings can change over short distances.
- The AVI values are determined from information that varies highly in detail and quality (*i.e.*, for example, if using the SWA water well drillers database without quality control).
- The AVI vulnerability classes have been arbitrarily selected.
- The hydraulic conductivities are approximate estimates only.
- Saturated hydraulic conductivities are used for unsaturated sediments.
  Since the hydraulic conductivity of unsaturated sediments is greater than that of saturated sediments, the calculated resistance is conservative.
- When the upper 10 m of the aquitard consists of till, the AVI method assumes that a decreasing fracture permeability is assumed, in the 0 -5 and 5 -10 m intervals. Tills below a depth of 10 m are assigned a vertical hydraulic conductivity of 10^{-5} m/s (about 1 x 10^{-10} m/s). This hydraulic conductivity may be an order of magnitude lower than the actual vertical hydraulic conductivity since fracture permeability may extend deeper than 10 m (*e.g.,* Keller *et al.*, 1986, 1988). Consequently, this assumption may overestimate the hydraulic resistance and may result in higher than “real” AVI’s.

4.3.2 Application of the AVI Method to the Yorkton Area

Maathuis (1999) presented an AVI map for the Yorkton study area based on the original method proposed by Van Stempvoort *et al.,* (1992), using the SWA water well driller database available at that time. Using a set of criteria (Maathuis, 1999, p. 7), the database of 1,700 entries was reduced about 650 sites for which an AVI value was calculated.

It was argued by Maathuis (1999) that rather than applying the AVI method to the first sand (greater than 0.6 m thick) encountered at a testhole/well site it should be applied on an aquifer basis. This makes sense in particular from an aquifer management and protection point of view. Consequently, for this report, using the currently known extent of known aquifers, an aquifer based AVI map was prepared (Figure 15, Map 7). The database (664 sites) used to prepare the AVI map is provided in Table A-4, Appendix A. Beyond the extent of mappable regional aquifers waterbearing zones occur which have a limited extent. In those cases, a point AVI value is shown on Map 7.

The results of the aquifer vulnerability mapping for the regional aquifers are further discussed in the chapters dealing with these aquifers.

5.0 GROUNDWATER RESOURCES OF THE LOGAN AQUIFER SYSTEM

5.1 Definition and Extent of the Logan Aquifer System

The term Logan aquifer system was introduced by Maathuis (1991) to name a complex aquifer system initially identified in the southern half of 35-25-04-W2, the western half of 36-25-04-W2, and the northwestern part of 31-25-03-W2. The aquifer system is composed of an aquifer of the valley type and its associated terraces and aquifers formed by sands of the "Bredenbury Formation". The aquifer formed by the valley and its terraces is referred to as the Logan Valley aquifer. The aquifers formed by the "Bredenbury Formation" are referred to in this report as the Logan North and Logan South aquifers. The location and extent of these aquifers is shown in Figure 16 and on Map 5. Map 8 shows the Logan aquifer system in more detail.

In 1991, it was known that the Logan aquifer extended to the northern boundary of 31-25-03-W2 but it was expected to extend farther northward. During the 1990s, a significant effort was made to trace the aquifer farther northwards and to better define the aquifer area where it was known to exist. Because of the favourable geological setting, a valley incised in bedrock clays, extensive use was made of geophysical methods to delineate the Logan Valley aquifer (Maathuis *et al.,* 1994; Simpson, 1996, 1997; Komex International, 2000). As a result of these studies, it was shown and proven by testhole drilling that the Logan aquifer extended much farther northwards. Testhole drilling by Pasloske (2001, 2002) further increased the extent of the aquifer northward.

The regional geological setting of the Logan aquifer system is shown on cross sections A – A' (logs 16 – 17, B – B' (logs 49 to 60), I – I' (logs 216 to 48). A local cross section (LV – LV') shows a longitudinal profile of the valley. Additional cross sections can be found in Maathuis (1991). Map 8 provides information on the depth to and thickness of the aquifers of the Logan system.

The Logan Valley aquifer is incised into the clays of the Pierre Shale and where present cut through the "Bredenbury Formation" into the Pierre Shale. As shown on the cross sections, the Logan Valley is confined by till and in some testholes is underlain by till. Consequently, the aquifer is an intertill aquifer. Its origin and age remains unknown.

The Logan Valley aquifer is about 13 km long (see cross section LV – LV') and between 400 and 500 m wide. The fill of the Logan Valley aquifer consists of sands, predominantly coarse, and gravels. In the centre of the valley, the sands and gravels are up to 45 m thick. The valley fill is covered by up to 5 m of till and clay. In the northern part of 31-25-03-W2, Yorkton Creek crosses over the aquifer and in the vicinity of the site of Well #011 is incised into the top of the aquifer. Within the northwestern part of 31-25-03-W2, pits exist which expose the aquifer. These pits were constructed to potentially serve as recharge reservoirs.

Little new information has become available since Maathuis (1991) regarding the aquifers formed by the sands "Bredenbury Formation" north and south of the valley. These sands of the "Bredenbury Formation" are hereby referred to as the Logan North and South. These aquifers are commonly between 5 and 10 m thick and are covered by 5 to 10 m of silt and till.

5.2 Groundwater Withdrawals from the Logan Aquifer System

Productions Wells #001/001A, #002/002A, #010, #011, #012 and #014 are completed in the Logan Valley aquifer. Maathuis (1991) subdivided the wells into the Logan West (35-25-04-W2) and Logan East (36-25-04-W2, 31-25-03-W2, part of 26-03-W2) well fields. The reason for separating the wells into two well fields is the presence of a partial blockage in the Logan Valley aquifer. This partial blockage was identified by Maathuis (1991) and is located in the western half of 36-25-04-W2. Wells #001/001A, #002/002A and #010 are located in the Logan West well field, also locally known as the Logan Flats well field. The Logan East well field includes Wells #011, #012 and #014.

Groundwater withdrawals from the Logan aquifer system are summarized in Table 8 and shown graphically in Figure 17.

Table 8 Summary of groundwater withdrawals from the Logan Valley aquifer

Well name	Long-term average withdrawals and standard deviation dam^3	Maximum annual withdrawal dam^3	Minimum Annual withdrawal dam^3	Period
Logan West well field				
001A	48.2 ± 46.9	176	0	1967 - 2004
002A	63.4 ± 58.8	270	0	1967 - 2004
010	37.2 ± 71.1	235	0	1967 - 2004
Total	135 ± 111	445	13	1967 - 2004
Logan East well field				
011	332 ± 269	809	0	1983 - 2004
012	507 ± 212	813	19.4	1988 - 2004
014		170	2.8	2003 - 2004
Total	731 ± 133	1048	349	1983 - 2004

Table 8 and Figure 17 show that the production from the individual wells in the Logan West well field has been extremely variable, as indicated by the large standard deviations. The long-term average combined volume produced annually from this well field is 135 dam^3, with a standard deviation of 111 dam^3. As is evident from Figure 17, there has been a significant decrease in the usage of this well field since 1990. Currently wells in this well field are used only during the summer months.

Pumping from the East well field has been relatively constant, at an average annual rate of about 731 dam^3/a with a standard deviation of 133 dam^3.

It never could be established if Well #003 was part of either the Logan or Collacott system. Maathuis (1991) included Well #003 for purely arbitrary reason in the Logan system. Since the well was formally decommissioned it is not further discussed.

5.3 Water levels in the Logan Aquifer System

Systematic monitoring of the water levels throughout the Logan aquifer system did not started till the mid 1970s. In the period between 1975 and 1981 a large number of monitor wells were installed in both the Logan West and East well field areas. Many of these wells have been lost over time either due to destruction or decommissioning. At present (end of 2005) existing active monitor wells in the Logan West well field area are: MW93-08 (observation well), MW93-07 (observation well), TH75-28, TH75-36, and TH79-20. In the Logan West well field area, the following monitor wells exists: MW93-06, MW93-04 (observation well), MW93-03 (observation well in Logan North aquifer), MW95-04B (observation well), TH79-23, TH79-39, TH79-46, TH79-49, SRC96-02,03,04 and 05, BHL00-21,25,49, BHL01-92,98, 110A,B, 111A,B, 113, 125 and 127. The locations of these sites are shown in Figure 18.

The hydrographs for the existing observation wells and monitor wells and the destroyed/decommissioned wells are included in the supplement (Maathuis 2006). Inspection of the hydrographs show that unconfined conditions exist throughout most of Logan Valley aquifer.

The hydrograph of the static water levels for production Well #001 provides a rare and unique historical water level record covering the past seven (7) decades (Figure 19). It shows that during those 70 years the water level in the production well has only varied by about 4.5 m. This assumes that the changes in reference elevation due to replacement and rehabilitation were relatively minor and that there was little change in the reliability of the water level measurements. The long-term water level fluctuations are characterized by a decreasing water level from the 1930s to the early 1950s, followed by an increase until the late 1950s. From the late 1950s until the mid 1960s the water level declined but subsequently increased again till the mid 70s. The static water levels in the well since the mid 90s are similar to those on the early 1930s.

5.4 Groundwater Withdrawals and Water Level Changes

5.4.1 Logan West System

In Figure 20, the hydrographs for observation/monitor wells in the Logan West well field are shown. Figure 20 shows that in this part of the aquifer flow is from the southwest (MW96-08 site) to the northeast (TH79-20 site). From the mid 1970s till 1991, the water level throughout this part of the aquifer declined as a result of pumping from the well field. Continuation of withdrawals at the pre-1991 volumes would have resulted in a continuing decline of the water levels. However, it can not be predicted what the drawdown in the aquifer would be if pumping would have continued at this average annual rate and if steady-state conditions would be reached. The decrease in withdrawals from the production wells since 1990 resulted in an overall recovery of the water levels throughout the aquifer.

The relatively high withdrawals in 1981-1982 (375 dam^3/a), compared to pumping prior to 1981 and after 1982, had a significant impact on the water levels throughout this part of the Logan Valley aquifer (see Figure 20). Although the impact of pumping from individual wells is not known, the impact of the high combined 1981 – 1982 withdrawals indicates that pumping affects water levels throughout the aquifer over large distances. This is typical for a valley type of aquifer. However, because the aquifer is unconfined, the high pumping rate resulted in additional drawdown only in the 1 – 2 m range. The drawdown caused by pumping from the well field also extended into the Logan South aquifer. This is evident from the hydrograph for

TH76-10.

Maathuis (1991) demonstrated that while the Logan Valley aquifer is a continuous aquifer, a partial blockage exist in the area just east of TH79-20. The presence of such a blockage was indicated by water level records for monitor wells just east of TH79-20.

5.4.2 Logan East System

Hydrographs for selected piezometers completed in the Logan East system are shown in Figure 21, together with the annual withdrawals from the well field. The hydrograph for TH70-20 (Logan West well field) is shown for comparison. The locations of the observation and monitor wells are shown in Figure 18.

Figure 21 shows that flow in 36-25-04-W2 and 31-25-03-W2 is from the southwest (MW93-06) to the northeast (MW95-05B). The water level in the monitor wells are a superposition of long-term natural trends and the impact of pumping. The impact of pumping on the water level in a particular well is a function of the distance of that well to production Wells #011 and #012 and the amount of water produced from these wells.

Therefore, it is not possible to separate the natural fluctuations from those caused by withdrawals. Figure 21 shows that water levels started to decline in 1983 when Well #011 was taken into production. The water level continued to decline until 1990. In the period 1990 to 1995, the water levels increased. However, since 1995 it declined again. Since the annual withdrawals since 1990 are relatively constant, the observed trends since 1990 likely are mainly controlled by natural events.

Wells MW95-04B and TH79-23 are located immediately south and north of Yorkton Creek. The hydrographs of these wells show significant seasonally fluctuations (up to 4 m) related to the Creek. The lowering of the water level in the Logan Valley aquifer clearly resulted in increased recharge from runoff through the Yorkton Creek. The period of flow through the Creek at the well site may range from several days to several weeks. Consequently, the annual spring recharge derived from the runoff is highly variable. Complex, temporary, groundwater flow reversals might be created during recharge events as the water level in the valley aquifer near the creek bed will show a greater rise in water level than farther away from the creek bed (Maathuis, 1991).

Hydrographs for monitor sites north of Yorkton Creek are shown in Figure 22. While Figure 22 appears to suggest flow towards the Creek, the data can not be interpreted at this time as the water level data for SRC96-04 and 05 show inconsistent trends. Because the Logan Valley aquifer is an aquifer of the valley type and because of its limited width, withdrawals from Well #014 will result in drawdowns extending over large distances.

5.5 Groundwater Regime of the Logan Aquifer System

The hydrogeological setting of the Logan aquifer system can be described as consisting of one highly transmissive aquifer of the valley type which is hydraulically connected over parts of its length to bedrock aquifers with a much lower transmissivity. Both types of aquifers are overlain by a thin and likely highly fractured, aquitard.

Prior to any development, recharge to the system was derived solely from precipitation. Flow in the Logan Valley aquifer was from the southwest to the northeast. Yorkton Creek crosses the Logan Valley aquifer in NW-31-25-03-W2 and, in fact, is incised into the top of the aquifer. Consequently, the bottom of the Yorkton Creek in this area was the discharge area for the Logan Valley aquifer south of it. Flow in the bedrock aquifers (Logan North and South) likely was to Logan Valley aquifer as it acted as a drain. The Logan Valley aquifer north of Yorkton Creek likely also discharged in the bottom of the Creek.

The development of the Logan West well field resulted in the development of a long but flat drawdown cone. Despite the development of the drawdown cone, the overall flow in the Logan Valley aquifer remained from the southwest to the northeast.

The development of the East well field (1983) revealed the presence of a partial barrier in the Logan Valley aquifer, located at the western boundary of 36-25-04-W2. The major impact of the development of this well field is that the bottom of the Yorkton Creek in 31-25-03-W2 is no longer a discharge area but a source of recharge to the Logan Valley aquifer. The amount of induced recharge is largely a function of the length of the period when there is flow in the Creek.

5.6 Safe Yield of the Logan Aquifer System

5.6.1 Logan West Well Field

Water has been withdrawn from the valley aquifer of the Logan West system since the early 1930s and since 1967 at an average rate of 135 dam^3/a. This pumping rate does not appear to have caused an unacceptable lowering of the water table in the Logan Valley or and adjacent aquifers. In fact, because of the limited use of this well field since 1990, water levels throughout the well field have recovered to mid 1975 levels when water level monitoring started. Maathuis (1991) suggested that the long-term yield of this part of the aquifer could be in the order of 400 dam^3/a. This estimate was based on the impact of the high rate of pumping during 1981 and 1982.

5.6.2 Logan East System

Long-term water level records for the Logan East well field area indicate that annual withdrawals of 731 dam^3 are sustainable. However, this is subject to continuation of careful water level monitoring.

5.7 Hydraulic Properties of the Logan Aquifer System

A number of pump tests have been carried out in the Logan West and East well fields (Maathuis, 1991, Appendix D), there are no reliable data on the hydraulic conductivity of the sands forming the aquifers. Based on data obtained during a 48 hour pumping and subsequent 10 hour recovery test conducted in 2001 on production Well #014, Pasloske (2002) reported transmissivity values in the 5,900 to 13,300 m^3/day range. These values correspond to a hydraulic conductivity in the 125 to 285 m/day range. The finer grained sands of the “Bredenbury Formation” will have a much lower hydraulic conductivity.

The aquitard overlying the aquifer system, in varying combinations, is composed of silt, till and surficial clay, and is less than 10 m thick. Because of its limited thickness it is very likely that the aquitard is fractured. The bulk vertical hydraulic conductivity is probably in the 10^{-8} to 10^{-9} m/s range.

5.8 Groundwater Quality in the Logan Aquifer System

A complete listing of all available water quality data for the northern part of the Logan aquifer system can be found in Table A-2, Appendix A. Table 9 provides a listing of the most recent water quality. These data are shown graphically in Figure 23.

The quality of the water in the valley aquifer(s) of the Logan Valley aquifer can be described as reasonably good to good. The water is of the Ca/Mg – HCO_3 type, with a sum of ions in the 465 to 1,560 mg/L range. The average concentration and standard deviations is 934 ± 249 (n = 35 samples). These water quality characteristics are common for surficial or very shallow semi-confined aquifers in Saskatchewan, and are indicative of fairly strong recharge. Water from BHL00-25 is of the Na+K – SO_4 type and has a sum of ions of about 1,600 mg/L. The monitor well is located at, what is believed to be, the most northerly known extent of the Logan Valley aquifer (see Figure 18). As the quality of the water in this well differs so significantly from that in the rest of the aquifer, it can not be excluded that this monitor well is not completed in the valley aquifer.

The historic water quality data for production Wells #001, #002 and #010 indicate that there have been no significant changes in water quality with time (see Appendix A: Table A-2). The wells yield water of the Ca/Mg- HCO_3 type. The long-term average sum of ions and standard deviations for Well #001, #002, and #010 are: 993 ± 76 (n = 25 samples), 1,023 ± 63 (n = 27 samples) and 1,085 ± 59 mg/L (n = 6 samples). The iron and manganese concentrations exceed the objectives for drinking water supplies (Saskatchewan Environment, 2002).

Wells #011 and #012 both yield water of the Ca/Mg- HCO_3 type. The long-term average and standard deviation of sum of ions in water from Wells #011 and #012 are 1,000 ± 173 (n = 13 samples) and 1,107 ± 100 mg/L (n = 23 samples). Variations in the quality of water from these productions wells are minor and appear to be related to withdrawals from the wells (Figure 24). Figure 24 shows that Well #011 yields water with a lower sum of ions if pumped hard. On the other hand, the sum of ions in water from Well #012 tends to increase if pumped hard.

Withdrawals from Wells #011 and #012 will induce recharge from Yorkton Creek during periods of flow. The impact of this induced water will be greater on the water quality in Well #011 as it is located immediately adjacent to Yorkton Creek. As demonstrated by Maathuis and Campbell (1996), the elevated color of and the elevated dissolved organic carbon (DOC) concentrations in the water from the buried valley aquifer in the vicinity of production Wells # 011 and #012 is related to water induced from the creek into the aquifer. The iron and manganese concentrations in water from these two wells exceed the objectives for drinking water supplies (Saskatchewan Environment, 2002).

The information on the quality of the groundwater in the aquifers formed by sands of the "Bredenbury Formation" is limited. Observation well MW93-03, completed in the Logan North aquifer yields water of the Ca/Mg- HCO_3 type with a sum of ions of 975 mg/L. Domestic wells completed in the Logan South aquifer tend to yield Ca/Mg – SO_4 type of water. The sum of ions is in the 1,140 – 2,095 mg/L range.

5.9 Susceptibility to Contamination of the Logan Aquifer System

It is evident from Figure 15 (see also Map 7) that all the aquifers of the Logan aquifers system are extremely vulnerable to contamination from sources at the ground surface. The high vulnerability (AVI values less than 2) is not surprising considering the near-surface position of these aquifers.

The Logan East well field area in particular is vulnerable to contamination. Potential sources of contamination include the old landfill in 36-25-04-W2, accidental spills, the Yorkton Creek and borrow pits. In NE -31-25-3-W2, the Logan Valley aquifer is hydraulically connected to the Yorkton Creek, which is a major source of recharge to the aquifer. Flow through the Yorkton Creek at the East well field site is not only derived from its own watershed, but because of diversions, can also be derived from adjoining watersheds. The bottom of two borrow pits dug within the well field area penetrate the top of the aquifer. These borrow pits are a potential source of contamination if not protected properly. The old landfill must be considered as a potential source of contaminants because of the southwest – northeast flow in the Logan Valley aquifer.

Production Wells #001, #002 and #010 (Logan West well field) are located in the S1/2 of 35-25-5-W2. The area above the aquifer has been grassland for a long time. Any development of this area may lead to potential contamination of the Logan Valley aquifer in this area.

6.0 GROUNDWATER RESOURCES OF THE COLLACOTT AQUIFER SYSTEM

6.1 Definition and Extent of the Collacott Aquifer System

The term Collacott aquifer system was introduced by Maathuis (1991) to designate a highly complex system of aquifers and aquitards which occurs just west of the City of Yorkton. To the north, the Collacott aquifer system may be hydraulically connected to an aquifer formed by sands of what is believed to be the "Bredenbury Formation". This aquifer is referred to as the Orcadia aquifer. The location and extent of the Collacott system and Orcadia aquifer is shown in Figure 25 (also see Map 5).

The geological setting of the Collacott system, and the Orcadia aquifer to the north, is shown on regional cross sections B – B' (logs 35 to 46) and on the local cross section COL – COL'. Additional cross sections can be found in Pasloske (2003).

Cross sections B – B' and COL – COL' (see Map 2 for locations) show a shallow sand and gravel unit which is overlain by about 5 to 10 m of till (see also Map 6). This aquifer unit is between 5 and 20 m thick but only its lower half is saturated. The saturated portion of this unit forms the upper, unconfined, aquifer of the Collacott system. Production Well #007 has been completed in this upper aquifer. The upper sand unit is separated from a lower sand unit by an aquitard formed by a 3 to 20 m thick silt unit. The lower sand unit, between 5 and 20 m thick, forms the lower, confined, aquifer unit of the Collacott system. Production Well #006 has been completed in this lower aquifer unit. The lower sand/aquifer unit is believed to be formed by sediments of the Empress Group.

The extent of the Collacott aquifer system and its subcomponents remains very poorly defined due to the lack of testhole information. Furthermore, at the locations of Well #004, and Wells #005 and #013, the continuity of the upper and lower aquifers may be interrupted. Well #004 appears to be largely completed in a laterally isolated aquifer formed by sands of the "Bredenbury Formation", believed to be preserved in a collapse structure. However, this aquifer appears to be hydraulically connected to an isolated portion of the upper aquifer unit (see cross section COL – COL'). The geological setting at the site of Wells #005 and #013 is extremely complex and poorly understood. The site is characterized by a deep low in the topography of the top of the Pierre Shale but it can not be determined whether this low is a collapse structure or a valley. This low is in part filled with sands and gravels which may have some lateral continuity. Wells #005 and #013 are located in the same surface drainage channel as Well #004 but the aquifers at these sites may not be related to each other and consequently, may form two additional subsystems of the Collacott system. The extent of these subsystems is unknown due to a lack of testhole information.

Cross section COL – COL' (logs 41 to 309) indicates that along the cross section line there is no linkage between the Collacott system and Orcadia aquifer to the north.

The Orcadia aquifer ranges in thickness from a few metres to over 20 metres. The aquifer is overlain by an aquitard, mainly composed of till, which varies in thickness from 3 to 20 m.

6.2 Groundwater Withdrawals from the Collacott Aquifer System

Groundwater withdrawals from the Collacott aquifer system are summarized in Table 10 and shown graphically in Figure 26.

Table 10 Summary of groundwater withdrawals from the Collacott aquifer system

Well name	Long-term average withdrawals and standard deviation dam^3	Maximum annual withdrawal dam^3	Minimum annual withdrawal dam^3	Period
004	109 ± 42	205	14.3	1967 - 2004
005	202 ± 167	547	0	1967 - 2004
006/6A	162 ± 109	456	1.4	1967 - 2004
007	199 ± 88	378	37	1967 - 2004
013	26.6 ± 75.5	310	0	1983 - 2004
Total	687 ± 235	1348	346	1983 - 2004

Figure 26 shows that both the annual volumes and volumes withdrawn by individual production wells in this aquifer system are highly variable. During the period 1967 – 1994, the average annual withdrawal rate was 836 dam^3/a. In the period 1986 – 1993, pumping from the well field was significantly reduced (average 401 dam^3/a). This reduction was largely due to the fact that the Logan East well field was taken into production. The average pumping from Well #005 and #007 in particular was greatly reduced. Since 1994 annual production from the West well field averaged 638 dam^3.

In addition to withdrawals for its municipal water supply, the City of Yorkton produces an estimated volume of 75 dam^3/a from its Hopkins Lake well, to maintain the water level in Hopkins Lake during the summer months. In recent years, it also has been used to supply the Deer Park Golf Course with water. Groundwater may represent only a portion of the water withdrawn from this well. The Hopkins Lake well is a shallow well located near the Lake and consequently, much of the water produced may be induced Lake water.

Households in the Collacott subdivision of the RM of Orkney obtain their domestic water supply mainly from private wells. Water well records indicate that wells in this subdivision have been completed in both the upper unconfined aquifer as well as in the lower confined aquifer. Pentland (1989) estimated that the total annual domestic withdrawals in the Collacott subdivision were about 29 dam^3. This volume currently will be less since a number of residences now obtain their drinking water from the Yorkville Utility.

6.3 Groundwater Withdrawals and Water Level Changes

There are few monitor wells existing in the Collacott aquifer system and two wells have long-term records (TH65-10A and TH65-25). Figure 27 shows the location of the production wells and monitor wells completed in the Collacott aquifer system. Monitor wells TH65-10A and TH65-25 are located several kilometers away from the West well field production wells, outside the area shown in Figure 27.

Hydrographs for the monitor wells in the Collacott aquifer system are shown in Figure 28.
The hydrographs for TH65-10A and TH65-25 represent background water level data as it is

unlikely that, because of their distance from production wells, the water levels in these wells is being affected by pumping. The hydrographs for MW93-01/02 and 09 are a superposition of long-term natural water level trends and impact of pumping. However, it is not possible to separate the impact of withdrawals from the natural trends.

In Figures 29 and 30, the reported "static" water levels in the West well field productions wells are shown together with the withdrawals. Maathuis (1991) suggested that since pumping from this well started in the mid 1950s the water may have dropped by 7 m before stabilizing in the late 1960s. The hydrograph for Well #005 shows a gradual but significant recovery during the period 1981 -1996 when there was little to no pumping from this well. It has not been established if the water level in Well #005 is affected by the pumping from Well #006 and/or Well #013. The hydrographs for Wells #004, #006 and #007 show that water levels in these wells fluctuated within a 5 meter range. The long-term hydrographs do not show any evidence of pumping induced long-term water level declines. The hydrograph for Well #013 represents natural fluctuations as it was hardly used in the period 1967 – 2003.

Due to either destruction or decommissioning there are no long-term water levels available for the Orcadia aquifer.

6.4 Groundwater Regime of the Collacott Aquifer System

From a geological point of view, the Collacott aquifer system remains very poorly defined in terms of extent and relationship between the various aquifers which form this system. However, aquifers within the system have been pumped for a large number of years without causing significant drawdowns. This suggests that the recharge to the system must be relatively high. This is supported by the good quality of the water which the aquifers are yielding (see section 6.7) Furthermore, it suggests that the various aquifer units of the Collacott system are hydraulically connected, probably in complex ways.

Groundwater flow within the Collacott aquifer system and Orcadia aquifer can not be described because they are so poorly defined geologically and because of the limited availability of water level data. The topographical depression north of Well #004 historically has been marshy, but it can not be established if these conditions are due to discharge from the shallow unconfined aquifer or are related to the "Bredenbury" aquifer in which Well #004 has been completed. The low water level in the unconfined aquifer of the Collacott system indicates that this aquifer is well drained. However, it is not known where the discharge area is.

6.5 Safe Yield of the Collacott Aquifer System

The hydrographs, long-term average annual pumping records and water quality data for the production wells completed in the Collacott aquifer system indicate that the groundwater withdrawals from the system have not caused any serious problems in terms of water level declines or water quality changes. The long-term total withdrawal of 687 dam^3/a from the production wells in the West well field is sustainable. In fact, the average annual combined withdrawal rate of 836 dam^3 does not appear to have resulted in significant water level declines.

It is likely that the safe yield is greater than 836 dam^3/a but careful monitoring would be required.

6.6 Hydraulic Properties of the Collacott Aquifer System

Despite the fact that several pump tests have been carried out in the Collacott aquifer system and in the unnamed aquifer to the north of it (Maathuis, 1991; Appendix D), there are no reliable calculated estimates of the hydraulic properties.

6.7 Groundwater Quality in the Collacott Aquifer System

Selected groundwater quality data for the Collacott aquifer system are listed in Table 11 and shown graphically in Figure 31. Additional data can be found in Table A-2, Appendix A. The location of the sample points is shown in Figure 27.

The available water quality data show that the Collacott aquifer system yields water which is of reasonably good quality. Typically, water is of the Ca/Mg – HCO_3 type (Figure 31), with a sum of ions in the 850 to 1,680 mg/L range. These characteristics are indicative of fairly strong recharge.

Repeat water quality data for productions Wells #004, #005, #006, #007 and #013 shows that there have been no significant changes in the quality of the water with time (Table A-2, Appendix A). The wells yield Ca/Mg – HCO_3 water with a sum of ions between 910 mg/L (Well #007) and 1,140 mg/L (Well #005). Typically, the iron and manganese concentrations exceed the objectives for drinking water supplies (Saskatchewan Environment, 2002).

As is evident from Figure 31, the water quality data for the McPhee, Wasyliw and Anderson wells are anomalous. The chemical analysis of the water from the McPhee well is characterized by low calcium and magnesium concentrations and a high sodium concentration. These water quality characteristics indicate that the water sampled is not formation water but is water which passed through a water softener. Water from the Wasyliw well is characterized by a high chloride and nitrate concentration (224 and 35 mg/L, respectively), suggesting that water from this well is affected by sewage effluent. The Anderson well yields water with an anomalously high chloride concentration (276 mg/L), but the nitrate concentration is below the detection limit (<0.04 mg/L as NO_3). Both the Wasyliw and Anderson wells are completed in the upper aquifer of the Collacott aquifer system and poor well construction is the likely cause of the contamination as there is no evidence of widespread pollution.

6.8 Susceptibility to Contamination of the Collacott Aquifer System

Since the aquitard confining the Collacott aquifer system is in the 5 to 10 m range it is not surprising that the aquifer system is vulnerable to contamination from above ground sources. The AVI values are in the high to moderate range (Figure 15, Map 7). The shallow unconfined aquifer in particular is susceptible to contamination because it is only covered by up to 5 m of till, which likely is fractured. The Collacott subdivision has no central sewage system and domestic sewage effluent commonly is disposed off by means of infiltration and evaporation from permeable mounds above ground. These mounds are a potential source for contamination of the upper Collacott aquifer. Since 1997, the number of active mounds has decreased as some residents now obtain their water supply and sewage services from the Yorkville Utility.

7.0 GROUNDWATER RESOURCES OF THE LEECH AQUIFER SYSTEM

7.1 Definition and Extent of the Leech Aquifer System

The name Leech aquifer system was introduced by Maathuis (1991) to define an aquifer system which is composed of two individual, but hydraulically connected, aquifer units. These aquifer units are referred to the Leech Lake and Otthon aquifers. The extent of the Leech aquifer system and its subcomponents is shown in Figure 32. The aquifer system covers roughly Ranges 4 and 5, Townships 23 and 24. The Otthon aquifer covers an area of about 200 km^2. The Leech Lake can be subdivided into a northern part (about 60 km^2) which occurs in Range 4, Township 24, and a southern part (Range 4, Township 23; about 70 km^2).

The Otthon aquifer is defined as the aquifer formed by sands of the "Bredenbury Formation", in the area covered roughly by Range 5, Townships 23 and 24, and the southern part of Township 25. The geological setting of the aquifer is shown in cross sections C - C1 (logs 84 -88), D – D' (logs 111 -114), E - E' (logs 133 to 136), G - G' (logs 135 to 169) and H – H' (logs 177 to 183). These cross sections show that the aquifer is bounded to the west and north by till. Along most of its eastern extent it is hydraulically connected to the sands and gravels forming the Leech Lake aquifer. In Tp 23, Rg 5 and 6, the Otthon aquifer is hydraulically connected to an unnamed aquifer formed by sediments of the Empress group (section E – E', logs 132 and 133).

The Otthon aquifer commonly is between 20 and 30 m thick. In the utmost northern portion of the aquifer and in the northwest of Range 4, Township 23, the aquifer is less than 10 m thick. The aquifer is confined by an aquitard which is mainly composed of till. Over most of the southern portion of the aquifer, the aquitard is between 20 and 40 m thick. In the area of the Hamlet of Otthon, the aquitard is between 5 and 10 m thick; over the northern portion of the aquifer the aquitard is between 10 and 20 m thick (see Map 6).

The Leech Lake aquifer is defined as the aquifer formed by the sands and gravels which occur in Range 4, Townships 23 and 24, and the southern part of Township 25. The geological setting of this aquifer is shown in cross sections C – C' (logs 88 to 97), D – D' (logs 115 to 120), E – E' (logs 137 to 142), H – H' (logs 177 to 183), and I – I' (logs 209 to 211). Due to the large number of testholes in the area of the South well field, a detailed map for this area has been prepared (Map No. 2) and five (5) "local" cross sections (LL1 – LL1' to LL5 – LL5') show the geological setting in this area.

Although in many places the aquifer sands occur between the bedrock surface and till, in the northern part of the aquifer till was encountered under the aquifer sands at a few testhole sites (*e.g.*, cross sections LL1 - LL1', LL4 - LL4' and LL5 – LL5') . Consequently, the Leech Lake aquifer is considered an intertill aquifer. It age, however, can not be determined as there is not sufficient information to characterize the tills in this area. In the recent testholes drilled by Clifton (2003) in the 02-25-04-W2, Leech Lake aquifer was encountered. Considering the proximity of these testholes to York Lake there can be little doubt that the Leech Lake aquifer extends under the Lake. The southern portion of the aquifer (Range 4, Township 23) is formed by sand and gravels of the Empress Group.

The depth to and thickness of the northern part of the Leech Lake aquifer is shown on Map 6 and in more detail on Map 9. The Leech Lake aquifer in Range 4, Township 24, and southern part of 25, is between 10 and 20 m thick, and is overlain by an aquitard which is mainly composed of till. Within the eastern half of this area the aquitard is between 10 and 20 m thick; in the western half it ranges between 5 and 10 m (Maps No. 3 and 9). In Range 4, Township 23, the thickness of the aquifer varies between 5 and 37 m. The overlying aquitard varies in thickness between 30 and 50 m thick.

7.2 Groundwater Withdrawals from the Leech Aquifer System

For the period 1970 - 2004, the average annual production from this South well field (Wells #008 and #009) is about 819 dam^3. The standard deviation in the average annual volume pumped is 187 dam^3. Till the end of 2004, a total volume of about 28,670 dam^3 was pumped from this well field. In the period 1983 – 2002, the South well field supplied about 41% to the City of Yorkton municipal supply.

7.3 Water Levels in the Leech Aquifer System

A large number of piezometers were installed in the northern part of the Leech Lake aquifer (Range 4, Township 24 and southern part of Range 4, Township 25), to monitor the effects of the withdrawals from the South well field. The available water level data for the Leech aquifer system are a mixture of approximate point-water level data and accurate long-term data for piezometers. The locations of observation wells and monitor wells in the northern part of the aquifer are shown in Figure 33. This Figure shows that only a few piezometers (1966 and 1967 piezometers) were installed prior to the start of pumping in 1969 from the South Well field.

A "snap-shot" of the groundwater flow conditions (*i.e.,* instantaneous piezometric surface) in the northern part of the Leech Lake aquifer is shown in Figure 34. The water level data were obtained on October 1, 2004. As to be expected, there is flow towards the two production wells. However, as is evident from Figure 34, there are a number of inconsistencies in the point-water levels. These inconsistencies are due to the absence of reliable elevation data.

There are no long-term water level records for the Otthon aquifer. Maathuis (1991) reported that the hydraulic head in the Otthon aquifer varies between 510 and 530 m asl. However, the hydraulic head data do suggest an eastward flow from the Otthon aquifer into the Leech Lake aquifer. In the utmost northern part of the Otthon aquifer, flowing conditions exist.

7.4 Groundwater Withdrawals and Water Level Changes

Any assessment of the impact of pumping on water levels in an aquifer relies on the availability of long-term antecedent water level records, reliable water level records for the initial years after pumping started and on pumping records.

Long-term hydrographs for selected monitor wells in the northern part of the Leech Lake aquifer are shown in Figures 35 and 36, together with a graph of the monthly groundwater withdrawals from the South well field. The locations of these monitor wells is shown in Figure 33.

Figures 35 and 36 shows the absence of reliable antecedent records and the lack of data for the initial years after the start of the pumping. Maathuis (1991) estimated that the drawdown induced by the pumping from the well field was in the order of 0.5 to 2 m. By the time that monitoring of the water levels started (1975) a steady-state drawdown cone was established. Therefore, it is not surprising that the post 1975 water level records show little evidence of pumping. The post 1975 water levels are longer-term and seasonal fluctuations superimposed on the drawdown cone.

The hydrographs for the SWA observation wells in the northern part of the Leech Lake aquifer are shown in Figure 37. The period of record is relatively short but the trend in the water levels is similar as that observed in the other monitor wells. The sudden and significant increase of the water levels in the fall of 2003 is real but the cause has not been established.

7.5 Groundwater Regimes of the Leech Aquifer System

The southern and northern portions of the Leech Lake aquifer are considered to form one continuous aquifer, but hydrologically behave differently. Water level data for the southern part are significantly lower than in the adjacent Otthon aquifer and the aquifer appears to drain southward, toward the Hatfield Valley aquifer (Maathuis, 1991).

The present groundwater regime of the northern part of the Leech Lake aquifer is characterized by radial flow toward the production wells. Recharge to this portion of the aquifer is depression focused but the aquifer also receives lateral recharge from the Otthon aquifer. Vertical recharge to the northern part of the Leech Lake aquifer can be expected to be variable because of the variable thickness of the overlying aquitard. Surface water bodies in the northern part of the aquifer may be an important source of recharge to the aquifer. York Lake likely is a recharge source but additional geodetic surveys are needed before the relationship between the Lake and the aquifer can be described in more detail. An unnamed artificial lake south of monitor well YRK 2000-01 may also be an important recharge source. Similarly a temporal surface waterbody in the northern part of 34-24-04-W2 may have an impact on recharge to the aquifer

Because of the variable thickness of the confining aquitard recharge to the Otthon aquifer will be spatially variable. In relative sense, the greatest amount of recharge will occur in the vicinity of the Hamlet of Otthon because of the limited thickness of the aquitard in the area. Water level data indicate that the aquifer discharges into the Leech Lake aquifer, and to the ground surface along its northern extent (Maathuis, 1991).

7.6 Hydraulic Properties of the Leech Lake Aquifer

Although a number of pumping tests have been carried out in the northern part of the Leech Lake aquifer (see Maathuis, 1999, Appendix D), no transmissivity or hydraulic conductivity data have been reported.

The transmissivity of the aquifer, and therefore the hydraulic conductivity, will be variable as the lithology is variable. The lithology of the aquifer ranges from very coarse gravels to medium- to coarse grained sands. These sediments will have a transmissivity in the order of 1,000s m^2/day. Considering its limited thickness, it is estimated that the bulk vertical hydraulic conductivity is in the order of 10-8 to 10-9 m/s, and perhaps locally somewhat higher.

7.7 Safe Yield of the Northern Part of the Leech Lake Aquifer

The available water level data indicate that the average long-term withdrawal rate is 819 dam^3/a is sustainable as water levels throughout the aquifer do not show any evidence of a declining trend over time. The allocated amount of withdrawal is 1,060 dam^3/a. Whether or not this amount can be withdrawn on a sustainable basis needs to be proven by further careful testing and monitoring.

7.8 Groundwater Quality in the Northern Part of the Leech Lake Aquifer

7.8.1 Major Ions

A complete listing of all available water quality data for the northern part of the Leech Lake aquifer can be found in Table A-2, Appendix A. Table 12 provides a listing of the most recent water quality for the monitor wells and domestic wells in this part of the aquifer. These data are shown graphically in the form of a Piper-plot in Figure 38. Figure 39 shows the location of sample points and the distribution of water type and sum of ions.

Figure 39 shows that the best quality of ground water is found in 33/34-24-04-W2. In this area, the aquifer yields water of the Ca/Mg – HCO_3 type with a sum of ions of less than 1,000 mg/L. This area roughly coincides with the area where the aquitard confining the aquifer is less than 10 m thick (see Map 9). The water quality in this area is a reflection of good recharge conditions.

In the remainder of the area covered by the northern part of the aquifer, water is predominantly of the Ca/Mg – SO_4 type with a sum of ions in the 1,100 to 2,200 mg/L range. This type of water is found in the areas where the confining layer is thicker than 10 m and is typical for intertill aquifers in Saskatchewan.

It is of importance to note that the nitrate concentration throughout the northern part of the aquifer is less than 0.04 mg/L as NO_3.

7.8.2 Arsenic and Selenium Concentrations

As part of establishing baseline data for selected existing and recently installed monitor wells water quality surveys were conducted in 2000 – 2003 (Maathuis, 2001; Maathuis *et al.*, 2002, 2004).

The arsenic (classified as a carcinogenic) concentrations found ranged from <0.5 to 21 µg/L (2001 sample from YRK99-02). Monitor well TH 75-02 yielded in 2001 and 2002 arsenic concentrations of 16 and 13 µg/L, respectively. All other wells sampled have concentrations less than 10 µg/L. These concentrations are below guidelines for Canadian drinking water (Health Canada, 2006) which is 10 µg/L.

The selenium concentration is below the guideline of 0.01 mg/L throughout the northern part of the Leech Lake aquifer.

7.8.3 Water Quality Wells #008 and #009

Water quality data for production Well #008 shows that the water produced commonly is of the Ca/Mg – HCO_3 type, with a sum of ions in the 1,100 to 1,390 mg/L range (see Table A-2, Appendix A). The variation in the sum of ions appears to be related to the pumping history of the well (Figure 40). During the period 1969 - 1980 the well was pumped virtually continuously at a high rate and during this period the sum of ions decreased from about 1,390 mg/L in 1969 to 1,100 mg/L in 1980. In the period 1981 – 1996 when the withdrawals from Well #008 were small, the sum of ions increased again. It decreased again when pumping from Well #008 increased in 1997.

Figure 41 shows the changes in the quality of the water from Well #009 over time. During the period 1976 – 1992, the sum of ions decreased slightly but since then increased from about 1,070 mg/L to 1,400 to 1,500 mg/L presently. The increase in the sum of ions is mainly due to an increase in the sulfate concentration, accompanied by minor increases in the concentrations of calcium magnesium and sodium. The observed changes are much less directly related, if at all, to the pumping from Well #009. The changes in quality after 1996 occurred when the pumping from this well was reduced.

The iron and manganese concentrations in water from these production wells exceed the objectives for municipal water supplies (Saskatchewan Environment, 2002).

7.8.4 Water Quality in the Otthon Aquifer

The available water quality data for the Otthon aquifer are shown in Table 13 and graphically in Figure 42. The water quality data for the Otthon aquifer show that this aquifer yields water which is commonly of the Ca/Mg – SO_4 or Na+K – SO_4 type. The TDS may range between 1,650 and 3,200 mg/L. The iron and manganese concentrations commonly exceed the guidelines for private and municipal water supplies (*e.g.,* Saskatchewan Environment, 2002).

It should be noted that little information is available concerning the quality of the water in the Otthon aquifer adjacent to the northern part of the Leech Lake aquifer.

7.9 Susceptibility to Contamination of the Leech Aquifer System

The aquifer vulnerability index for the Leech Lake aquifer system is shown in Figure 15 and on Map 7. Most of the Leech aquifer system is well protected against contamination by virtue of the thickness of the overlying aquitard and the fact that the overlying land is mostly used for low-intensity agriculture. However, the western part of the Leech Lake aquifer in Range 4, Township 24, and the Otthon aquifer in the vicinity of the Hamlet of Otthon have high AVI ratings.

8.0 GROUNDWATER RESOURCES OF THE STURDEE AQUIFER SYSTEM

8.1 Definition and Extent of Sturdee Aquifer System

The name Sturdee Aquifer system was introduced by Maathuis (1991) to define a complex aquifer system which was initially identified by International Water Supply in the eastern half of 34-25-03-W2 as a potential area for the development of a well field. Prior to 1991 the area was referred as the Three Miles East well field. Recent investigations by Pasloske (2002, 2003) have significantly expanded the knowledge about the Sturdee aquifer. The location and extent of the Sturdee aquifer systems and its components is shown in Figure 43.

The location of testholes and piezometers in the Sturdee aquifer area is shown on Map 10. This Map also shows the depth to and thickness of the aquifer. The geological setting is shown on regional cross sections A-A' (logs 21 – 23) and B-B' (logs 63 – 74), and on the "local" cross section ST-ST'. Additional cross sections can be found in Pasloske (2002).

The Sturdee aquifer system is a complex system. The main component of the aquifer system is a south-north trending aquifer of the buried-valley type, composed of sands and gravels with interbeds of till and silt. Tills within and locally above the aquifer sands suggest that the age is that of an intertill aquifer. However, the age of the sediments is not known, nor is its origin. The Sturdee aquifer is between 2 km and 4 km wide and about 14.5 km long. The aquifer typically is between 10 and 35 m thick (see Map 10 and cross section ST-ST'). Over much of the aquifer extent aquifer sands start at the ground surface but locally it is covered by 1 – 10 m of silts/clays or till.

To the east, the aquifer is bounded by till. Cross section ST-ST' shows that to the north the aquifer thins to zero thickness. Pasloske (2002, cross section C-C') suggests that in the northwest the Sturdee aquifer might be hydraulically connected to the Logan Valley aquifer. However, this will have to be confirmed by further test drilling. To the west, the aquifer is hydraulically connected to an unnamed aquifer formed by the "Bredenbury Formation" (see cross section B-B'). As shown in cross section ST-ST', in the southeast the aquifer is hydraulically connected to the Dunleath aquifer, composed of sands of the "Bredenbury Formation".

8.2 Groundwater Regime of the Sturdee Aquifer System

The groundwater regime can only be described in very general terms as most of the 1975, 1976 and 1979 monitor wells either have been destroyed or were recently decommissioned. Of the older monitor wells only wells TH 75-52, TH75-53, TH75-54, TH76-23 and TH76-30 are still in use (Figure 44). Surveyed elevations are not available for the BHL00 and BHL01 monitor wells completed in the aquifer. Consequently, it is not possible to construct a piezometric map for the aquifer or to delineate in detail the areas where the aquifer is unconfined and semi-confined. However, it is evident from Map 10 that the aquifer is unconfined over much of its extent as the aquifer sands are at ground surface. Little is known about the amount of recharge to surficial aquifers in Saskatchewan but likely is in the order of several centimetres. Consequently, the aquifer could receive a significant amount of recharge annually from precipitation. The hydraulic relationship between the aquifer and the creek is not known. Further study would be needed to determine where the creek may be a source of recharge or where it may be fed by the aquifer. Further investigations are needed to determine the relationship between the creek and the aquifer. Based on the topographical setting flow within the Sturdee aquifer will be from the southeast to the north – northwest (see section ST-ST'). The aquifer likely discharges in the northern part of its extent. Toth (1977) indicated that there are numerous springs northeast of 34-25-03-W2 but provided no detailed information on the location and characteristics of these springs.

The long-term hydrographs for monitor wells TH 75-52, TH75-53, TH75-54, TH76-23 and TH76-30 are shown in Figure 45. This figure shows small water level fluctuations over time, typically in the 0.5 to m range. These kinds of fluctuations are not uncommon for unconfined surficial aquifers in Saskatchewan. The water levels in all the wells appear to be influenced by the pumping from Well #015, except at the site of TH75-52. The apparent absence of response of the water level in this well to the pumping needs to be further investigated.

8.3 Hydraulic Properties of the Sturdee Aquifer

In 1978, International Water Supply conducted a short-term pumping test on IWS Testwell TW 76/24, near monitor well TH75-53. This test only proved that it is possible to construct a well yielding at least 15 L/s (about 475 dam^3/a) at this location.

A complex, 45 day long, pumping test was conducted on the Sturdee aquifer in 2000. The pumping test started on September 12, 2000 with pumping from Testwell BHL00-38 at a rate of 30.3 L/s. As it became apparent that the aquifer was not stressed enough at this rate nearby IWS Testwell TW 76/24 was also pumped (11.4 L/s). Pumping from this well started on September 29, 2000. The two wells were pumped simultaneously for 28 days at a combined rate of 41.6 L/s.

Although the pumping test indicated that the aquifer could be pumped at a high rate, it provided little insight in the impact of pumping on the aquifer as no water level data are available for the wells monitored prior to and after the pumping test. However, it proved hydraulic continuity.

Pasloske (2000) analyzed the data from the 1978 pumping test and the data for the first two days for the test on BHL00-38. Pasloske (2000, page 12) reported a transmissivity in the 890 to 6,550 m^2/day range, with an average of 4,550 m^2/day.

Production Well #015 (BHL01-115PW15) was constructed about 50 m south of Testwell BHL00-38. Well #015 was pump tested in 2001 at a rate of 60.5 L/s for 48 hours, followed by a 10 hour recovery period. Monitor well TH75-52, located about 100 m from the production well, was used as an observation well. Pumping test analyses suggest a transmissivity in the range of 4,320 to 10,870 m^2/day (Pasloske, 2002).

Reported values for the specific yield of the aquifer, as determined from the various pumping tests are in the 0.29 to 0.38 range (Pasloske, 2001, 2002). These values are somewhat higher than what would be typical for an unconfined sand aquifer for which the specific yield typically is in the 0.2 – 0.3 range.

8.4 Groundwater Quality in the Sturdee Aquifer System

The few groundwater quality data available for the Sturdee Aquifer system are listed in Table 14 and are shown in the form of a Piper-plot in Figure 46.

The sum of ions ranges from 465 to 1,600 mg/L, averaging 913 ± 334 (n=25 samples), excluding the water quality for BHL01-61 excluded. BHL01-61 yield highly mineralized water, characterized by a sum of 4,670 mg/L and a sulfate concentration of 2,060 mg/L. Monitor well

BHL01-61 is completed at the edge of the Sturdee aquifer system and could reflect the quality of water in the "Bredenbury Formation". Water in the main part of the Sturdee aquifer typically is of the calcium/magnesium sulfate or calcium/magnesium – bicarbonate type. The iron and manganese concentrations commonly exceed the water quality guidelines for municipal drinking water supplies (Saskatchewan Environment, 2002). Most monitor wells yield water with a few mg/L NO_3. A notable exception is the water from well BHL 01-85 which has a nitrate concentration of 54 mg/L. Data provided by Pasloske (2002) show that arsenic concentrations range from below detection limit (<0.5 µg/L) to 30 µg/L (BHL00-34). Other wells yielding water with elevated As concentrations are: BHL00-20 (17 µg/L), BHL00-29 (19 µg/), BHL00-40A (13 µg/L), BHL01-63 (25 µg/L) and BHL01-85B (10 µg/L). The current Canadian maximum acceptable concentration is 10 µg/L (Health Canada, 2006).

8.5 Well Yield and Aquifer Yield

Based on the screen design Pasloske (2002) estimated the safe well yield of Well #015 to be 75.69 L/s (about 2,390 dam^3/a). Based on specific capacity data and allowing for a 25% decrease in well efficiency over time Pasloske (2002) estimated that the long-term drawdown would be 8.13 m. The well has been licensed for 1,000 dam^3/a.

The long-term sustainable yield of the aquifer is difficult to estimate because of the complex hydrogeological setting. It can only be established by careful monitoring the water levels in the aquifer in response to the pumping. Consequently, it is critical that locations and elevations (ground and top of casing) are surveyed. In addition to equipping a number of monitor wells with a digital water level recorder, the water level in the other wells should be measured several times per year.

8.6 Susceptibility to Contamination of the Sturdee Aquifer System

Considering that the aquifer sands either outcrop at the ground surface or is confined by a relatively thin aquitard, it is not surprising that the aquifer is highly vulnerable to contamination. The AVI index for much of the aquifer extent is <1 and in the remaining area between 1 and 2 (Figure 15, Map 7). Consequently, protection of the groundwater resources of this aquifer should be given high priority.

9.0 GROUNDWATER RESOURCES OF THE BREDENBURY AND WILLOWBROOK AQUIFERS

9.1 Bredenbury Aquifer

The Bredenbury aquifer, named and described by Schreiner and Maathuis (1982), is an extensive aquifer formed by sands of the “Bredenbury Formation”. Within the study area its extent is limited to a narrow zone along the eastern boundary (Figure 47). However, it extends eastward to the Manitoba border and into Manitoba (Maathuis *et al.,* 1999). Pasloske (2001, page 18) renamed the northern portion of the Bredenbury aquifer the Dunleath aquifer to avoid confusion with other aquifers formed by the “Bredenbury Formation” the study area. The use of the name Dunleath aquifer should be discontinued as the Bredenbury aquifer is a well defined regional aquifer.

The geological setting of the aquifer is shown in cross sections J - J' and C – C’. The Bredenbury aquifer is not continuous along the eastern portion of the study area as it is separated by an unnamed aquifer formed by sediments of the Empress Group. In how far this unnamed aquifer is hydraulically connected to the Bredenbury aquifer remains a matter of speculation but some connection can not be excluded (see section C – C’). Within the northern part, the aquifer was locally removed presumably by glacial erosion (cross section J – J’, log 241).

In the northern part the aquifer is overlain typically by a 10 to 20 m thick aquitard which is mainly composed of till. The aquitard confining the southern part of the aquifer is typically between 20 and 40 m thick. The thickness of the Bredenbury aquifer typically is in the 20 to 40 m range.

Water quality data for the Bredenbury aquifer are provided in Table 14 and are shown graphically in Figure 48. The location of the sample points is shown in Figure 47. The few available data suggest that these aquifers may yield water of reasonable good quality. Typically, water is of the Ca/Mg – SO_4/HCO_3 type, with a TDS in the range of 670 to 2,280 mg/L.

The AVI index is generally moderate to low except in the northern part of the Bredenbury aquifer where the Sturdee and Bredenbury aquifer are interconnected (Figure 15, Map 7).

9.2 Willowbrook Aquifers

The Willowbrook aquifer, formed by sands of the "Bredenbury Formation", was named and described by Schreiner and Maathuis (1982). They showed that within the present study area the aquifer was continuous and that its extent covered most of Range 6, Townships 25 and 26. However, Maathuis (1991) showed that the Willowbrook aquifer may be limited to the western half of Range 6, Township 24, and the southwestern part of Range 6, Township 25. As is illustrated in cross section F - F', this part of the Willowbrook aquifer may not be continuous with an aquifer occurring in the north western part of Range 6, Township 25, and in Range 6, Township 26 (see Figure 47). The latter aquifer might be a separate system, consisting of an aquifer formed by sands and gravels believed to be of the Empress Group and an aquifer in the vicinity of the Town of Willowbrook which is formed by sands of the "Bredenbury Formation". Maathuis (1991) referred to the aquifer formed by the Empress Group sediments as Willowbrook “A” aquifer. The location of the Willowbrook and Willowbrook “A” aquifers is shown in Figure 47.

The Willowbrook aquifers occur at depths ranging from 40 to 75 m and are between 10 and 20 m thick (Map 6). The thickness of the aquitard overlying the Willowbrook "A" aquifer ranges from 30 to 55 m; the thickness of the aquifer commonly is between 10 and 20 m.

The available water quality data for the Willowbrook aquifers are listed in Table 15 (see Figure 47 for location of sample points) and are shown graphically in Figure 48. These data show that the aquifers yield water with a TDS in the range of 980 to 1,950 mg/L. Water is of the Ca/Mg – SO_4 or Na+K – SO_4 type. Typically, the iron and manganese concentrations exceed the objectives for municipal and private water supplies (Saskatchewan Environment, 2002). There is only one analysis for water from the Willowbrook "A" aquifer.

The Willowbrook aquifers have a low to extremely low AVI index and thus are well protected against contamination from the ground surface (Figure 15, Map 7).

10. CONCLUSIONS

10.1 General

- It is important to realize that boundaries of geological units and therefore, boundaries of aquifer units, shown on the maps and cross sections in this report, are based on interpretation of available information. Shown extents of aquifer units are an approximation only as they are a function of testhole density and distance between testholes. Extents are also subject to change as additional information becomes available.

- The aquifers used by the City of Yorkton for its municipal water supply typically have an aquifer vulnerable index (AVI) less than 2 and therefore, are vulnerable to contamination from above ground sources and require protection.

- It is not possible to establish the sustainable yield of the aquifers used by the City of Yorkton for its municipal water supply. Determining sustainable yield of an aquifer or aquifer system requires establishing criteria which have to be exceeded. These criteria (*i.e.*, unacceptable drawdowns and/or changes in water quality) have not been established.

- The actual long-term withdrawals from the well fields have been lower than the allocated withdrawals. As documented in this report, these actual long-term withdrawals have not resulted in long-term declining water levels. Withdrawals from the wells fields likely can be increased but careful water level and water quality monitoring would be required.

10.2 Logan Aquifer System

- The Logan aquifer system consists of a valley type aquifer (Logan Valley aquifer) which over part of its length is hydraulically connected to aquifers formed by sediments of the “Bredenbury Formation” (Logan North and South aquifers).
- Although continuous in length, there is a partial barrier located in the western part of 36-25-04-W2. The overall flow direction in the Logan Valley aquifer south of Yorkton Creek is from the southwest to the northeast. The overall flow direction in the Logan Valley aquifer north of Yorkton Creek can not be confirmed because of lack of elevation data but likely is from the northeast to the southwest, towards Yorkton Creek.
- The Logan Valley aquifer is unconfined over much of its length. Recharge to the aquifer is high as the aquitard confining the aquifer is generally less than 5 m thick. Yorkton Creek, incised into the top of the Logan Valley aquifer in the northern part of 31-25-03-W2, is an important source of recharge to the aquifer.
- The Logan Valley aquifer yields water of the Ca/Mg – HCO_3 type with a sum of ions in the 465 to 1,560 mg/L range. Water typically has a sum of ions in the 800 – 1,100 mg/L range. The water type and sum of ions reflect good recharge conditions. There have been no significant changes over time in the quality of water produced by the production Wells #001A, #002A and #010. The quality of the water from production Wells #011 and #012 is subject to small changes. These changes are related to pumping from these wells.

10.3 Collacott Aquifer System

- The Collacott aquifer system is a highly complex system which remains very poorly understood. The aquifer system consists of an upper, unconfined aquifer and a lower, semi-confined aquifer. The Collacott aquifer may be hydraulically connected to the Orcadia aquifer to the north.
- Withdrawals from the production wells, the West well field have not resulted in long-term water level declines. There is no evidence of significant changes over time in the quality of water produced by the production wells.
- The Collacott aquifer system yields water of the Ca/Mg – HCO_3 type with a sum of ions in the 850 to 1,680 mg/L range. The water quality characteristics are indicative for good recharge conditions.

10.4 Leech Aquifer System

- The Leech aquifer system consists of the Leech Lake aquifer and the Otthon aquifer. The northern part of the Leech lake aquifer is an intertill aquifer which, to the west, is hydraulically connected to the Otthon aquifer. The northern part of the Leech Lake aquifer is typically between 10 and 20 m thick. In its western part, it is covered by a 5 and 10 m thick aquitard (mainly till); in the eastern part this aquitard is between 10 and 20 m thick.
- Withdrawals from the production Wells (#008 and #009) completed in the northern part of the Leech Lake aquifer, have not resulted in long-term declining water levels.
- In its western part, the aquifer yields water of the Ca/Mg – HCO_3 type with a sum of ions of less than 1,000 mg/L. This area roughly coincides with the area where the aquitard confining the aquifer is less than 10 m thick. The water quality in this area is a reflection of good recharge conditions. In the remainder of the area covered by the northern part of the aquifer, water is predominantly of the Ca/Mg – SO_4 type with a sum of ions in the 1,100 to 2,200 mg/L range.
- The quality of the water from production Wells #008 and #009 is subject to minor changes. These changes are related to the withdrawals from the production wells.

10.5 Sturdee Aquifer System

- The Sturdee aquifer system consists of a complex valley type aquifer which is hydraulically connected to the Bredenbury aquifer in the southeast and in the west to an unnamed aquifer formed by sediments of the “Bredenbury Formation”. Over most of its extent the aquifer is unconfined and outcrops at the ground surface,
- Because the aquifer sands are at or near the ground surface, recharge to the aquifer is excellent. The relationship between the aquifer and a creek that runs over it requires further study.
- Flow patterns within the aquifer can not be established at the present time due to the absence of reliable elevation data for the monitor wells completed in the aquifer.
- The Sturdee aquifer yields water which is of the Ca/Mg – HCO_3 or SO_4 type with a sum of ions typically in the 600 – 1,200 mg/L range.

11. RECOMMENDATIONS

11.1 General

- Interpretation of groundwater flow directions and the impact of withdrawals on water levels requires the availability if accurate location and elevation data. Existing geodetic data (UTM location, ground elevation and top of casing elevation) available for testholes and observation/monitor wells are highly variable in quality and are not available for a large number of the recent testholes and monitor wells drilled for the City. To ensure availability and consistency of geodetic data, a major geodetic survey of the highest quality should be conducted in 2006. This survey should include all existing observation/monitor wells and all of the recent testholes and monitor wells not yet surveyed.
- After these geodetic data have been obtained, updated hydrographs should be prepared for all existing observation/monitor wells and revisions should be made to this report, if warranted.
- To determine changes in the quality of the water, water from all production wells should be sampled annually. Water samples should be analyzed for major ions, nutrients, trace elements (including As and Se) and DOC.

11.2 Logan Aquifer System

- To obtain long-term records, monitor wells TH79-20, MW96-06, SRC96-01, SRC96-02 or BHL00-49 and BHL00-21 should be equipped with a digital water level recorder.

11.3 Collacott Aquifer System

- The extent of the aquifers of the Collacott aquifer system and the relationship between aquifers of this system remains poorly defined.
  A drilling program should be designed based on a review of all available information and subsequent preparation of "local" cross sections. Main issues to be addressed are: the hydrogeological setting in the vicinity of Wells #006A, #005 and #013, the westward extent of the upper and lower Collacott aquifers and the relationship(s) between the Collacott aquifers and the Orcadia aquifer.
- At present, there are no observation wells in the Collacott aquifer system. It is recommended to install digital water level recorders in: MW93-01, MW93-02, MW93-07 and MW93-10. Subject to the proposed detail study of the Collacott aquifer system additional observation wells may be needed.
- At present, there are no observation wells in the Orcadia aquifer. To determine the impact of withdrawals, one or two observation wells should be constructed for long-term monitoring of the water level in this aquifer.
- Interference tests should be conducted to determine the impact of pumping of production wells on the other production wells. The results will provide

information which will facilitate the management of withdrawals from the production wells and of the aquifer system as a whole.

11.4 Leech Lake Aquifer

- A "stress" test should be conducted to determine the extent of the drawdown cone induced by the pumping from Wells #008 and #009.

11.5 Sturdee Aquifer System

- To obtain baseline data, annual water samples should be obtained from the presently existing monitor wells until a data set of three consecutive annual analyses is available. Water samples should be analyzed for major ions, nutrients, trace elements and DOC. After this set of data has been collected, the monitoring frequency should be reviewed.
- To determine changes in the quality of the water produced, annual water quality data should be collected from production Well #015. Water samples should be analyzed for major ions, nutrients, trace elements and DOC.
- At least three (3) of the existing monitor well sites should be equipped with a digital water level recorder: one well in the vicinity of Well #015 and a well north and south of the production well. Water level data for all other existing monitor wells should be collected four times a year. Data for all the monitor wells should be collected on the same day.
- The relationship between the creek that runs over the aquifer and the aquifer needs to be established. A site along the creek should be established for obtaining water quality data from the creek, when there is flow through the creek.

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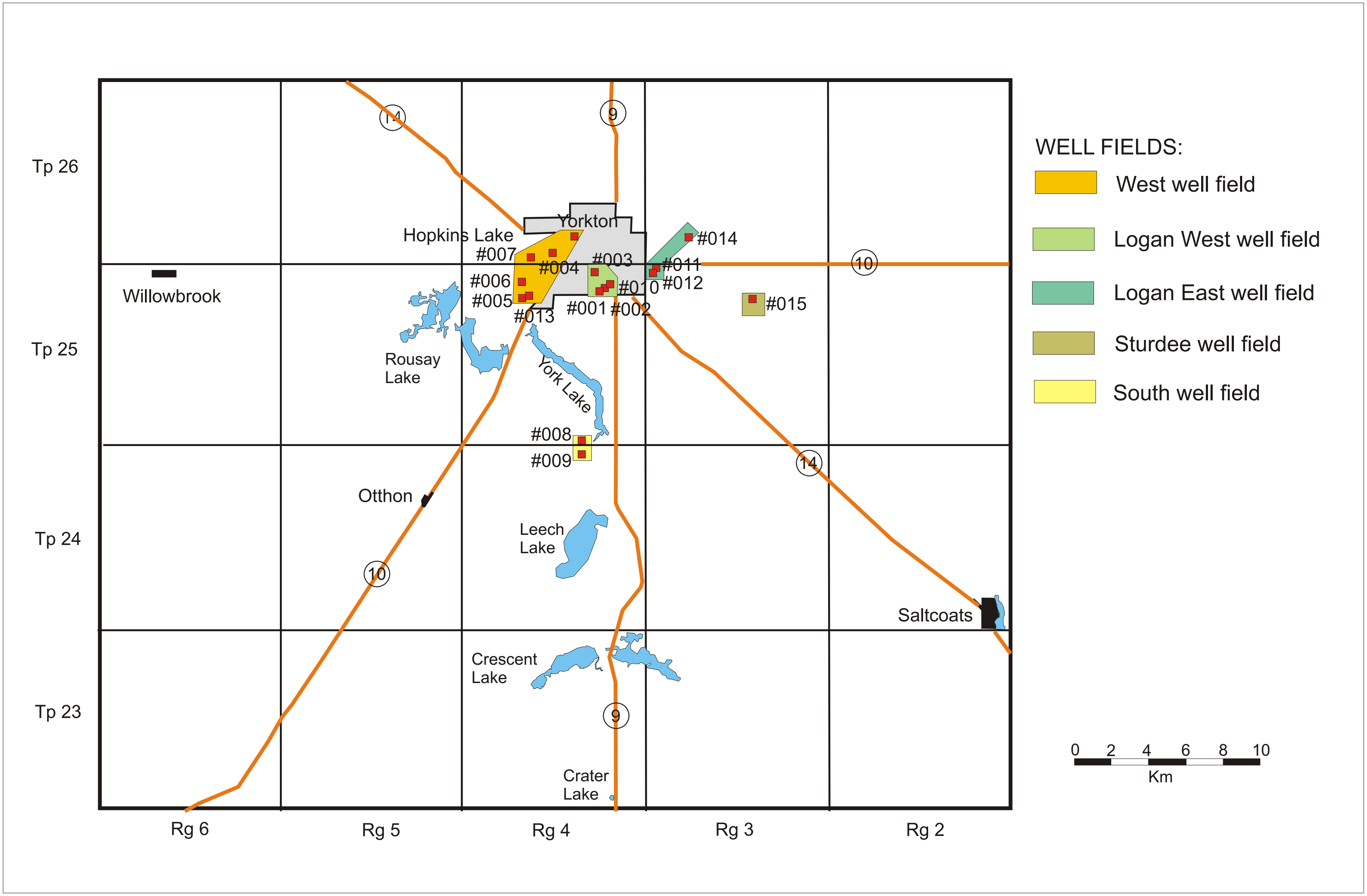

Figure 1 Extent of the Yorkton study area and location of well fields

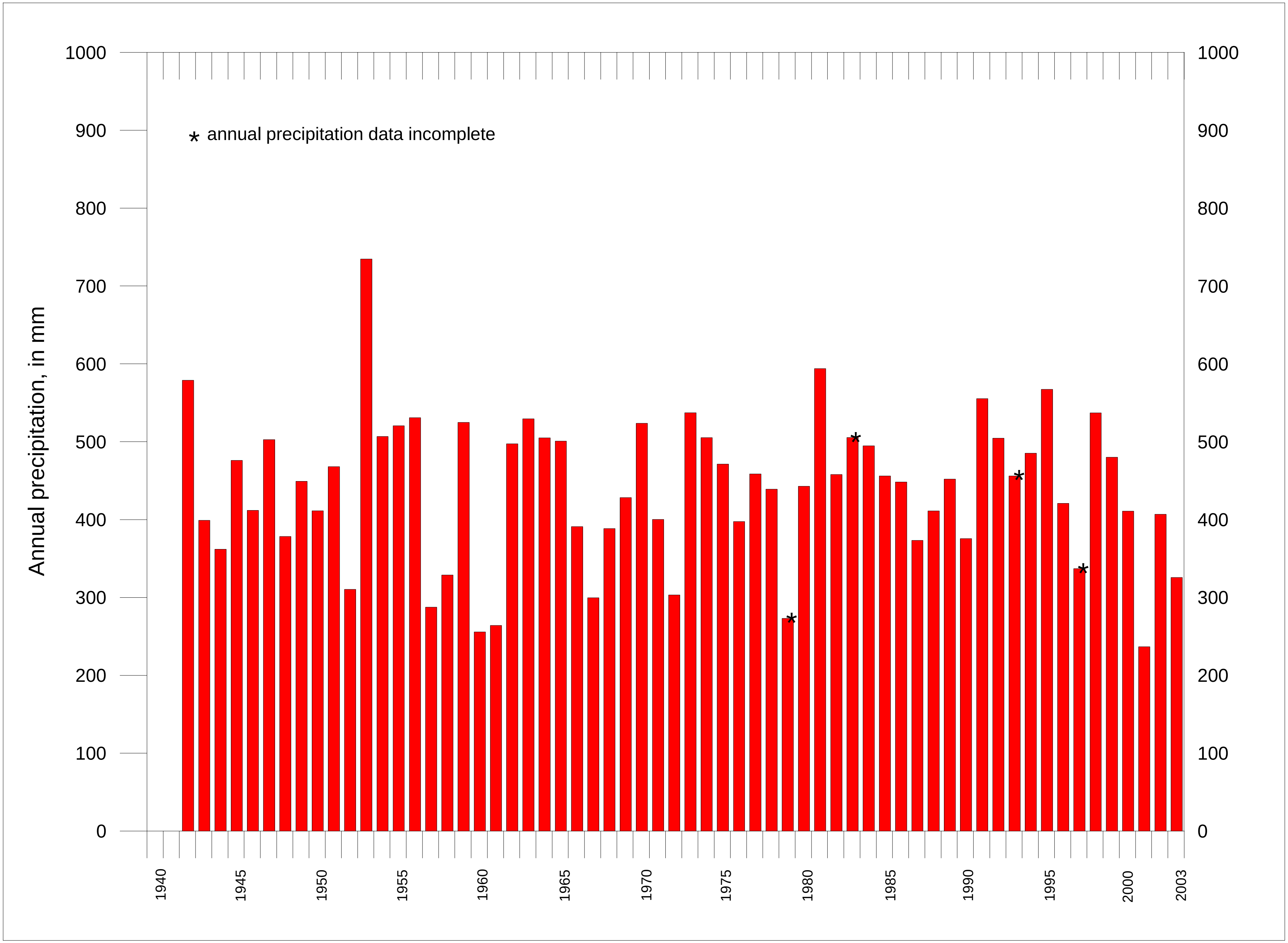

Figure 2 Annual precipitation at Yorkton airport, for the period 1942 - 2003

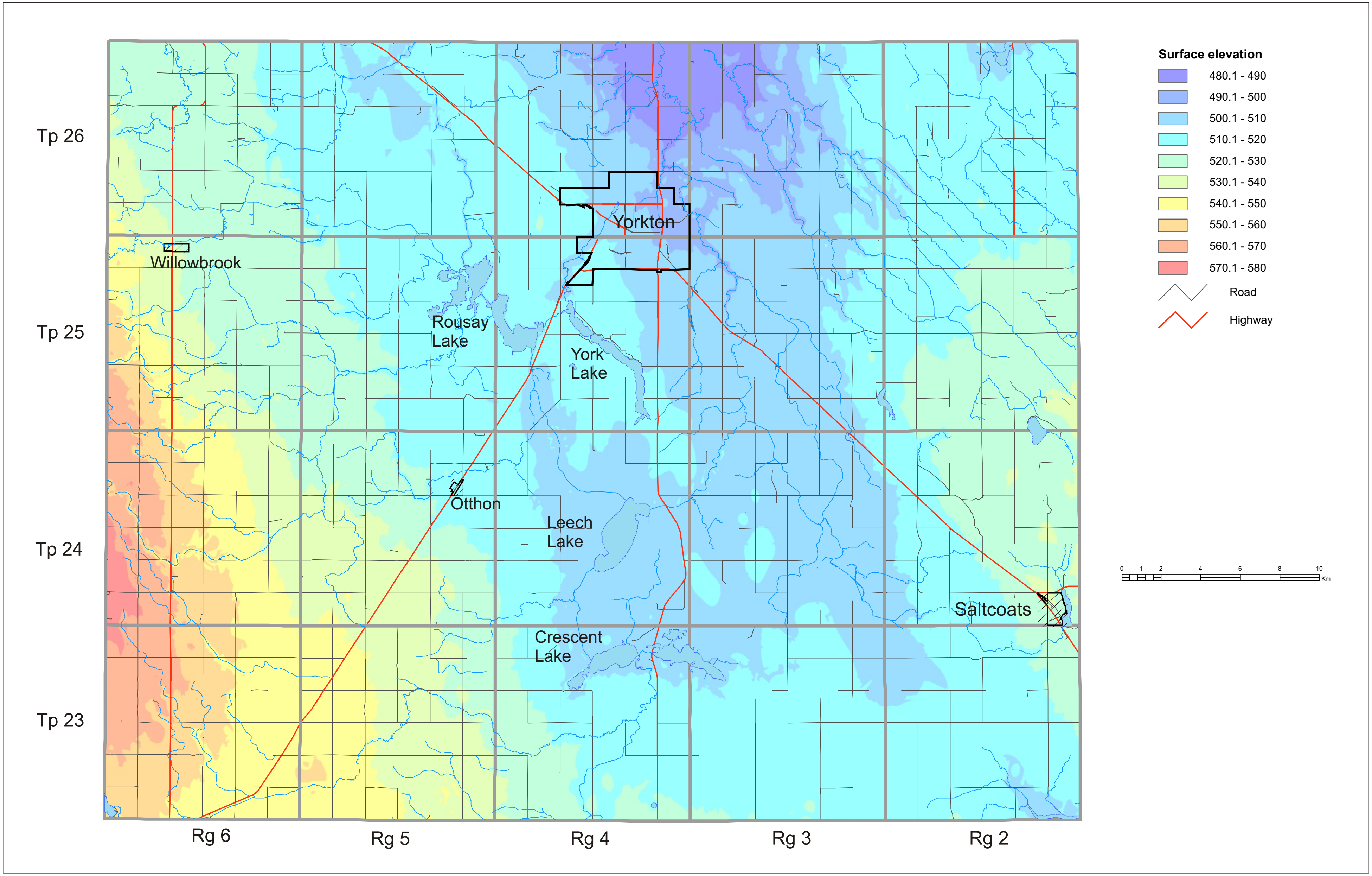

Figure 3 Topographical setting of the Yorkton study area

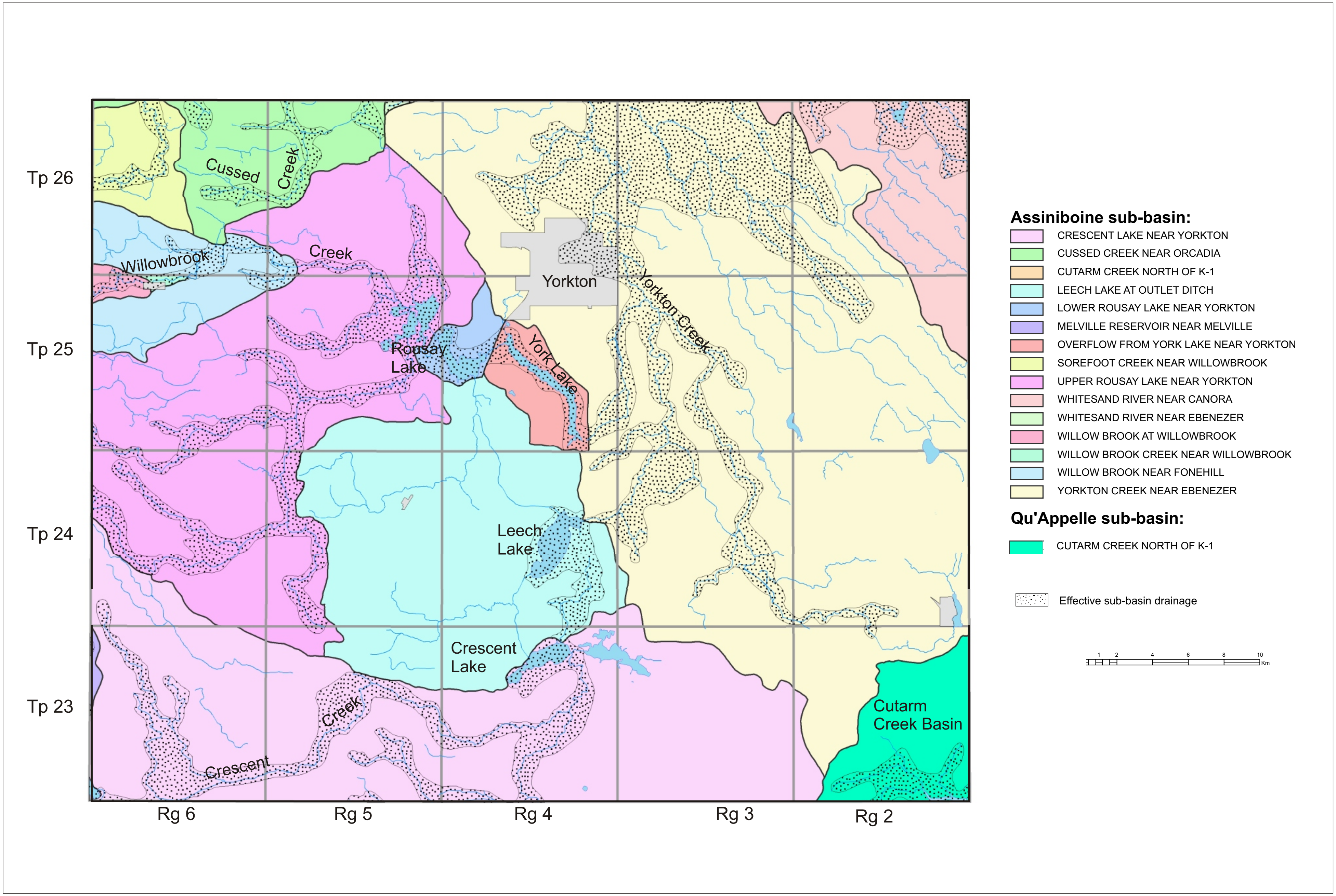

Figure 4 Drainage basins in the Yorkton study area

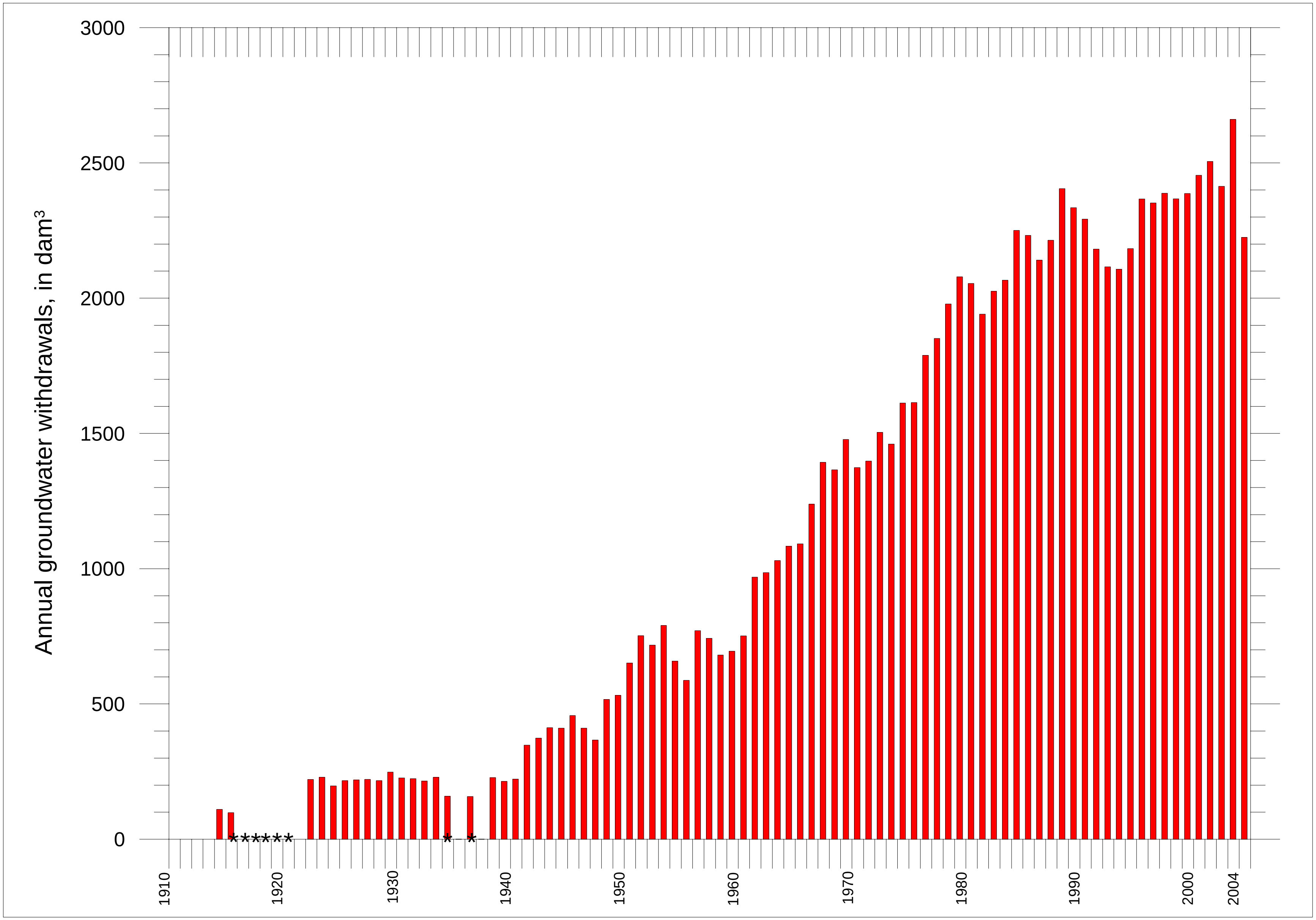

Figure 5 Historic annual groundwater withdrawals by the City of Yorkton

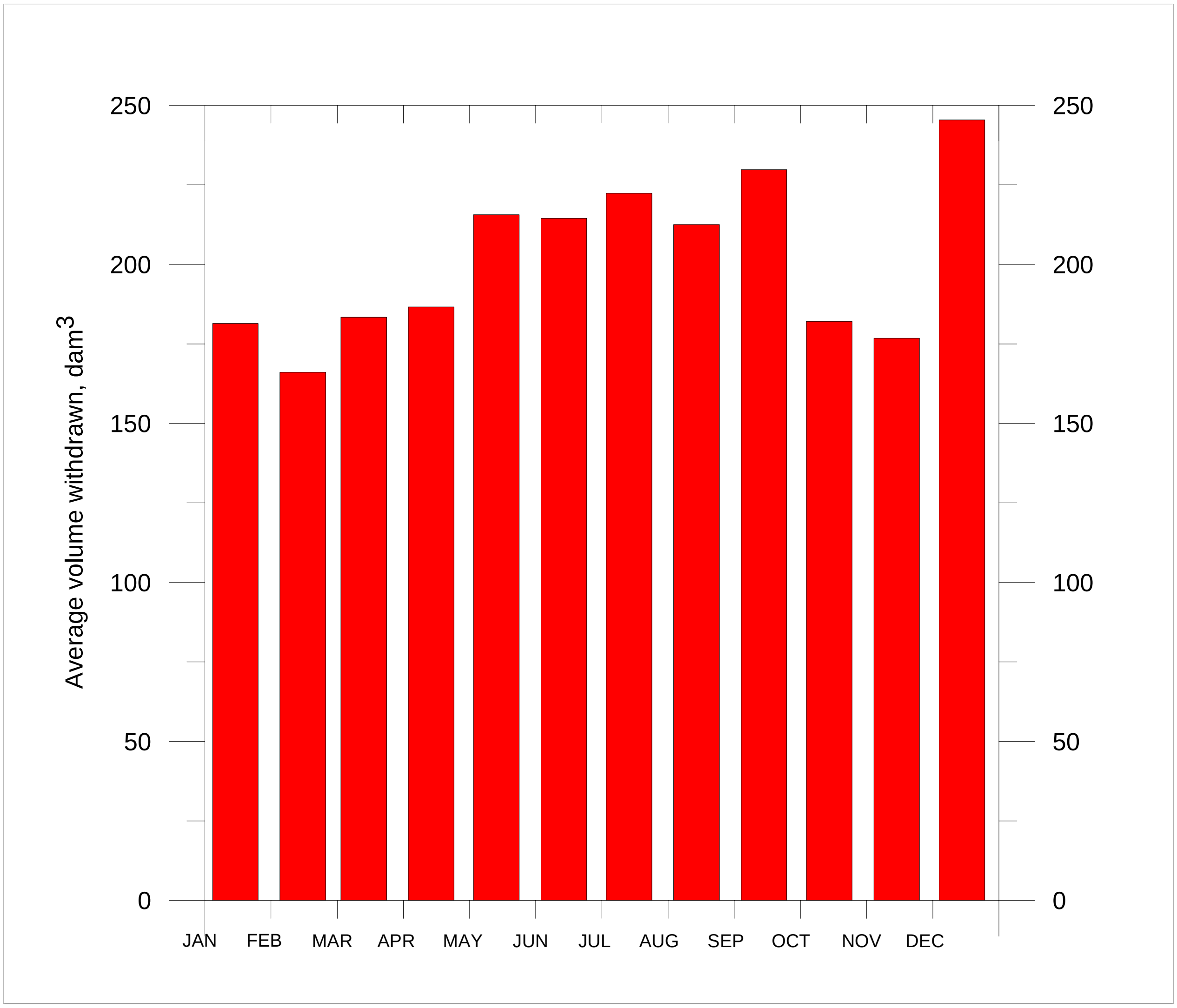

Figure 6 Distribution of monthly groundwater production, averaged over the period 1985 - 2004

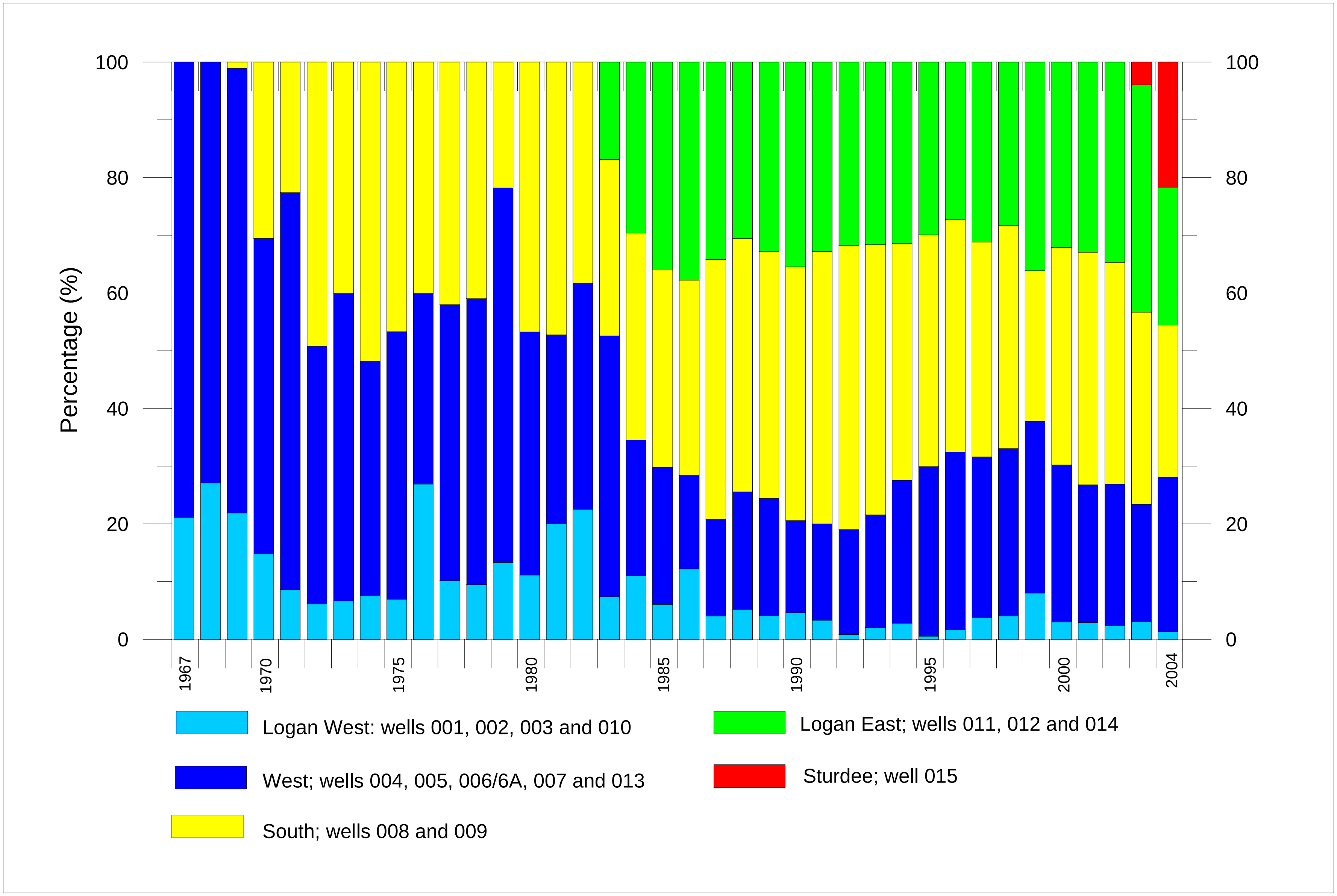

Figure 7 Relative contribution (percentage) of well field to total annual groundwater withdrawals, for the period 1967 - 2004

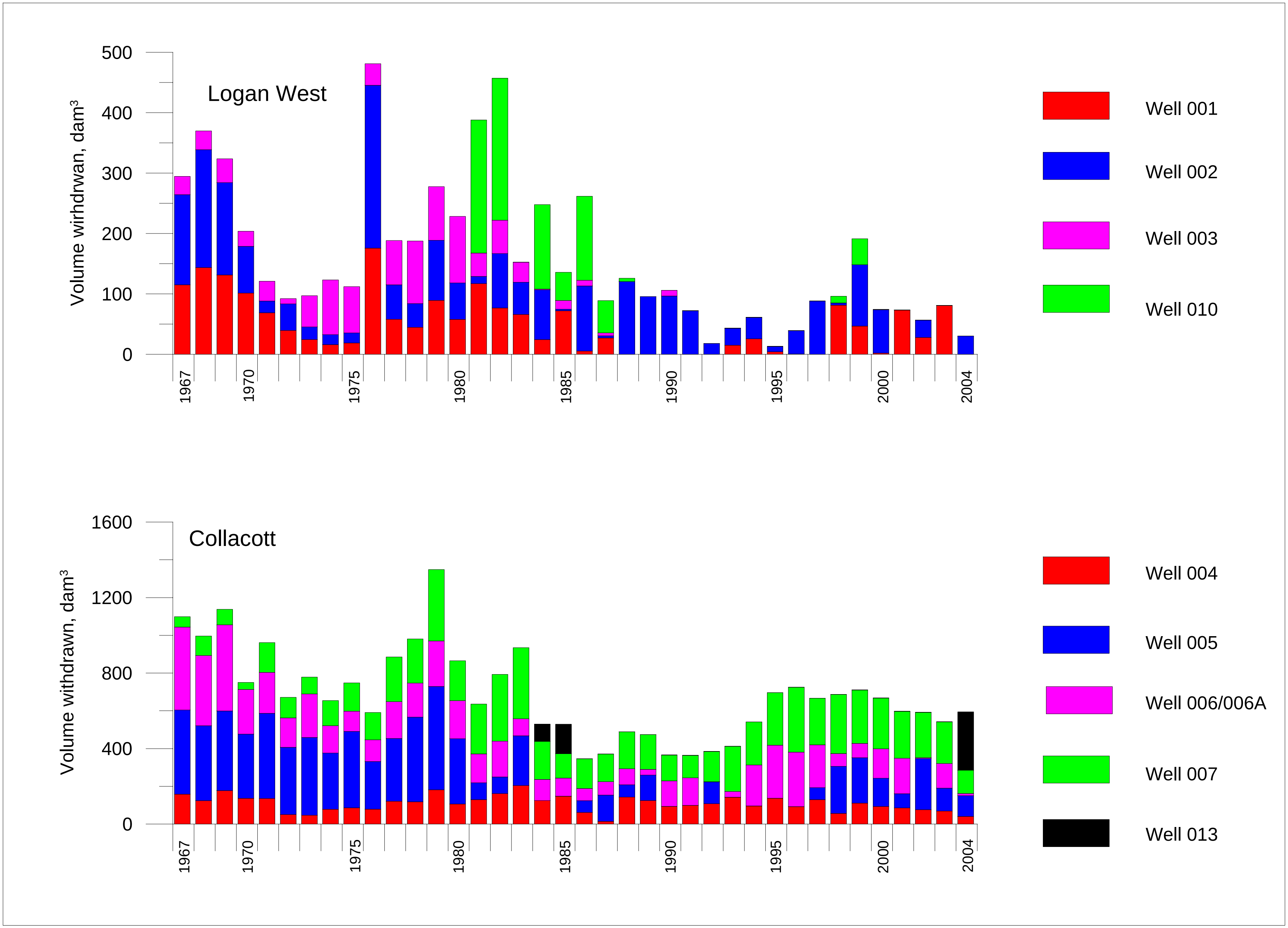

Figure 8 Annual volumes withdrawn by production wells in the Logan West and Collacott well fields, for the period 1967 - 2004

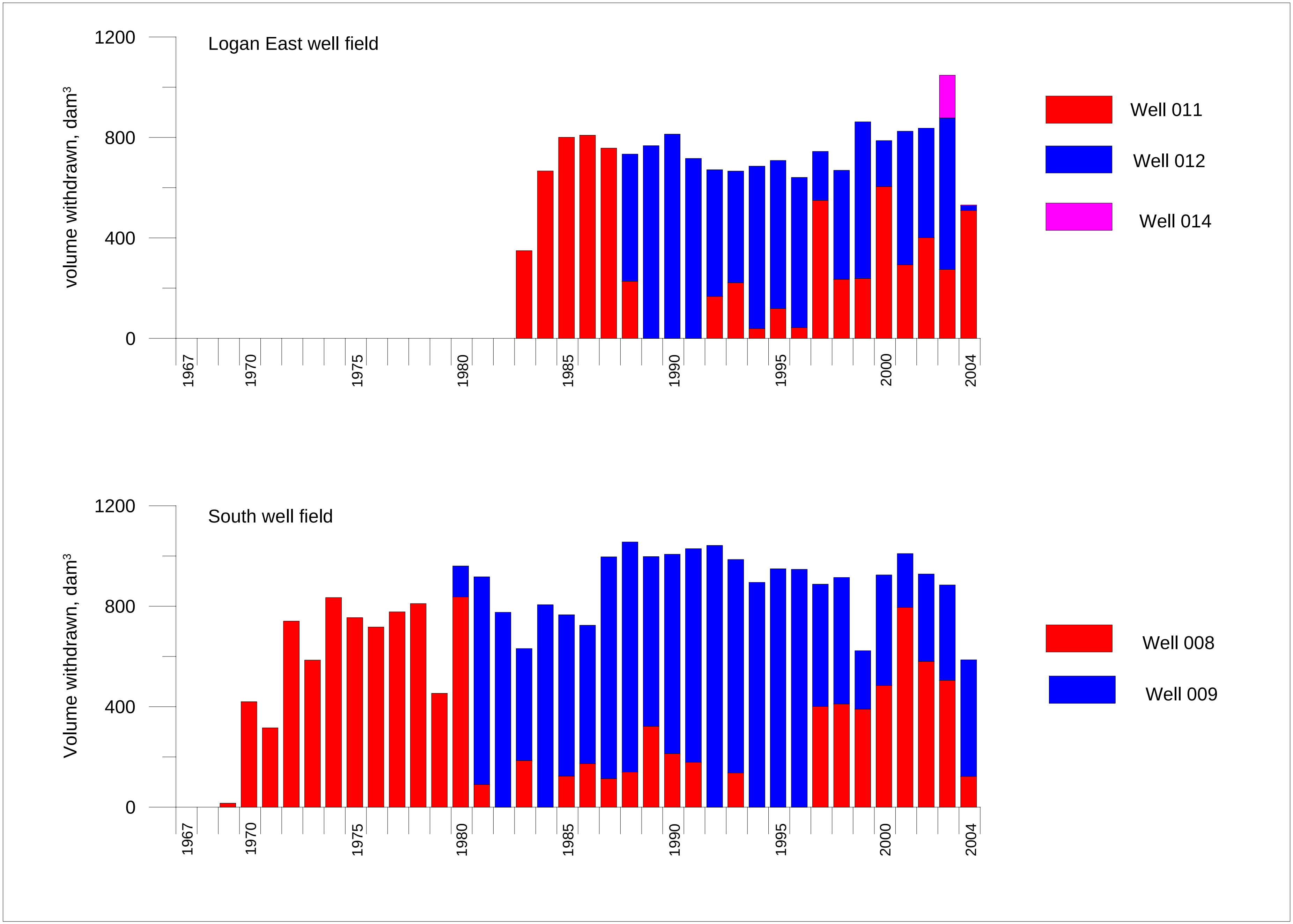

Figure 9 Annual volumes withdrawn by production wells in the Logan East and South well fields, for the period 1967 - 2004

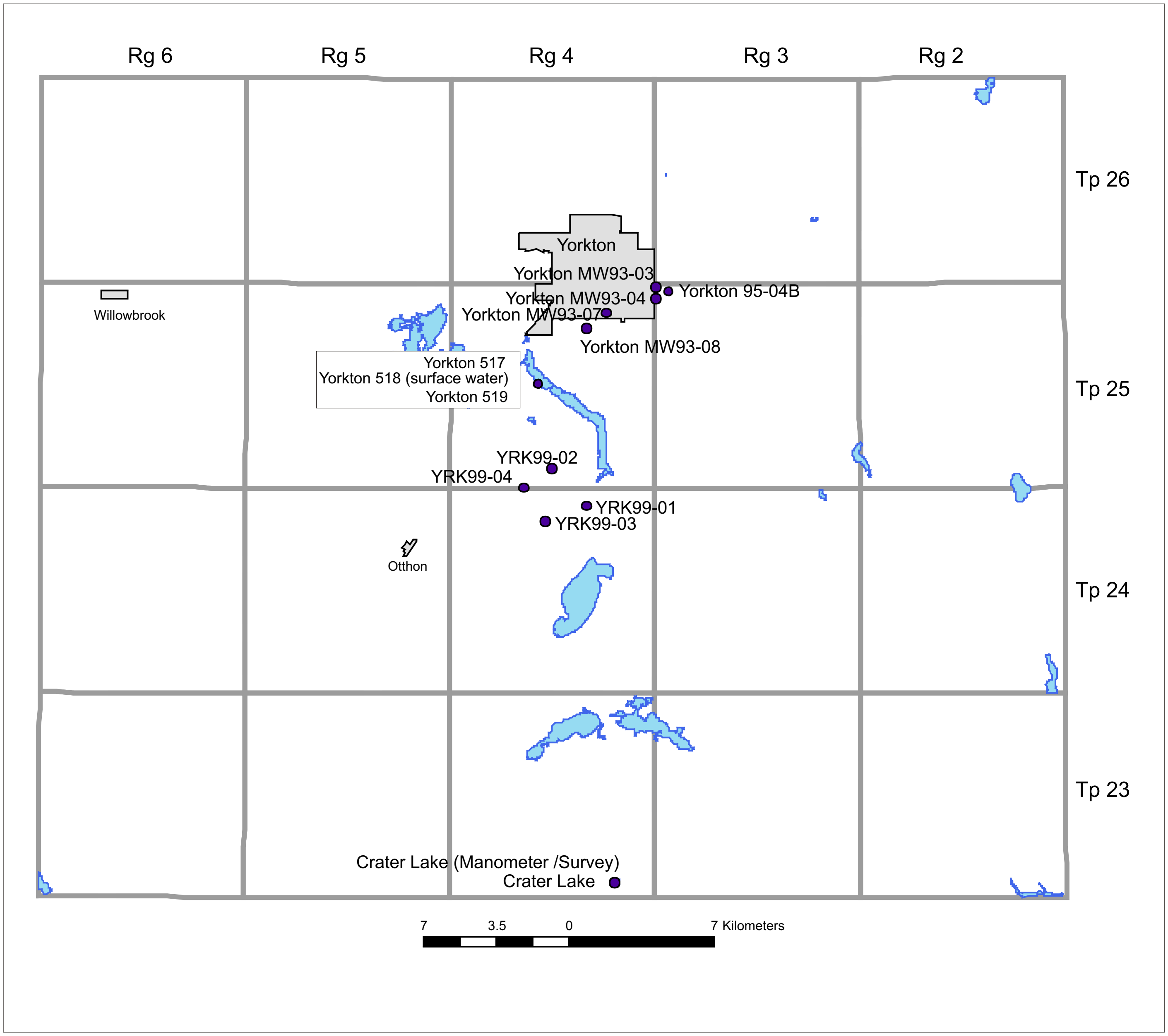

Figure 10 Locations of SWA groundwater level observation wells and surface water monitor stations in the Yorkton study area

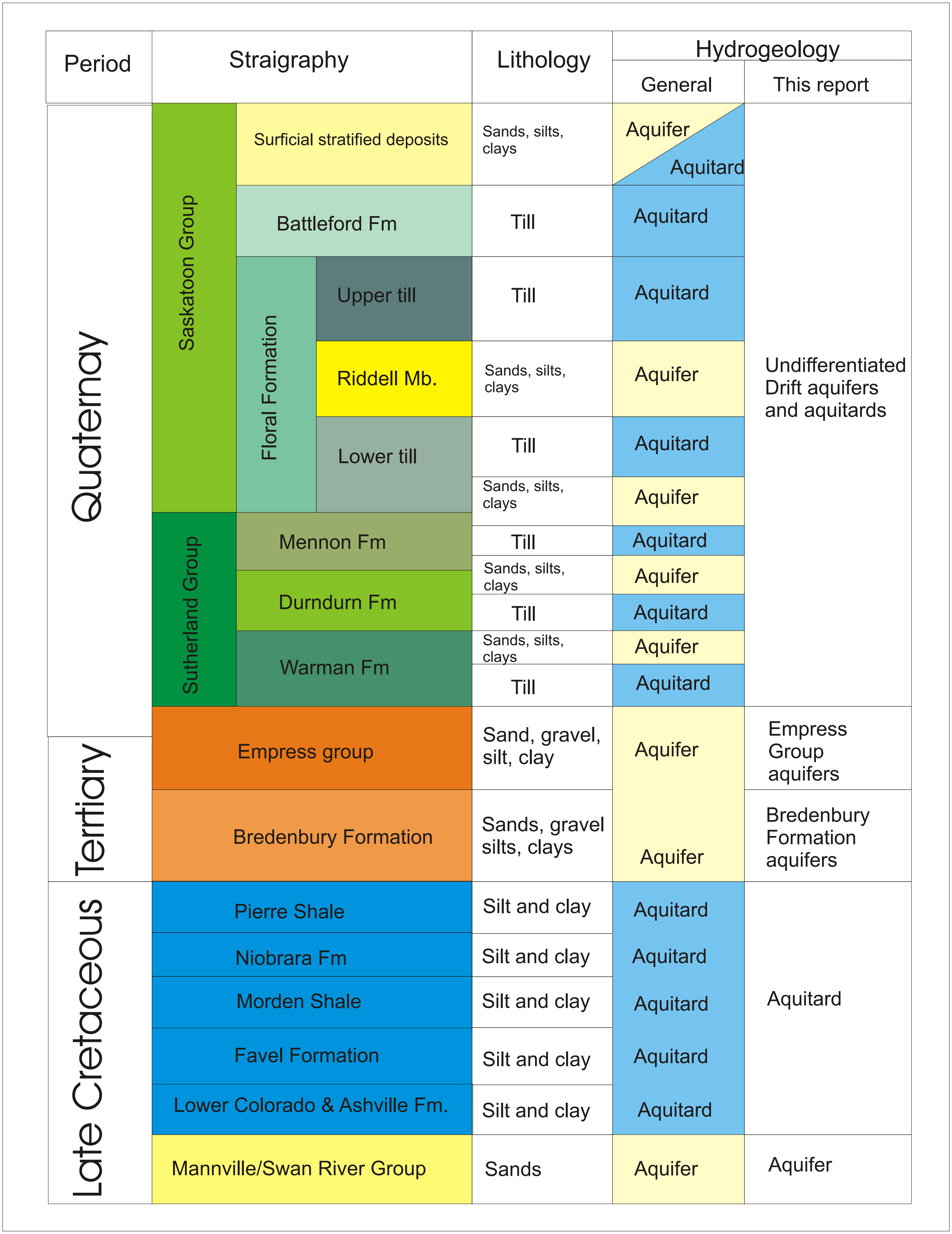

Figure 11 Schematic illustration of the stratigraphic, lithologic and hydrogeologic settings of the Yorkton study area

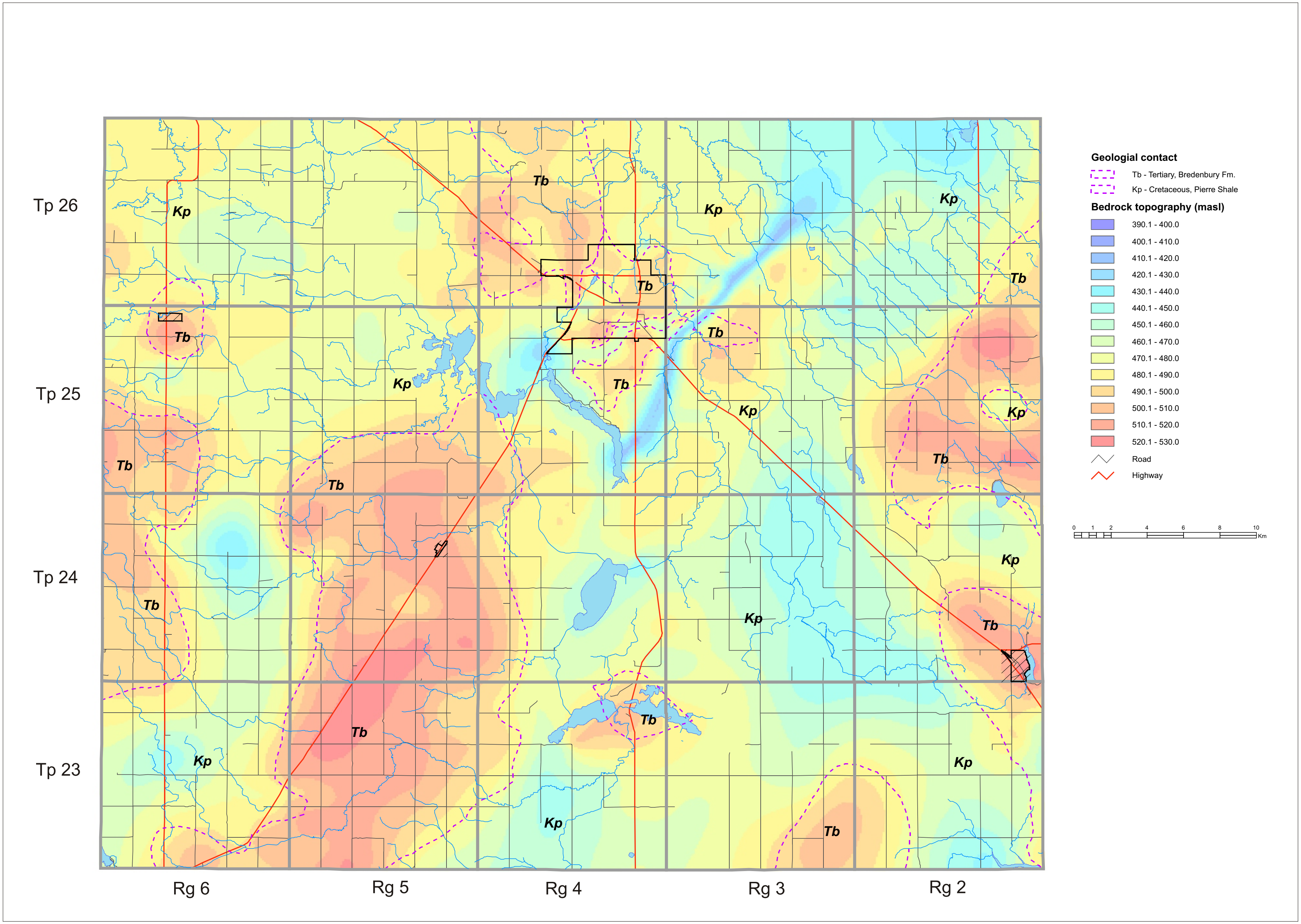

Figure 12 Bedrock geology and topography in the Yorkton study area

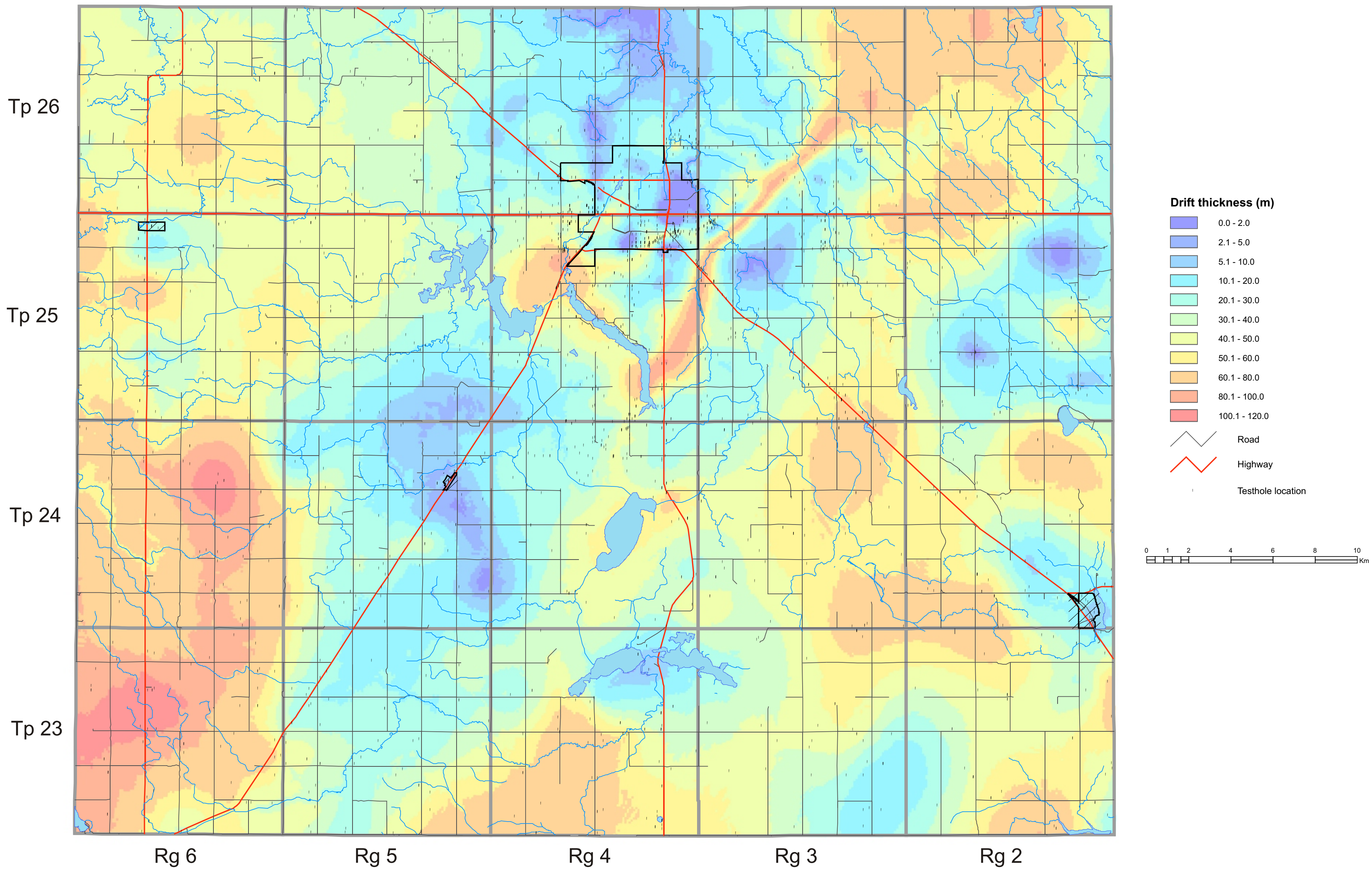

Figure 13 Thickness of the drift in the Yorkton sudy area

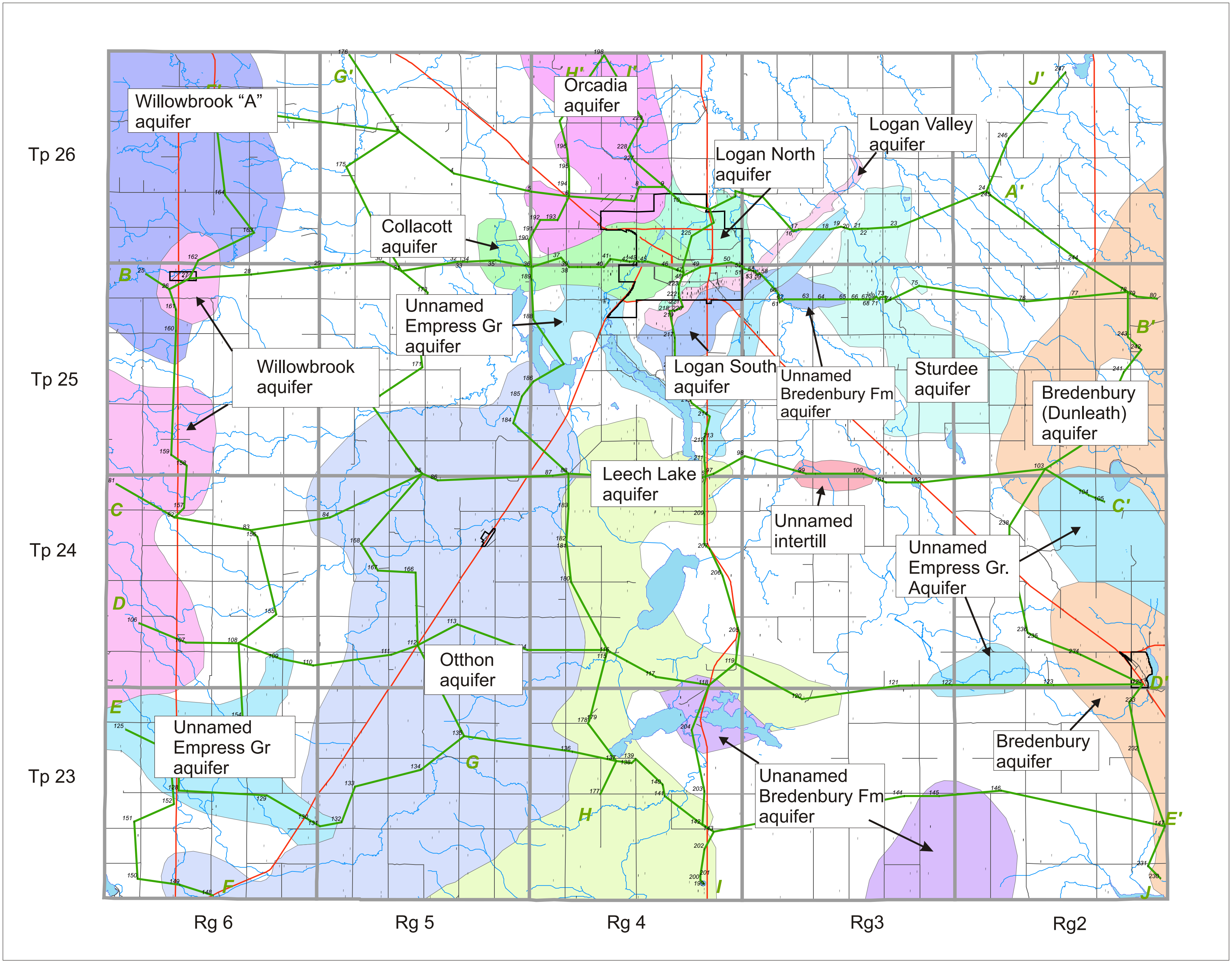

Figure 14 Location, extent and name of major aquifers in the Yorkton study area

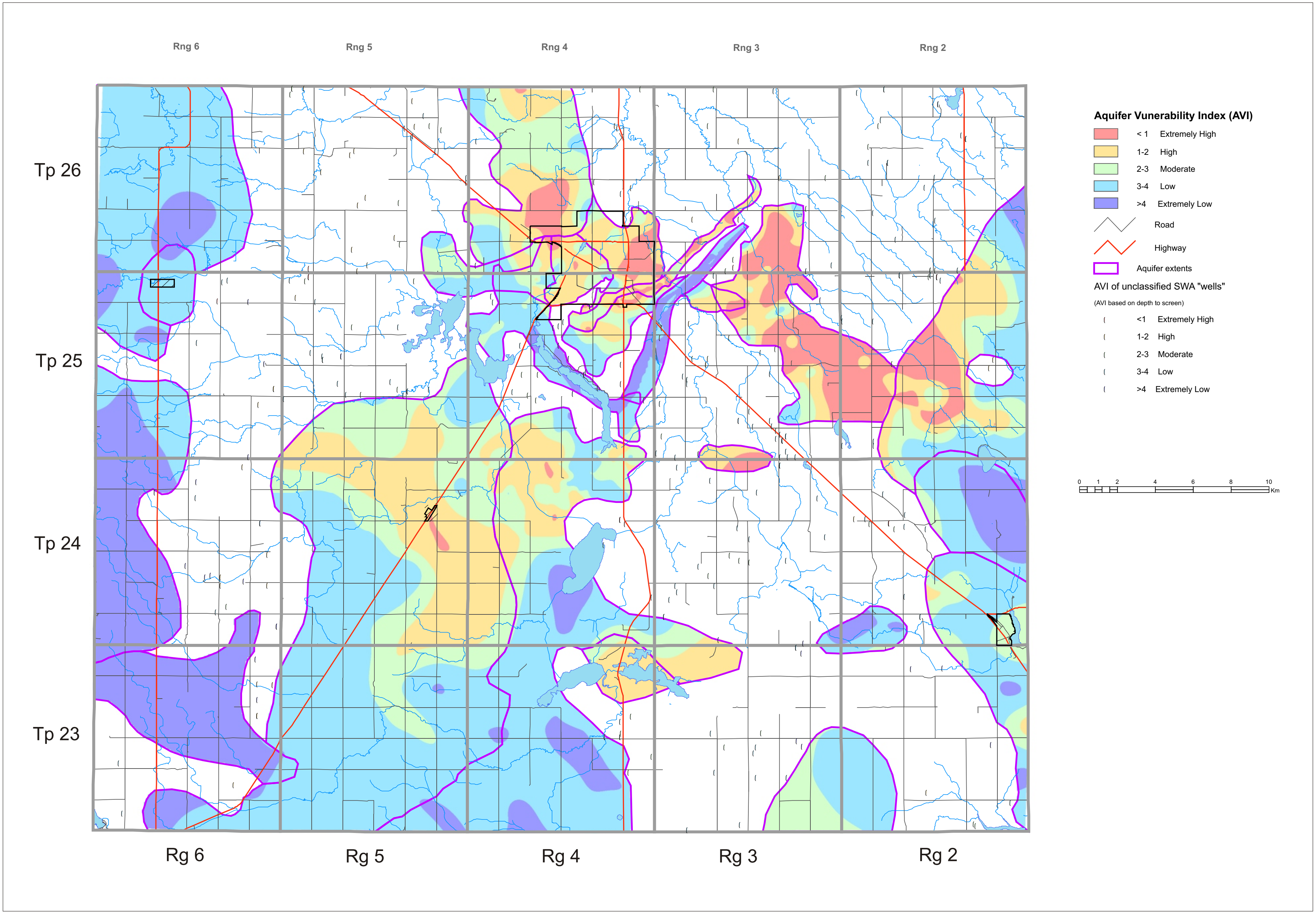

Figure 15 Aquifer vulnerability index (AVI) for major aquifers in the Yorkton study area

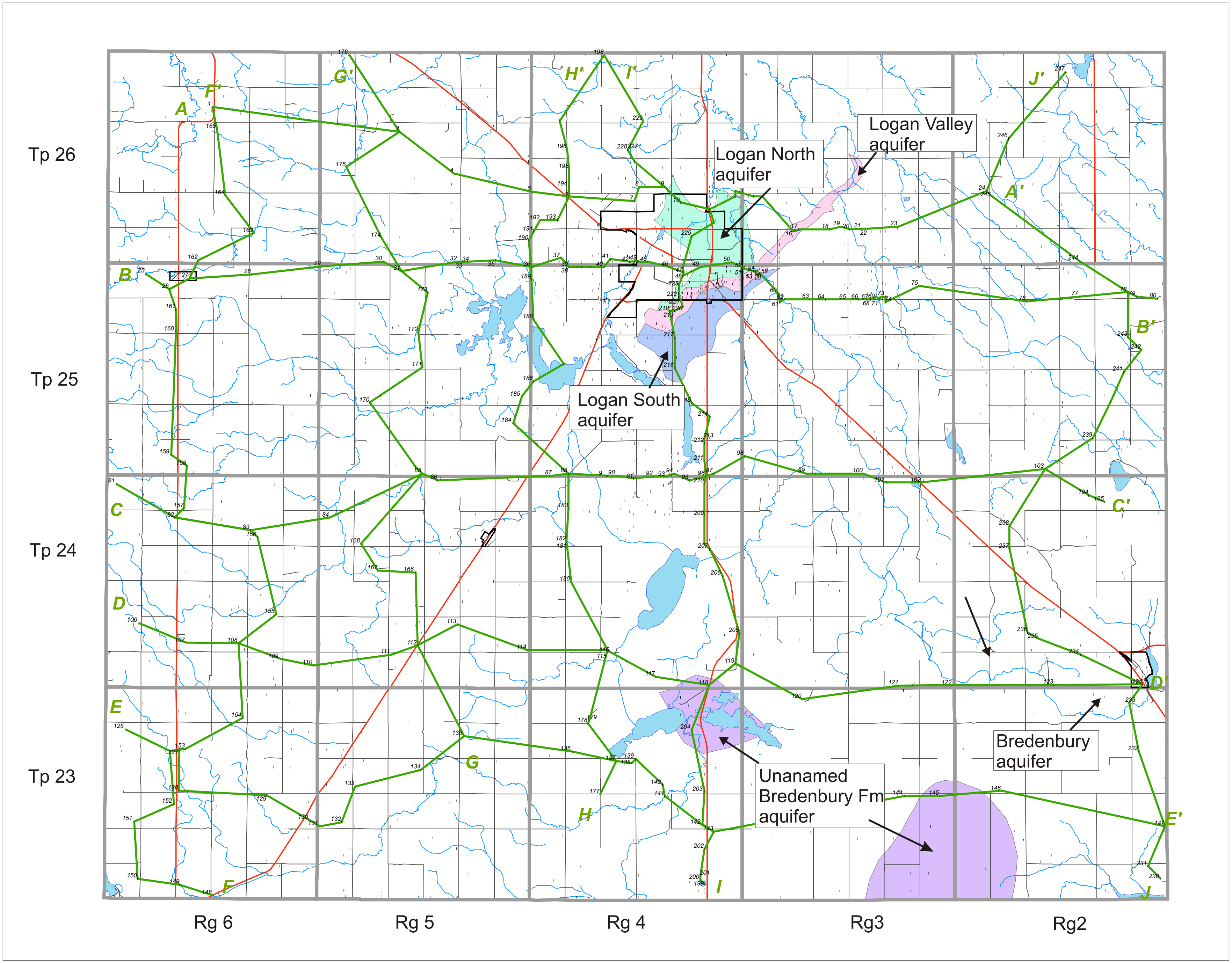

Figure 16 Location, extent of the Logan aquifer system and its components

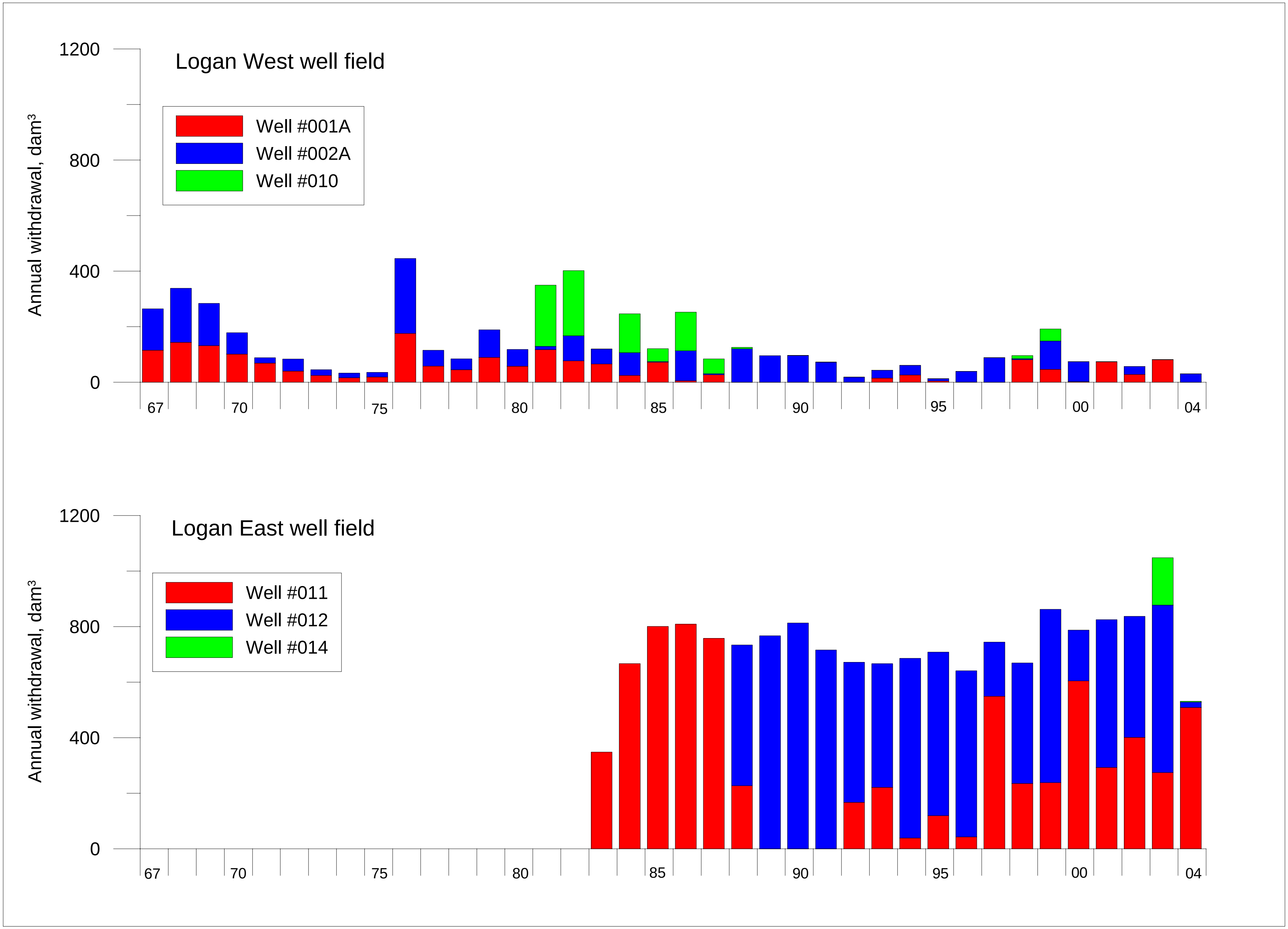

Figure 17 Long-term withdrawals from the Logan West and East well fields

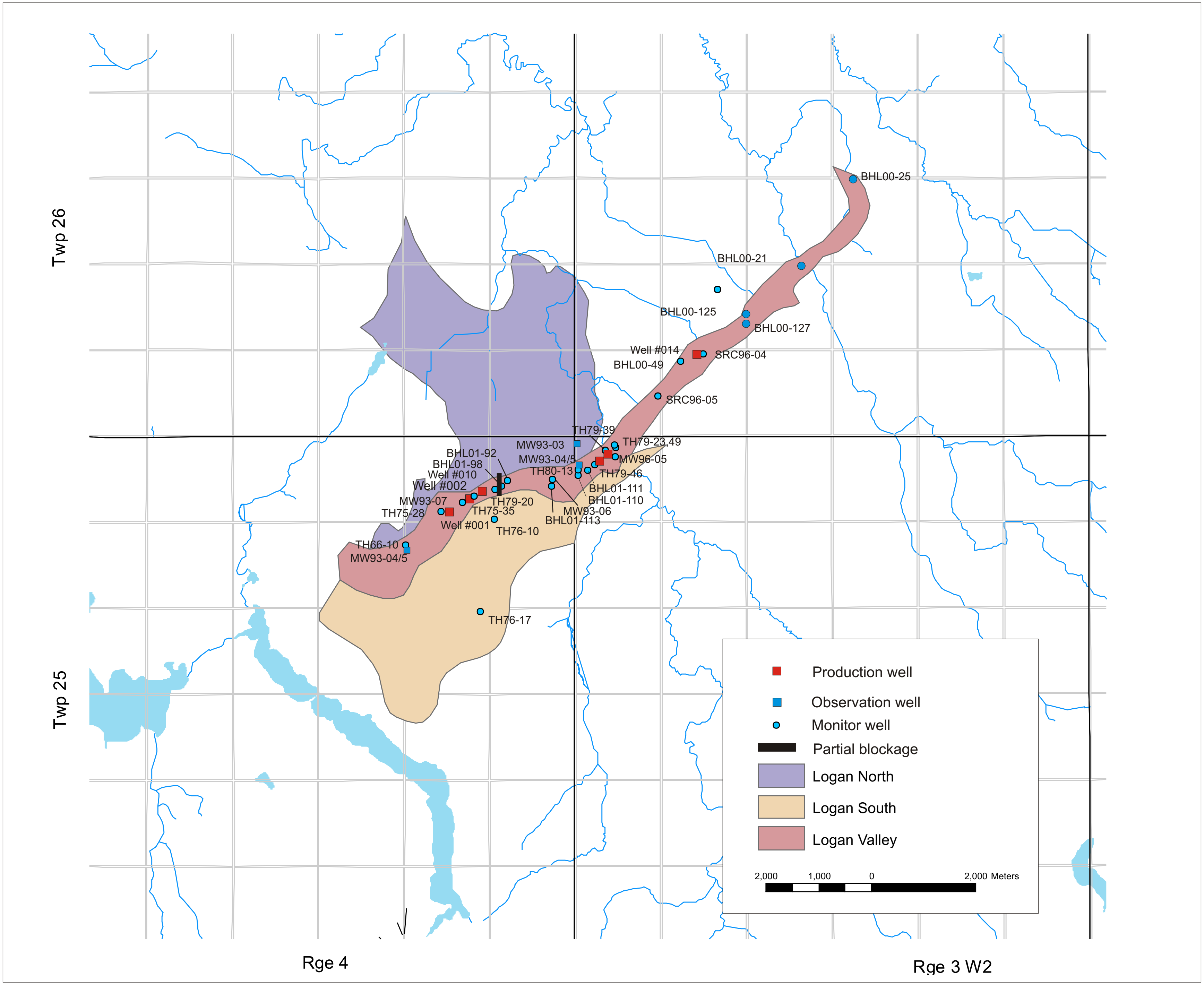

Figure 18 Locations of observation and monitor wells in the Logan Valley aquifer

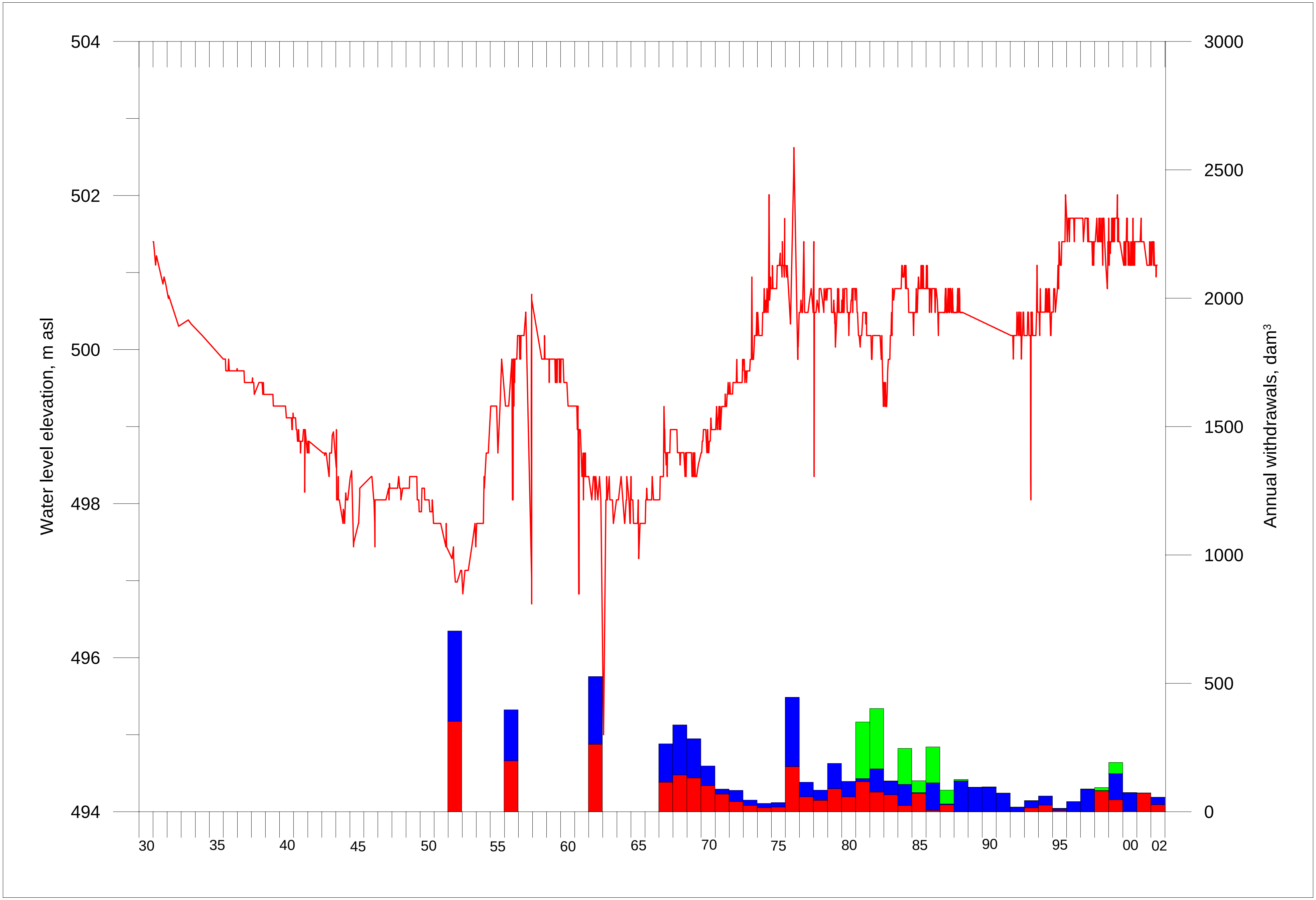

Figure 19 Long-term hydrograph for Well #001 and annual withdrawals from Logan West well field

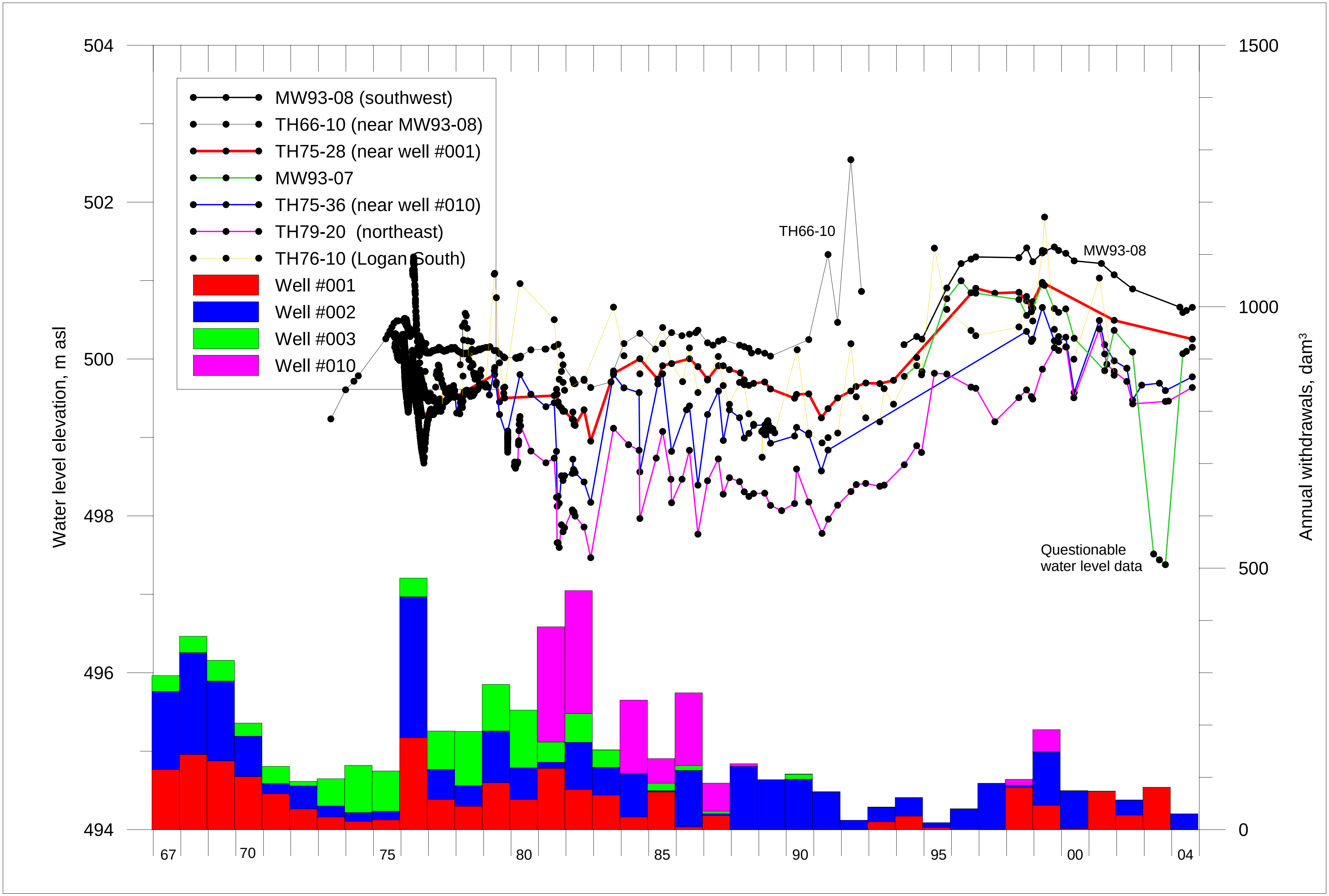

Figure 20 Long-term hydrographs for selected monitoring wells in Logan West well field

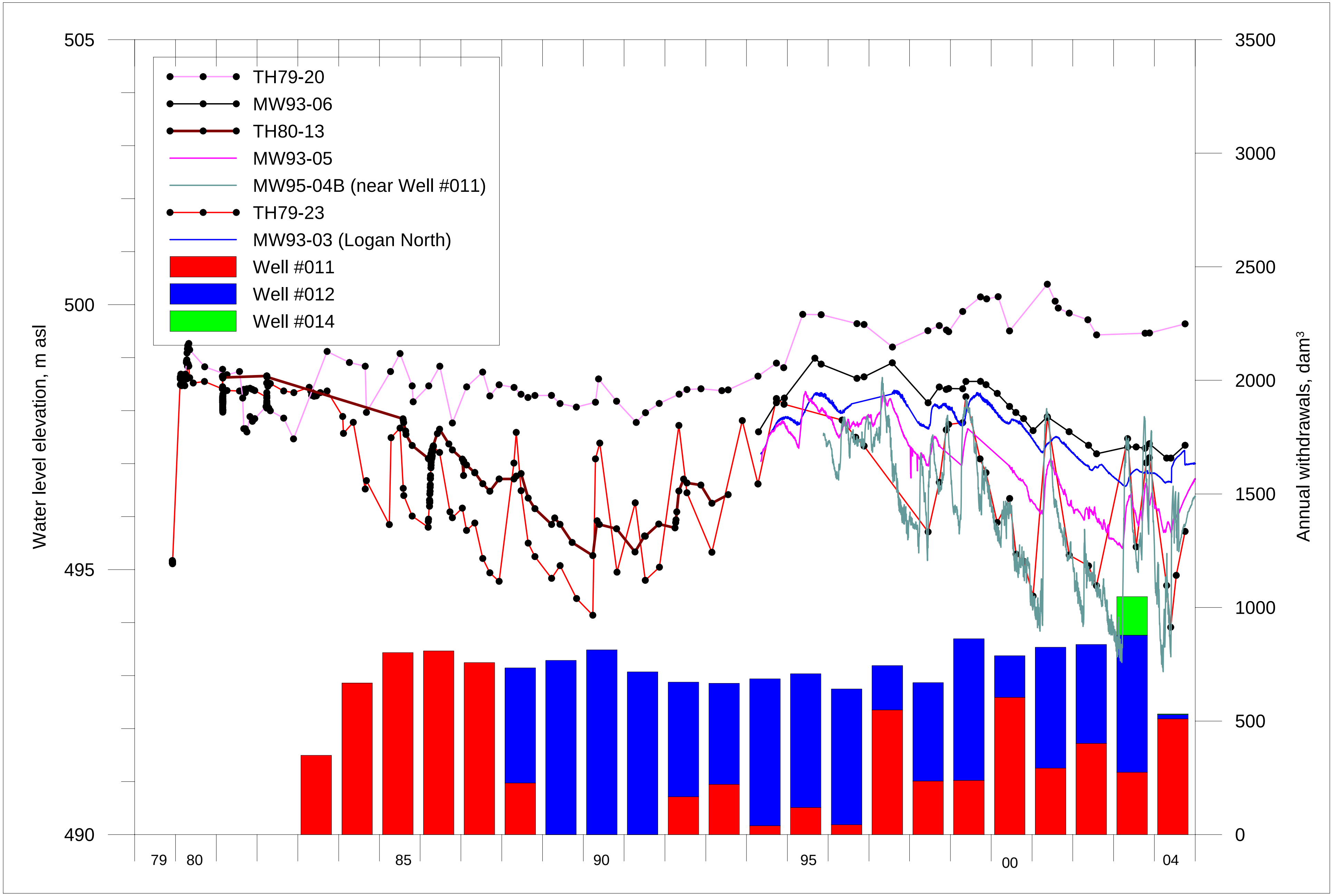

Figure 21 Hydrographs for observation and monitor wells in the Logan East well field

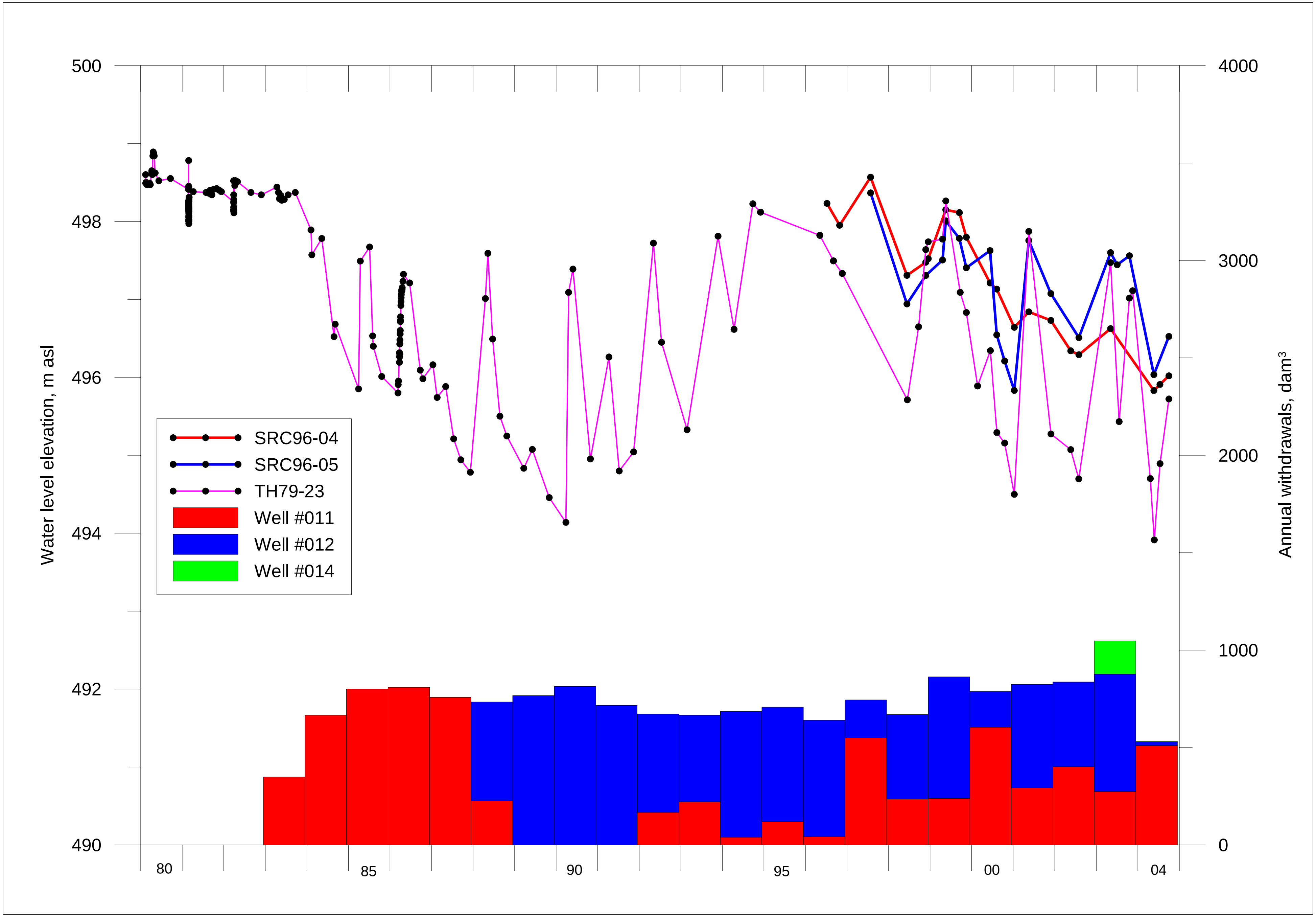

Figure 22 Hydrographs for monitor wells completed in the Logan Valley north of Yorkton Creek

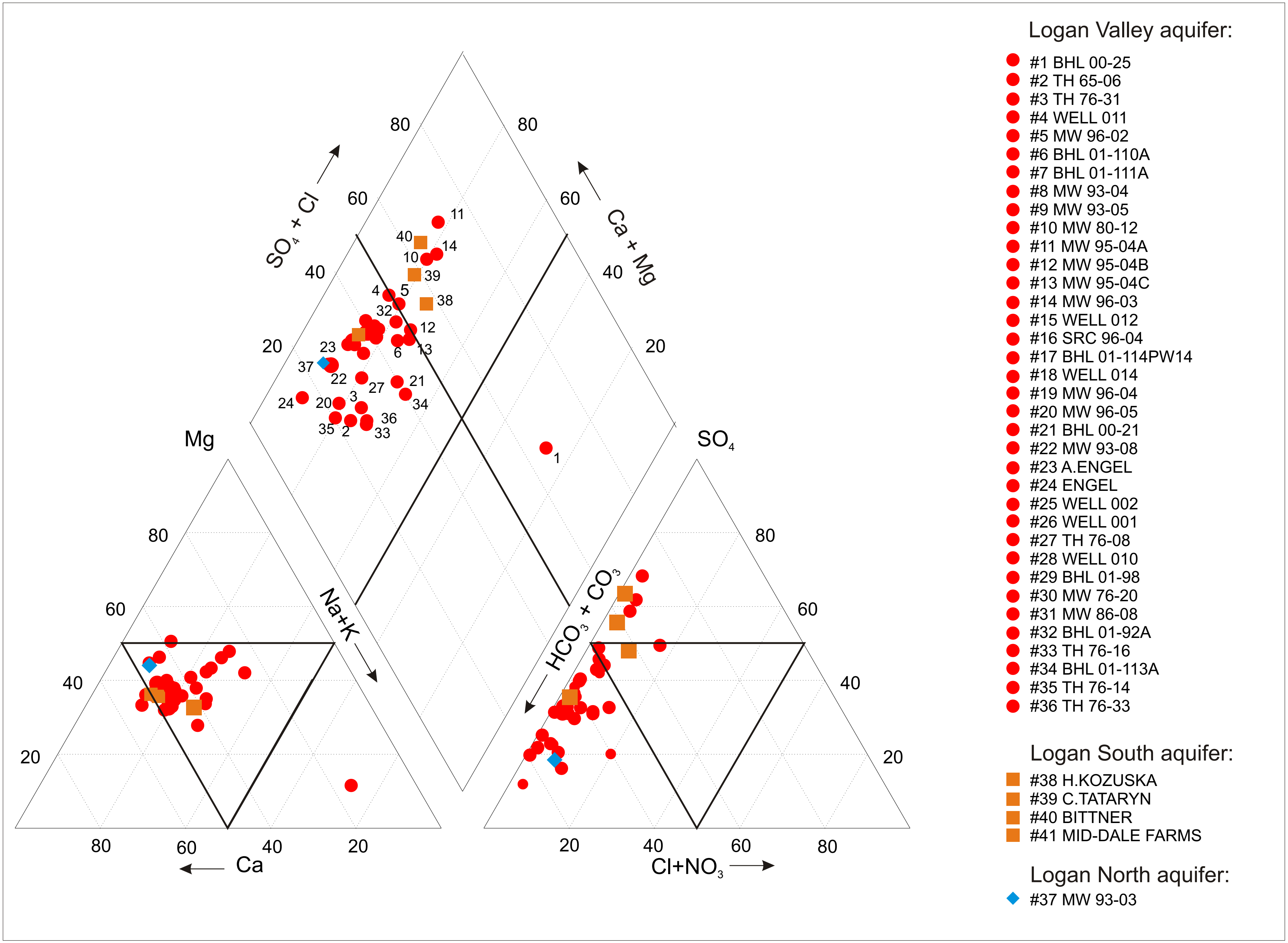

Figure 23 Piper-plot of water quality data for the Logan Valley and Logan North and South aquifers

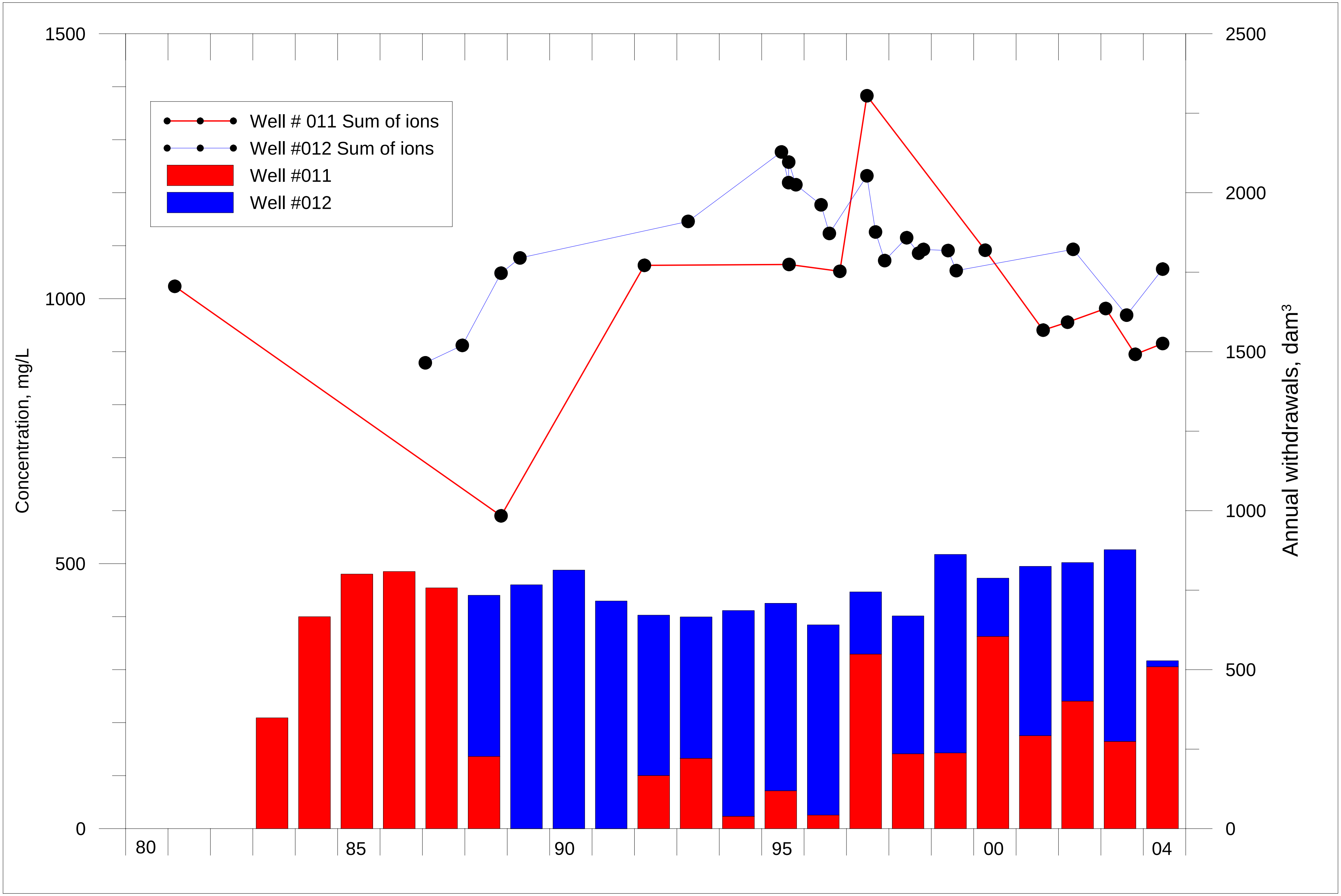

Figure 24 Changes in sum of ions in water from Wells #011 and #012 versus annual withdrawals from Wells #011 and #012

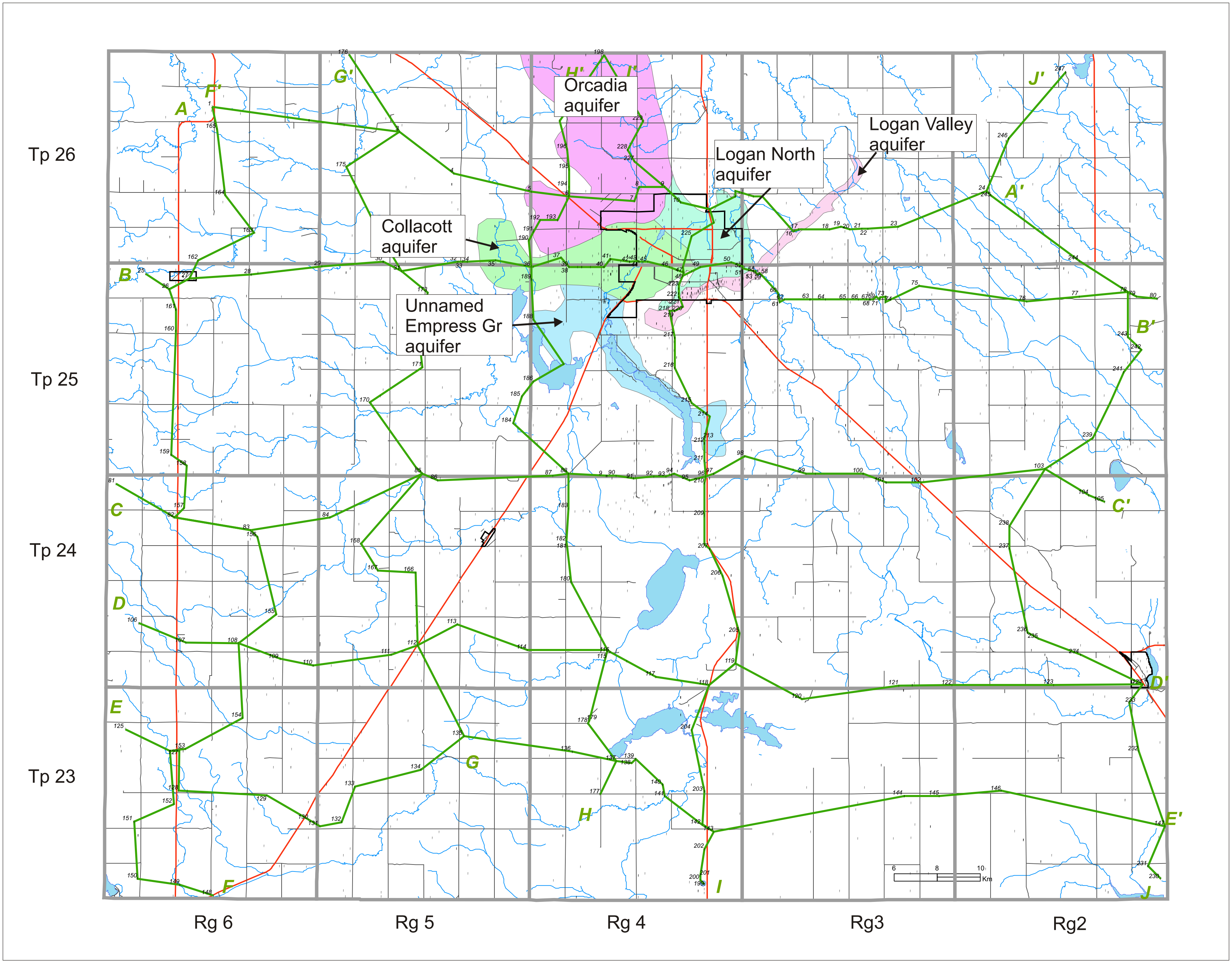

Figure 25 Location and extent of the Collacott aquifer system

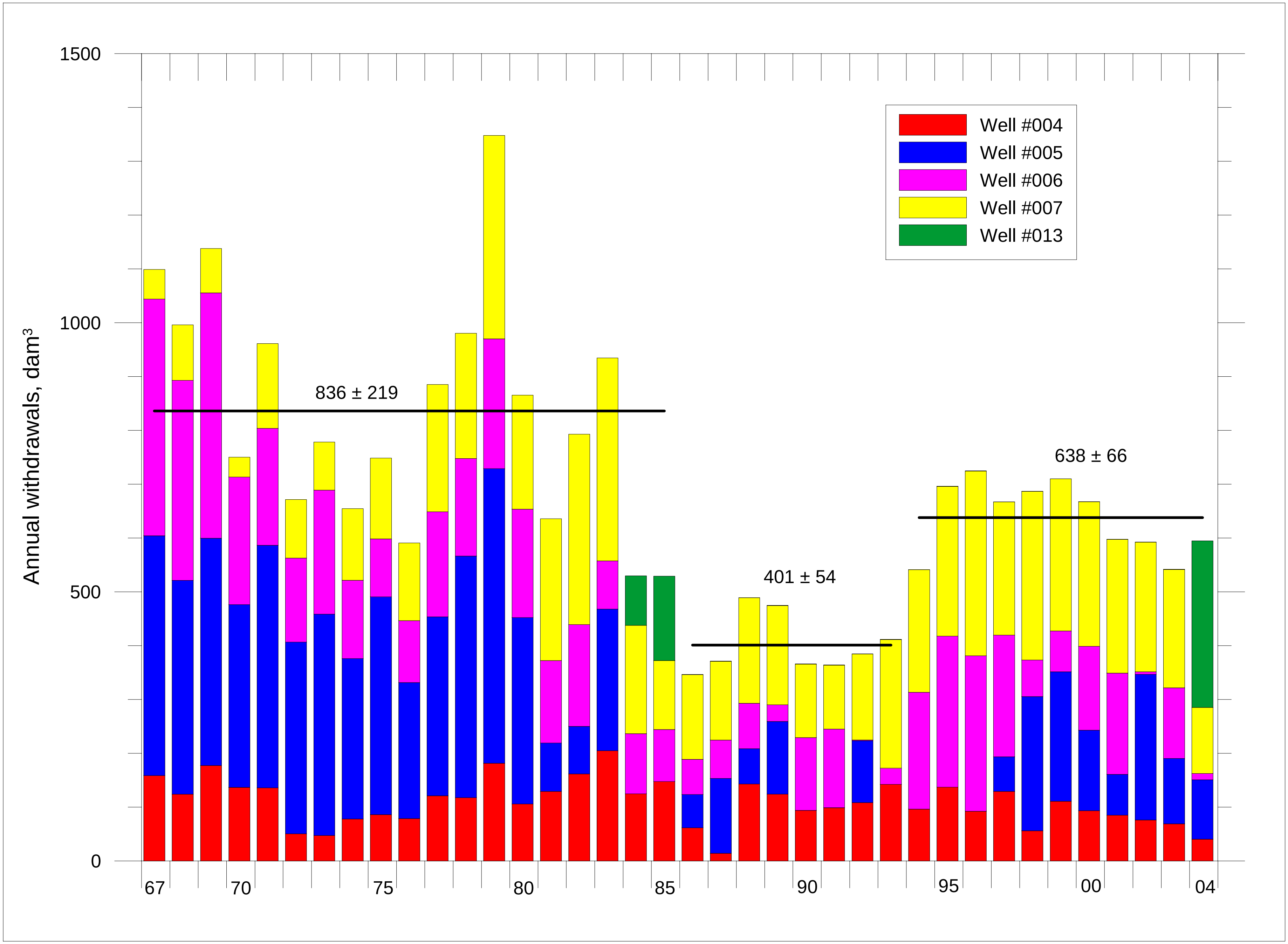

Figure 26 Historical withdrawals from the Collacott aquifer system

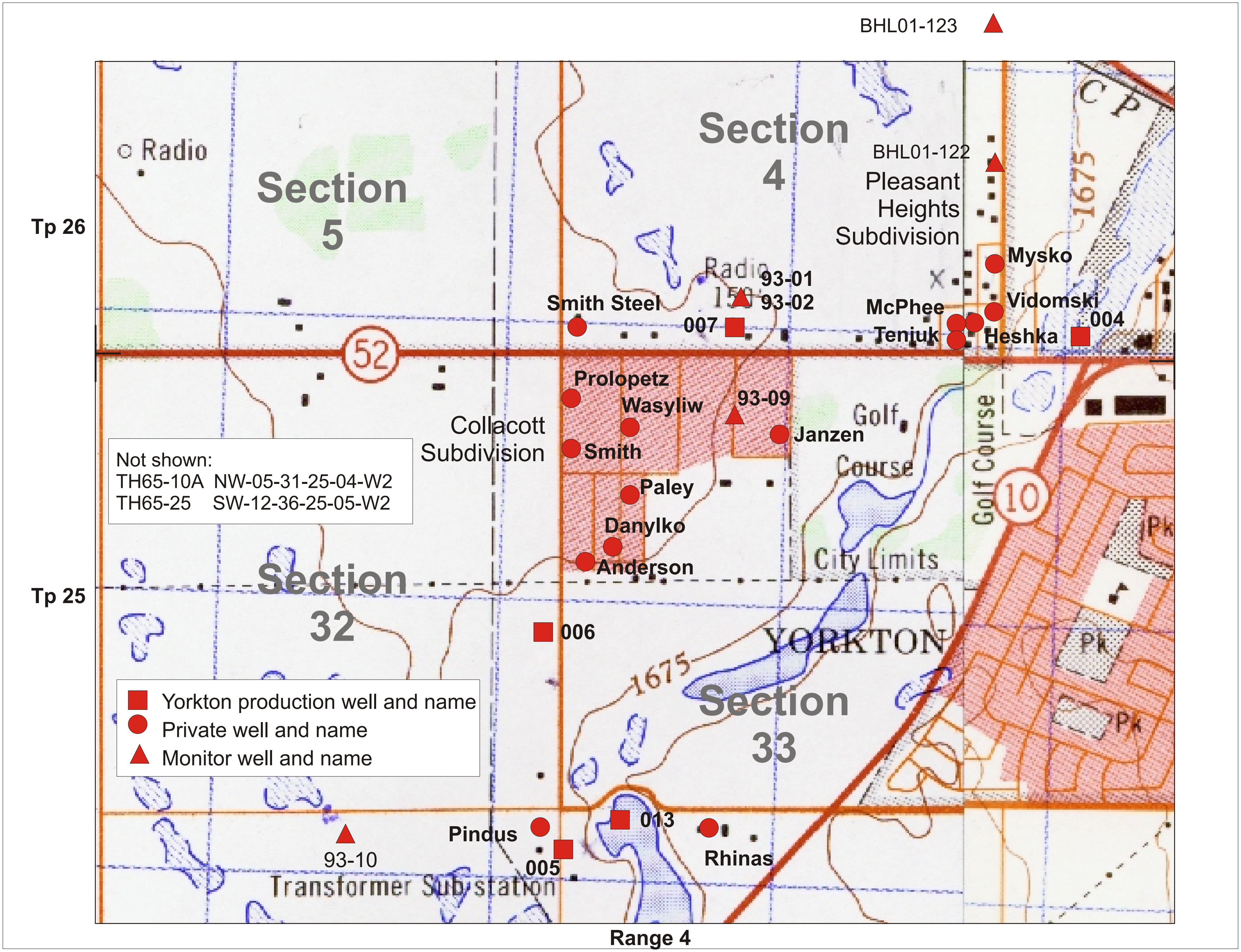

Figure 27 Location of production wells, monitor wells and private wells completed in the Collacott aquifer system

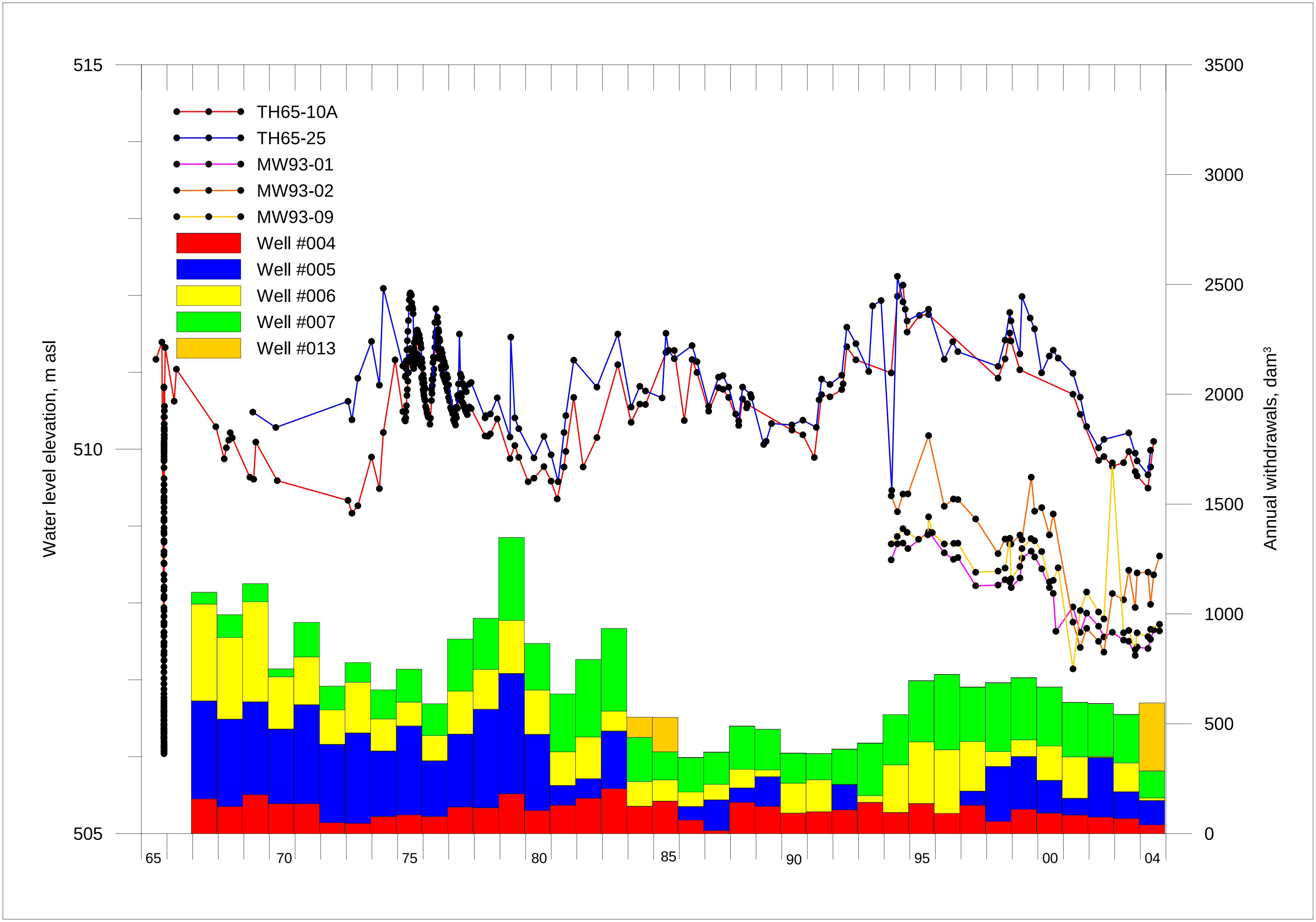

Figure 28 Long-term hydrographs for selected wells completed in the Collacott aquifer system

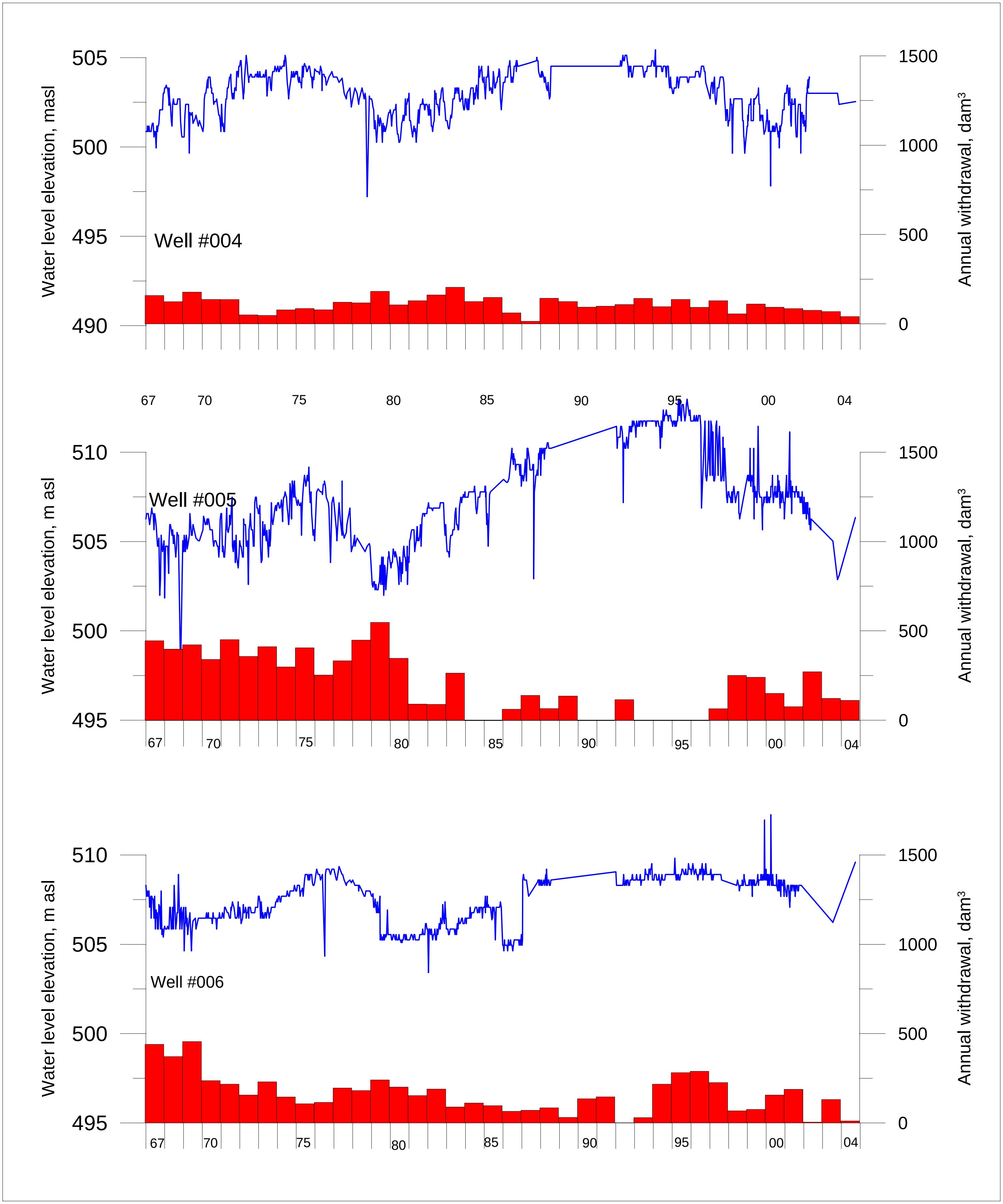

Figure 29 Long-term hydrographs for production wells #004, #005 and #006

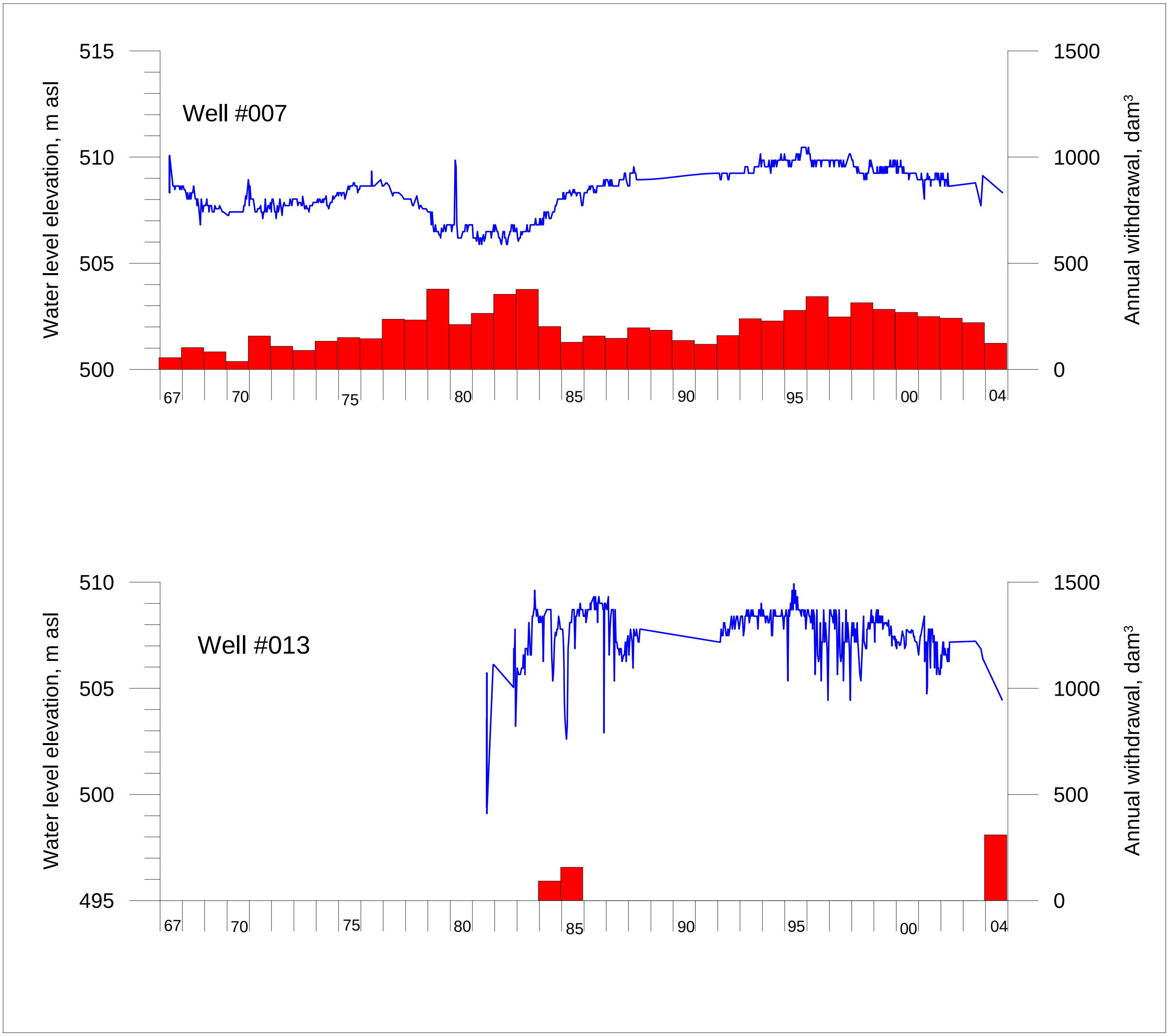

Figure 30 Long-term hydrographs for production Wells #007 and #013

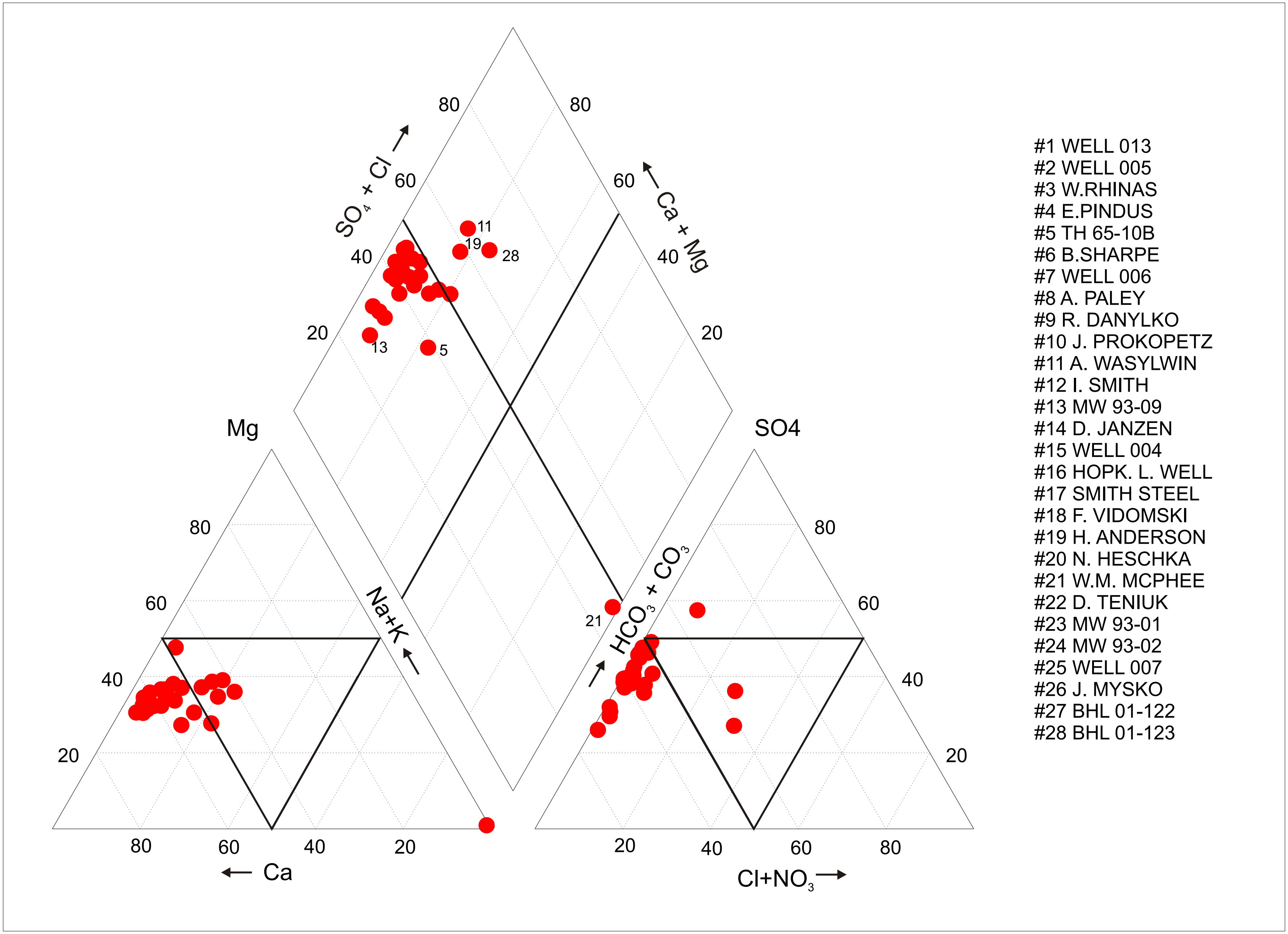

Figure 31 Piper-plot of water quality data for the Collacott aquifer system

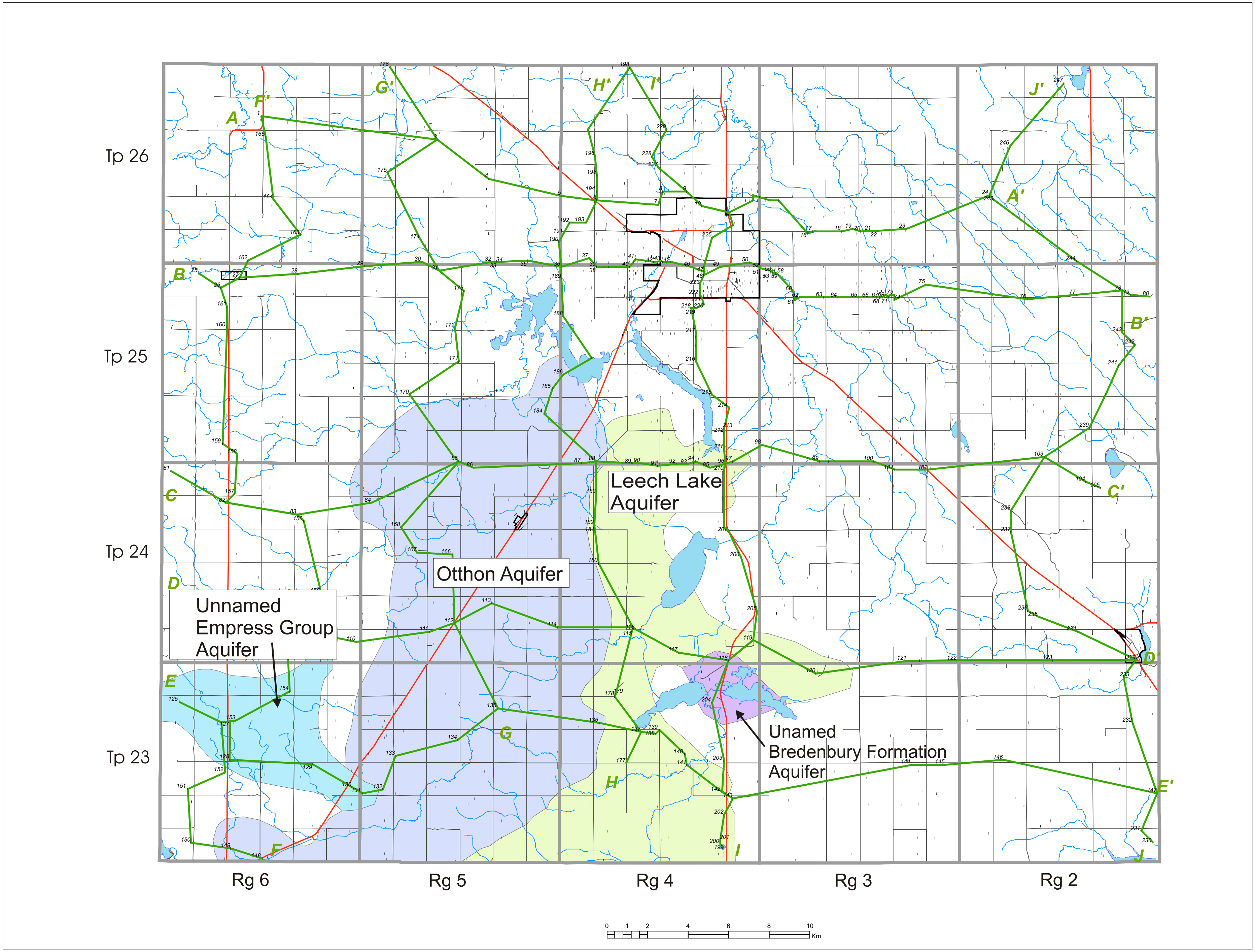

Figure 32 Location and extent of the Leech aquifer system and its components

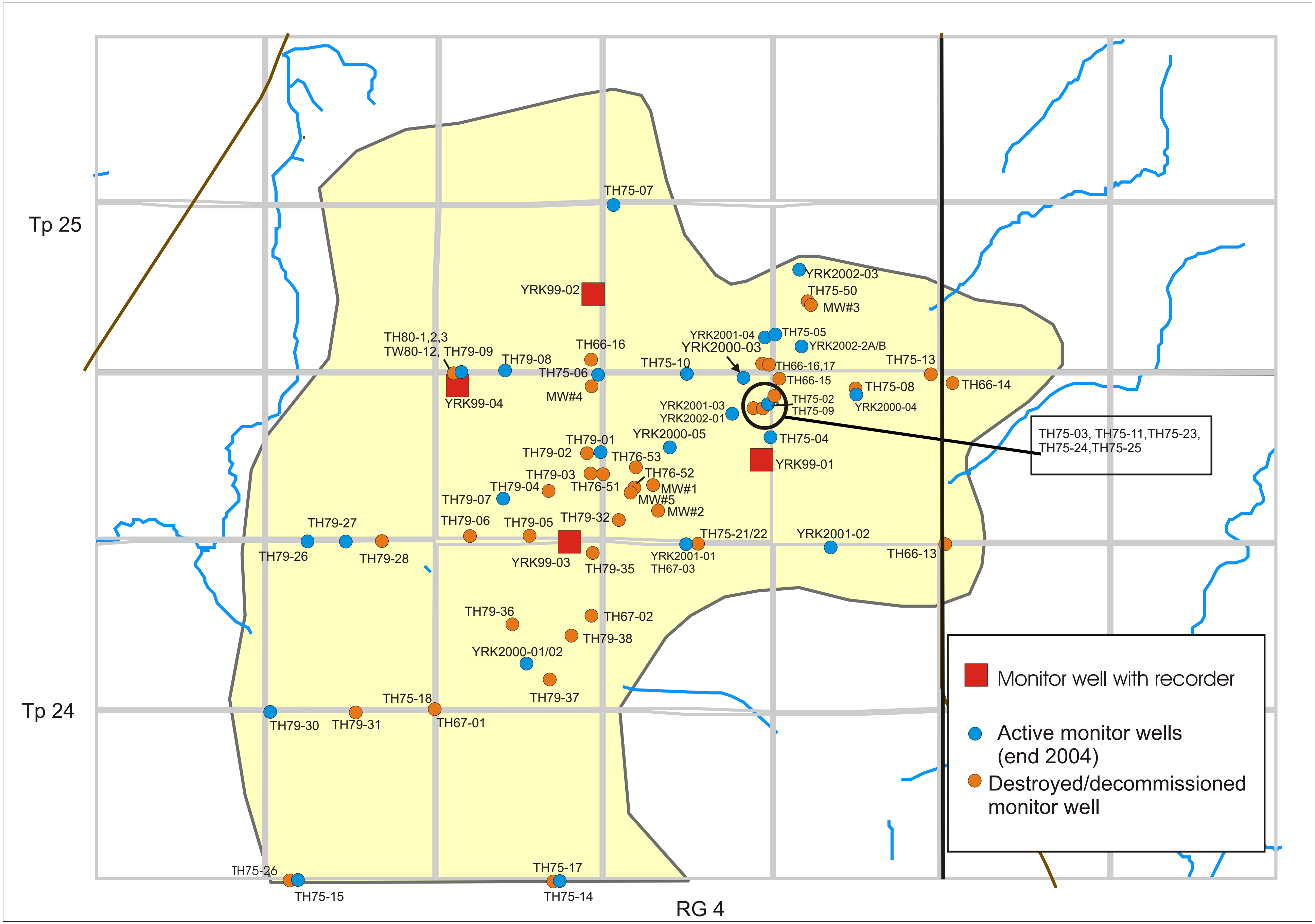

Figure 33 Location of observation and monitor wells in the northern part of the Leech Lake aquifer

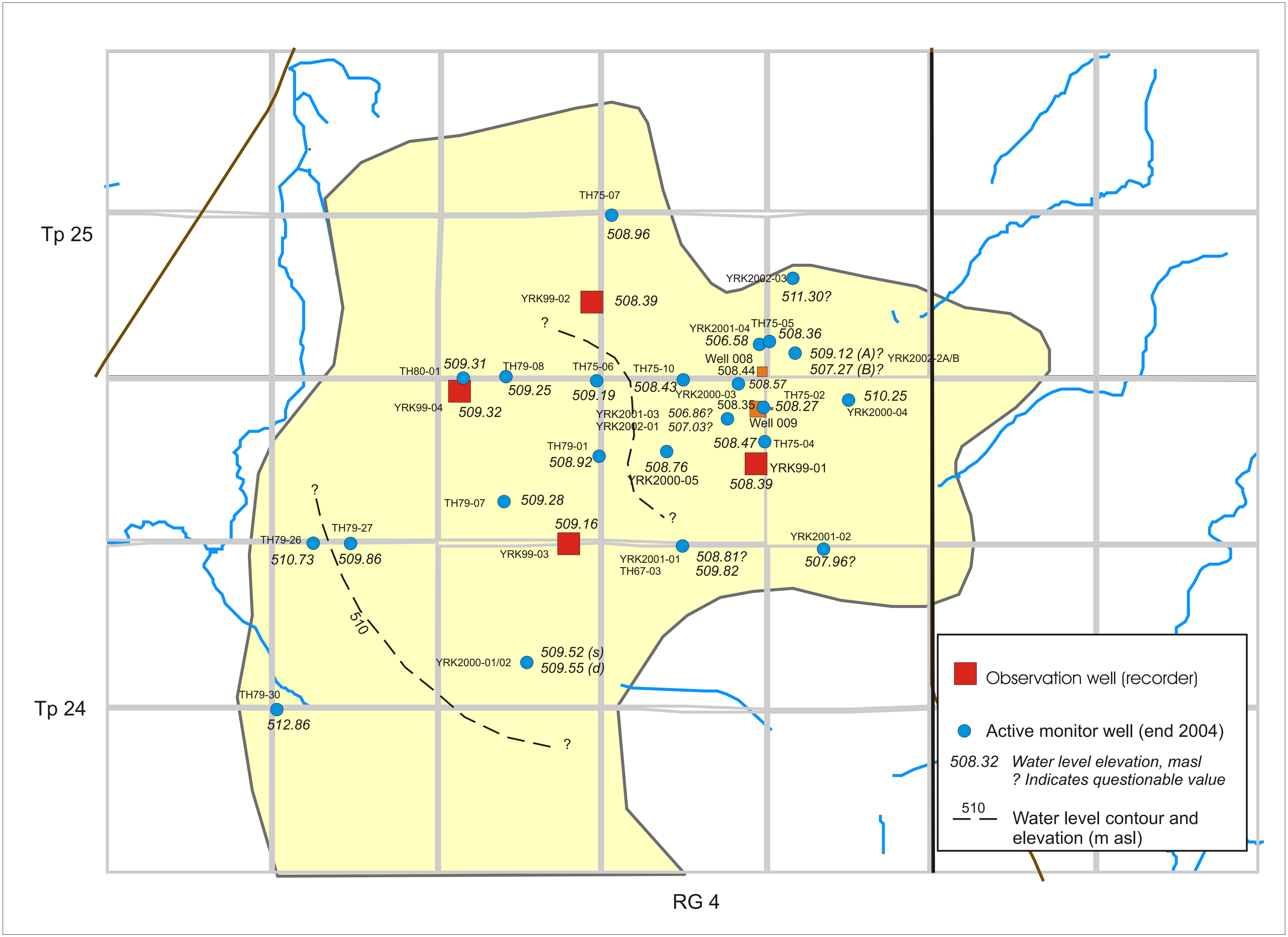

Figure 34 Instantaneous piezometric water levels for the northern part of the Leech Lake aquifer (October 1, 2004)

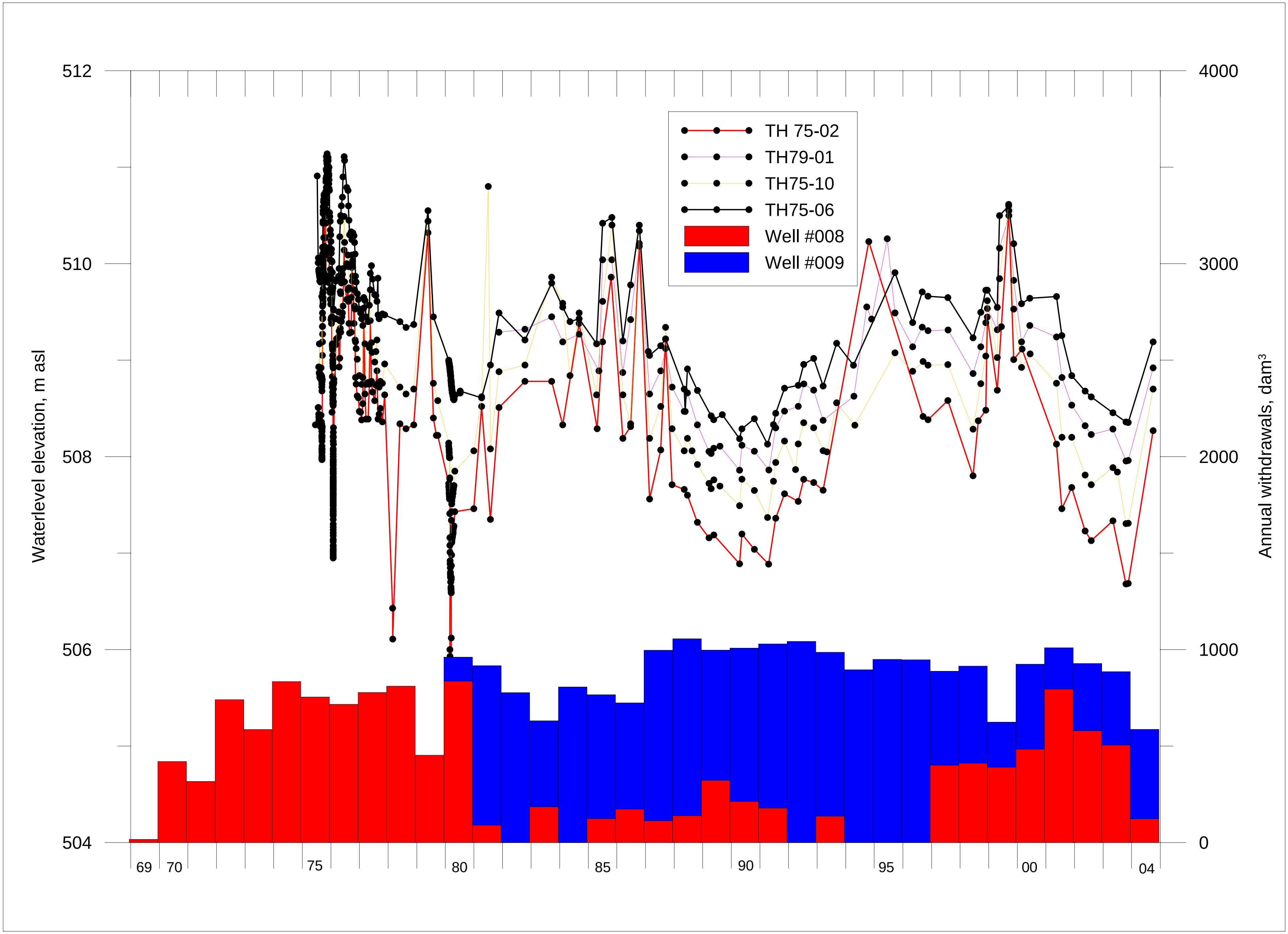

Figure 35 Long-term hydrographs for selected monitor wells (TH 75-02, TH75-06, TH 75-10 and TH79-01) in the Leech Lake aquifer located in the vicinity of production Wells #008 and #009

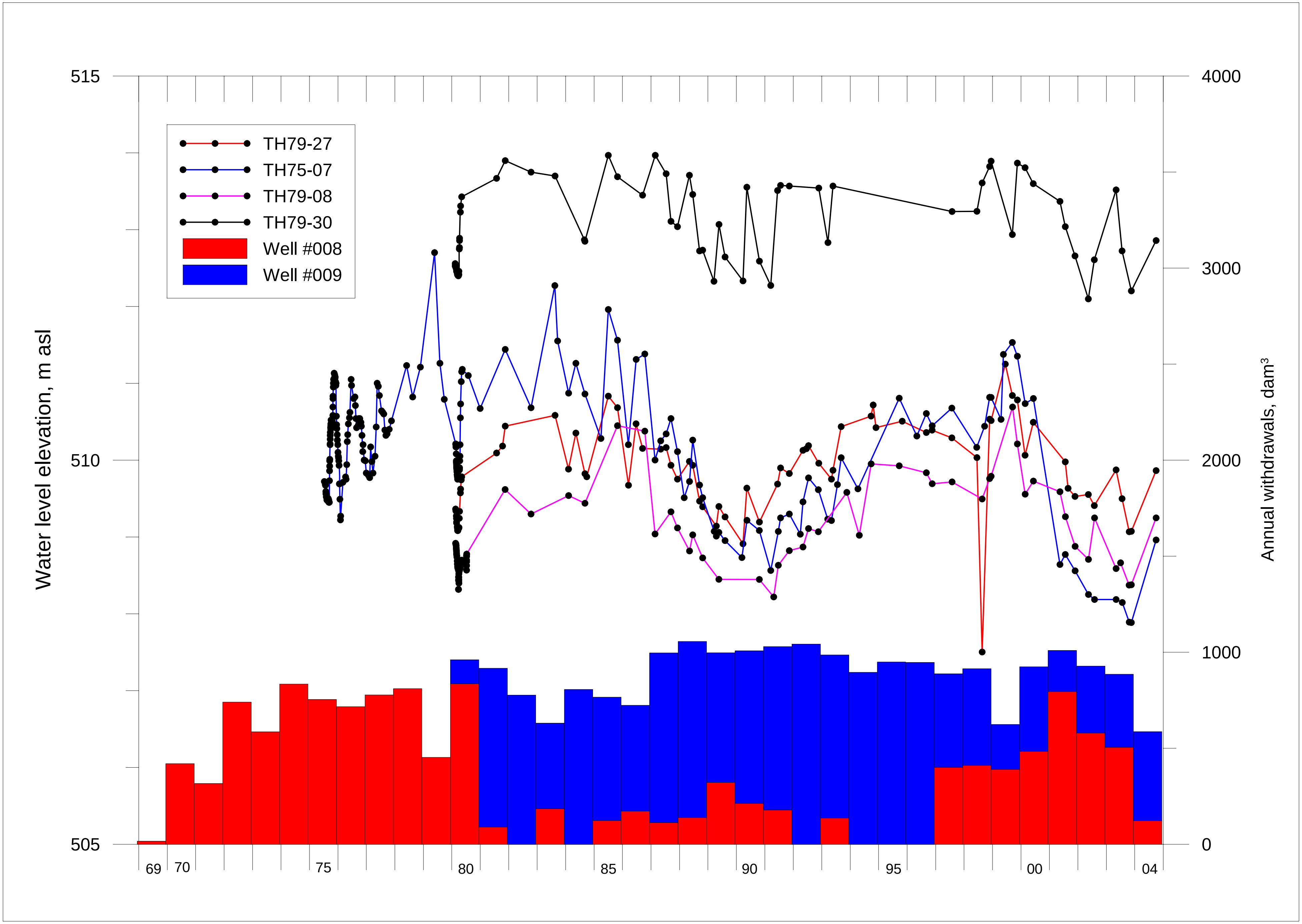

Figure 36 Long-term hydrographs for selected monitor wells (TH75-07, TH79-08, TH79-27 and TH79-30) in the Leech Lake aquifer located away from production Wells #008 and #009

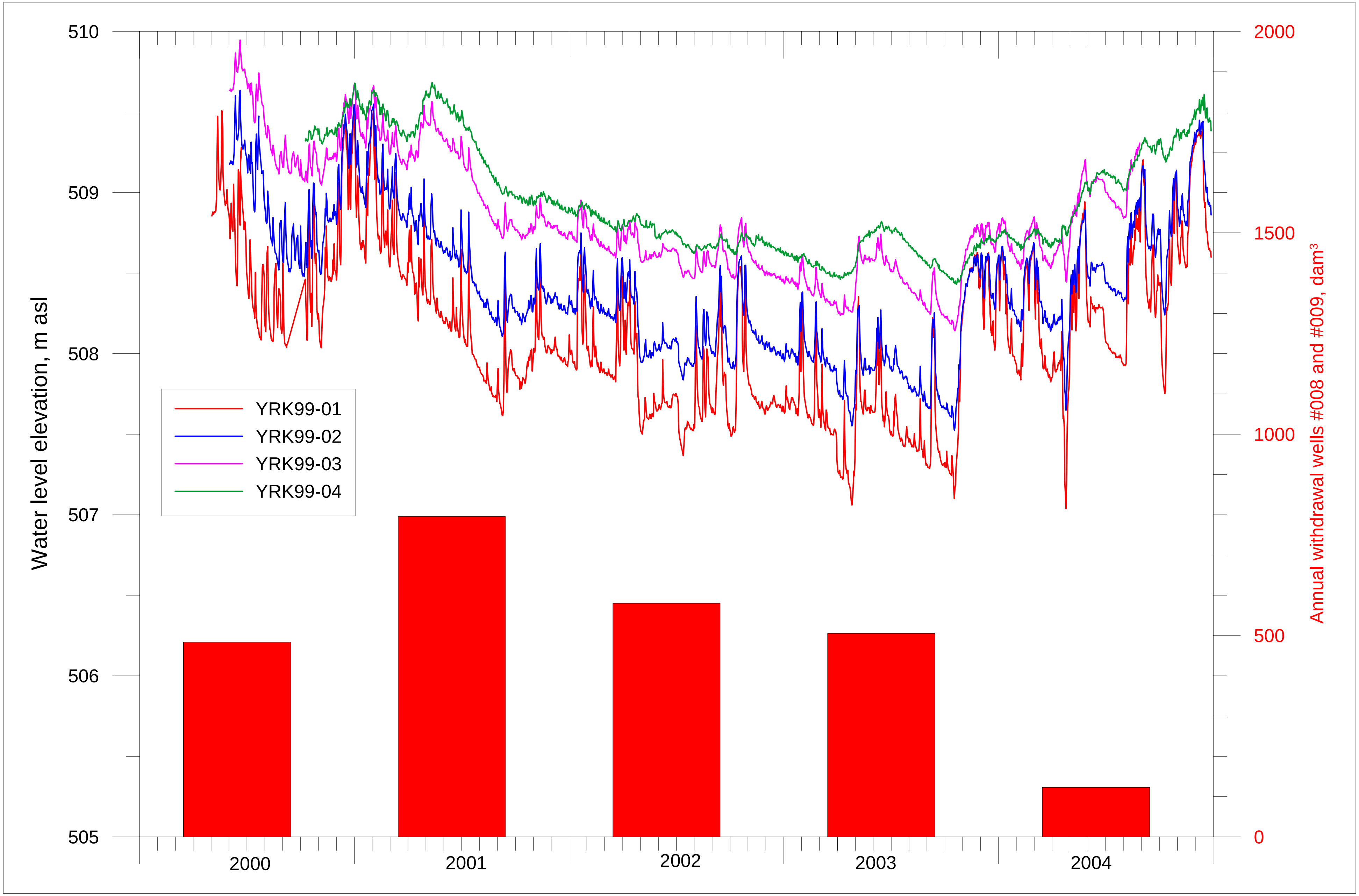

Figure 37 Hydrographs for SWA observation wells in the northern part of the Leech Lake aquifer

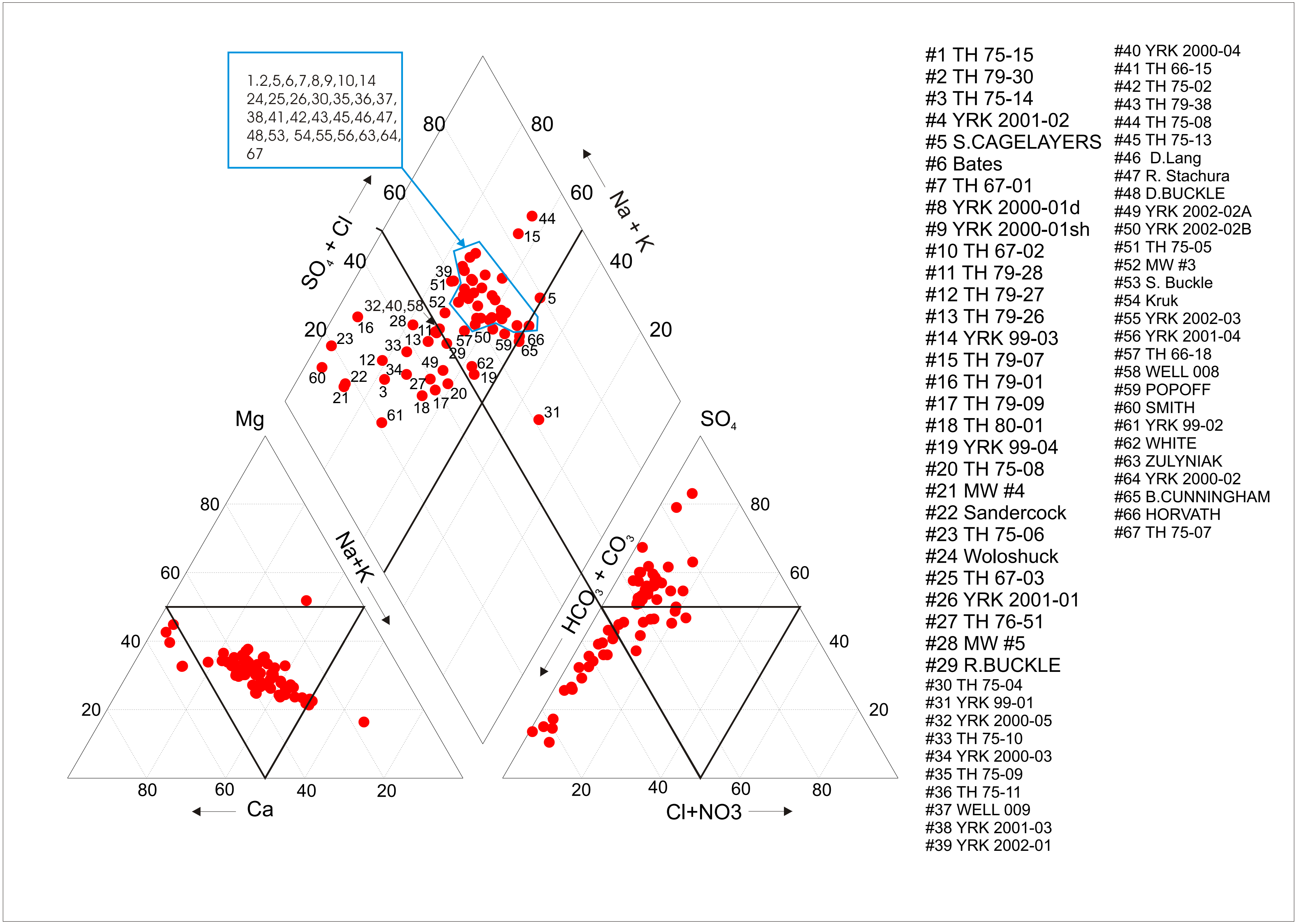

Figure 38 Piper-plot of water quality data the northern part of the Leech Lake aquifer

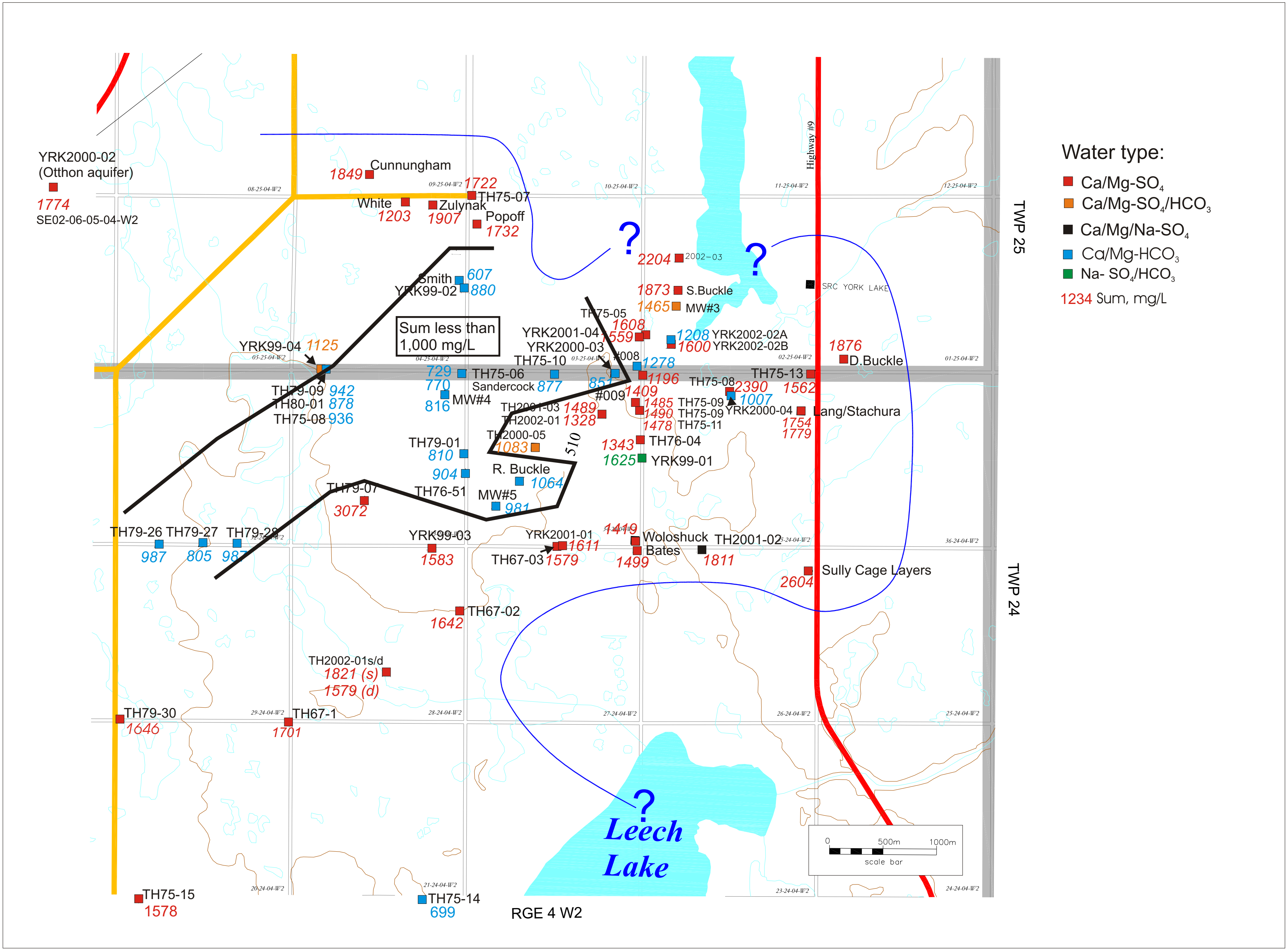

Figure 39 Distribution water type and sum of ions in the northern part of the Leech Lake aquifer

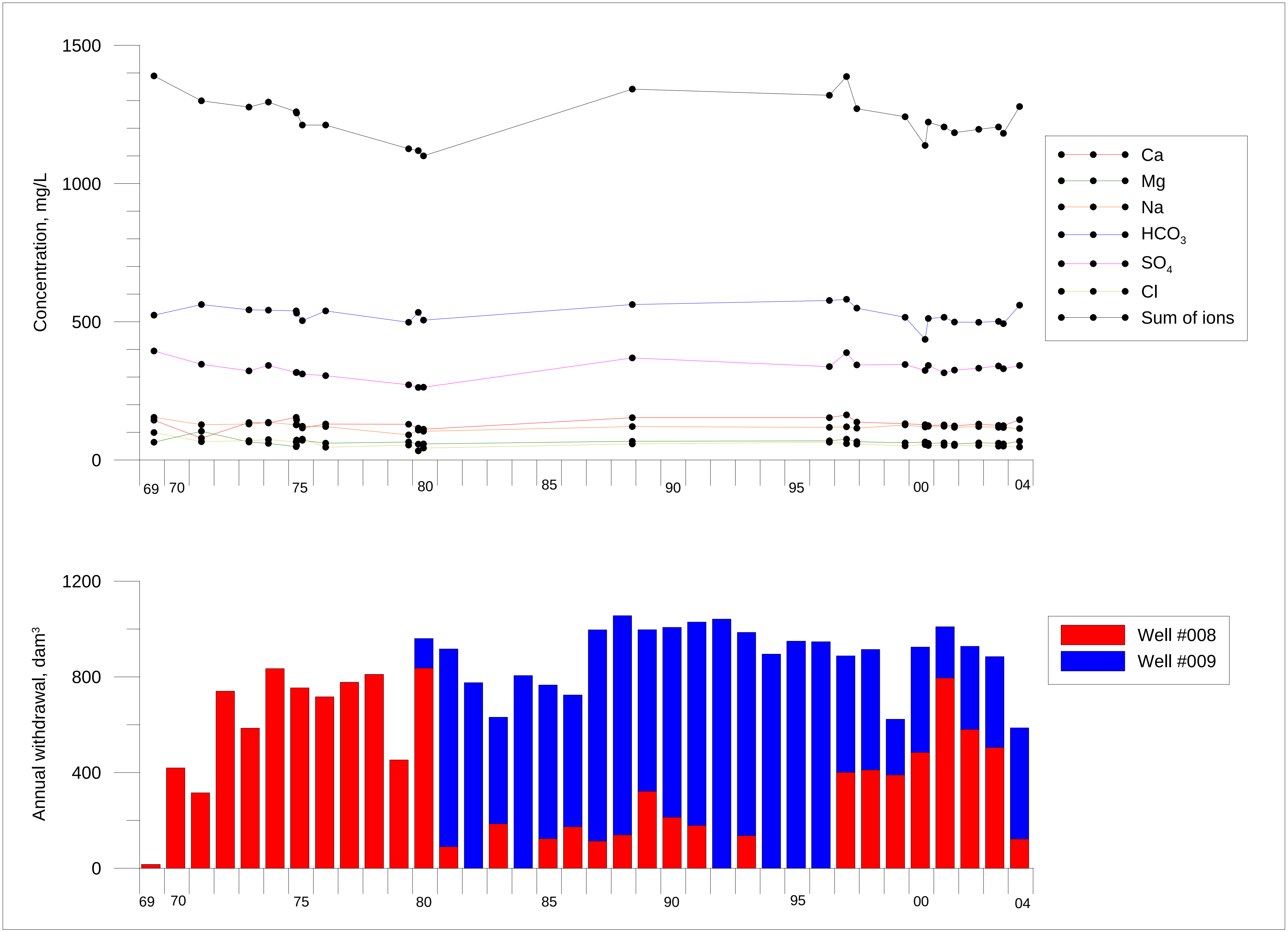

Figure 40 Changes in quality of water from production Well #008 and annual withdrawals from Wells #008 and #009

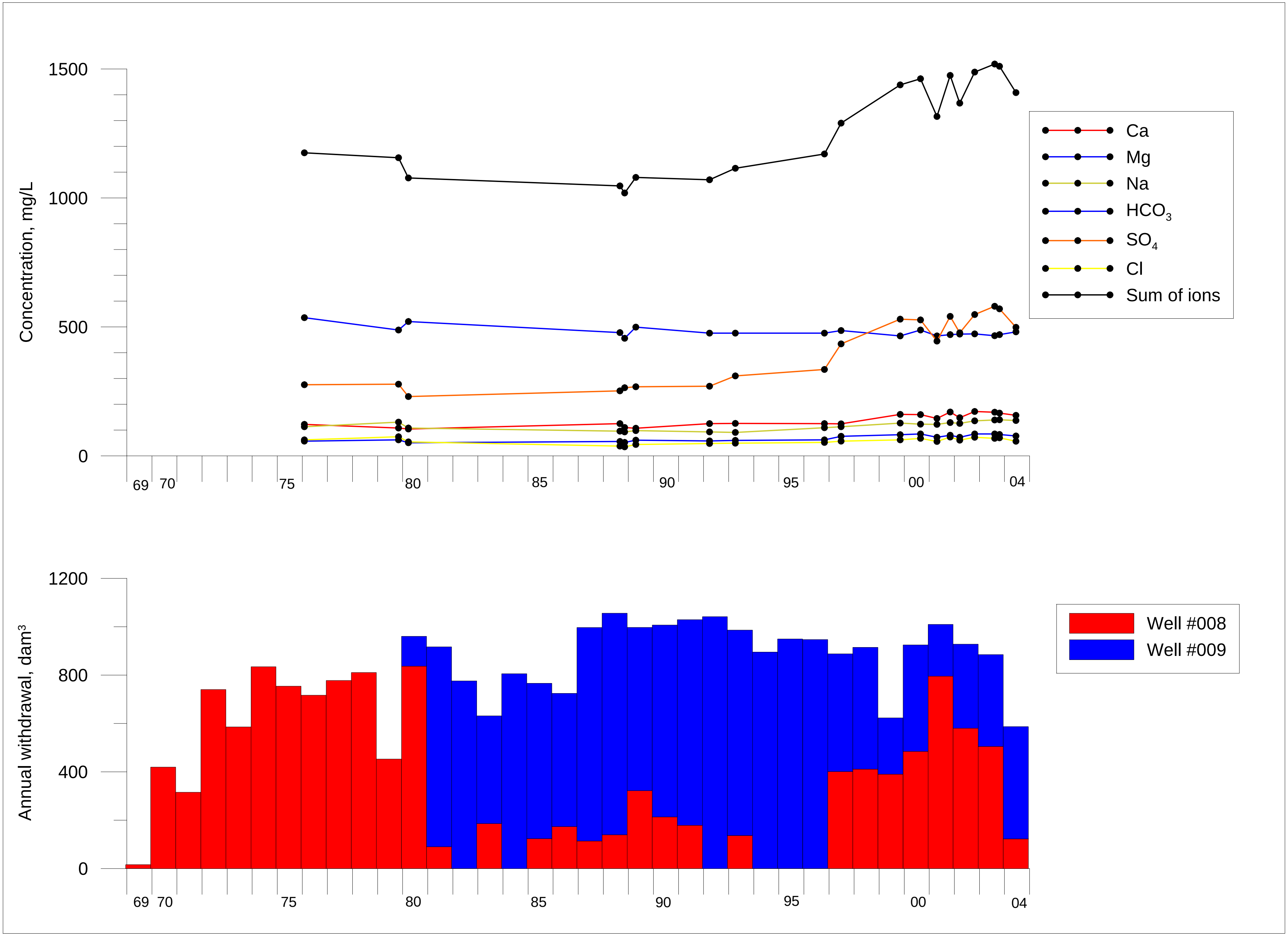

Figure 41 Changes in quality of water from production Well #009 and annual withdrawals from Wells #008 and #009

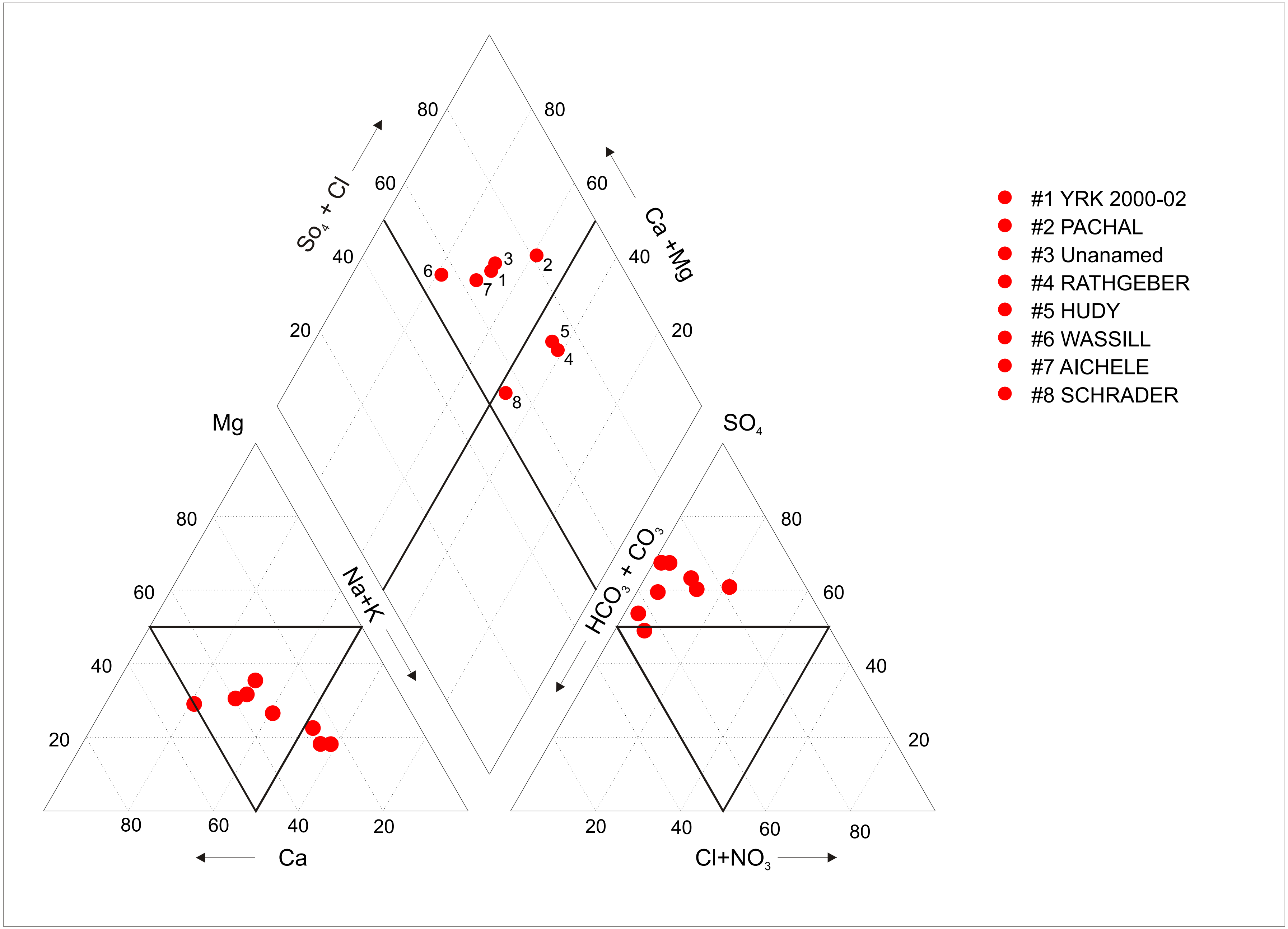

Figure 42 Piper-plot of water quality data for the Otthon aquifer

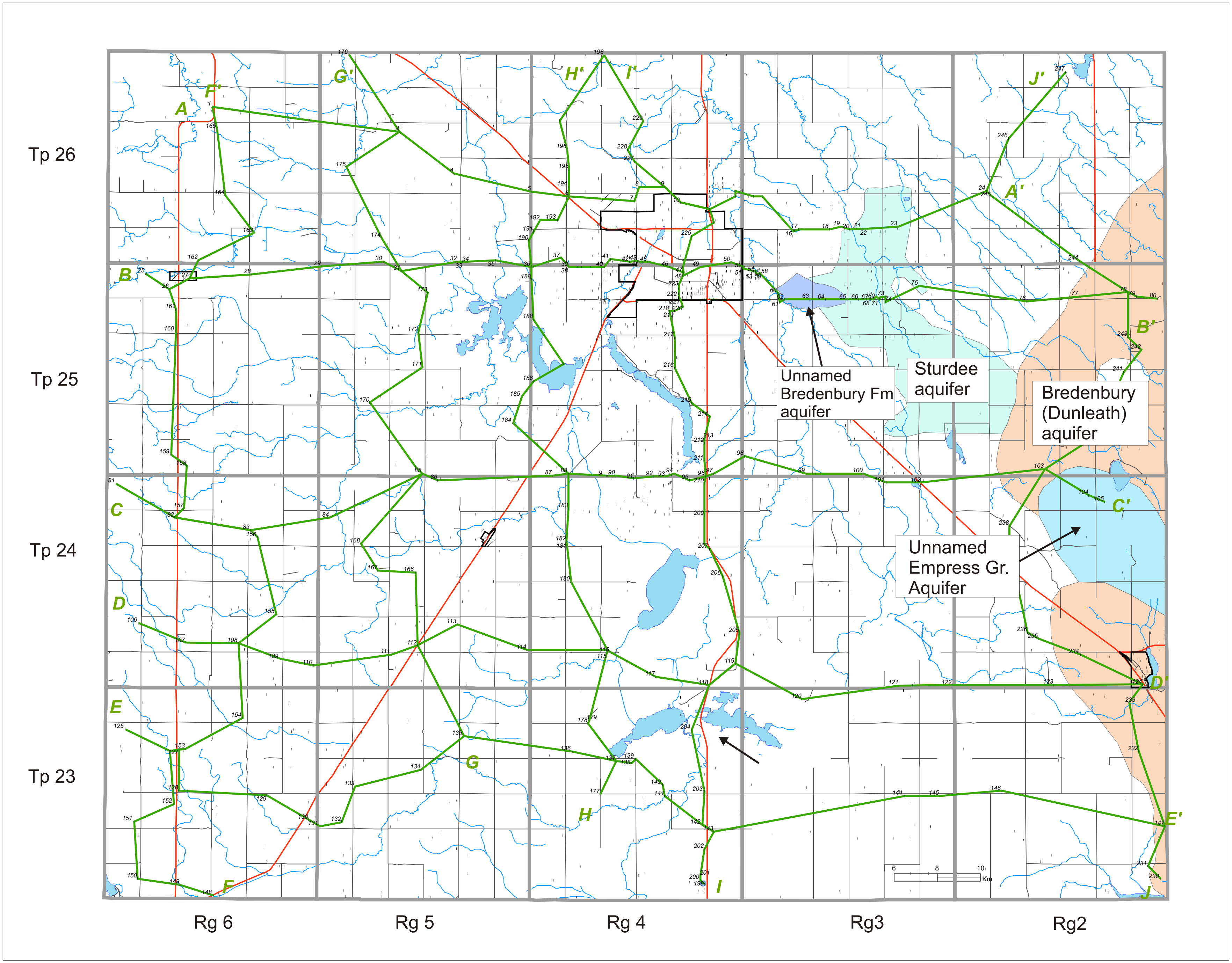

Figure 43 Location and extent of the Sturdee aquifer system and its components

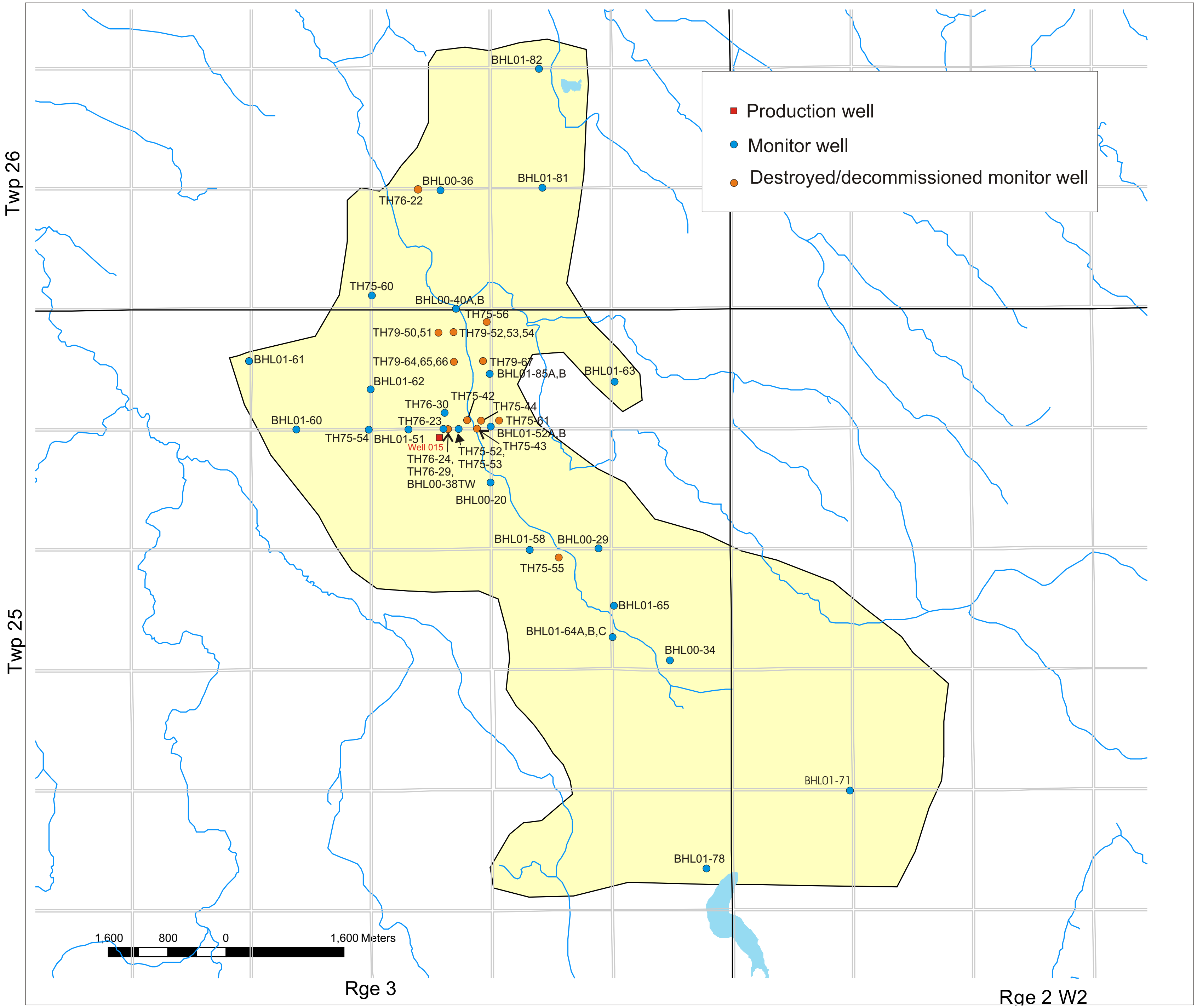

Figure 44 Location of active and abandoned/decommissioned monitor wells in the Sturdee aquifer

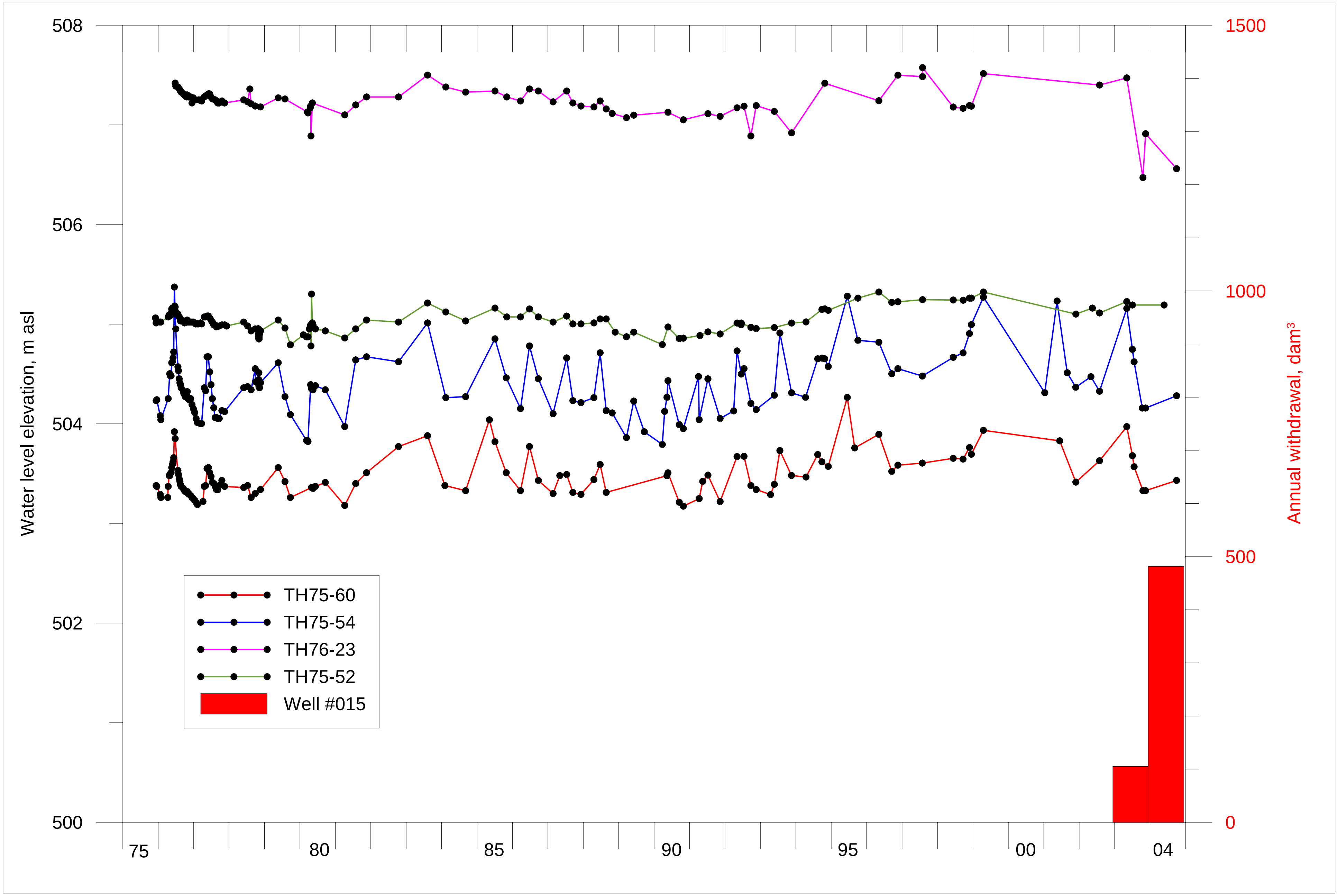

Figure 45 Long-term hydrographs for the Sturdee aquifer

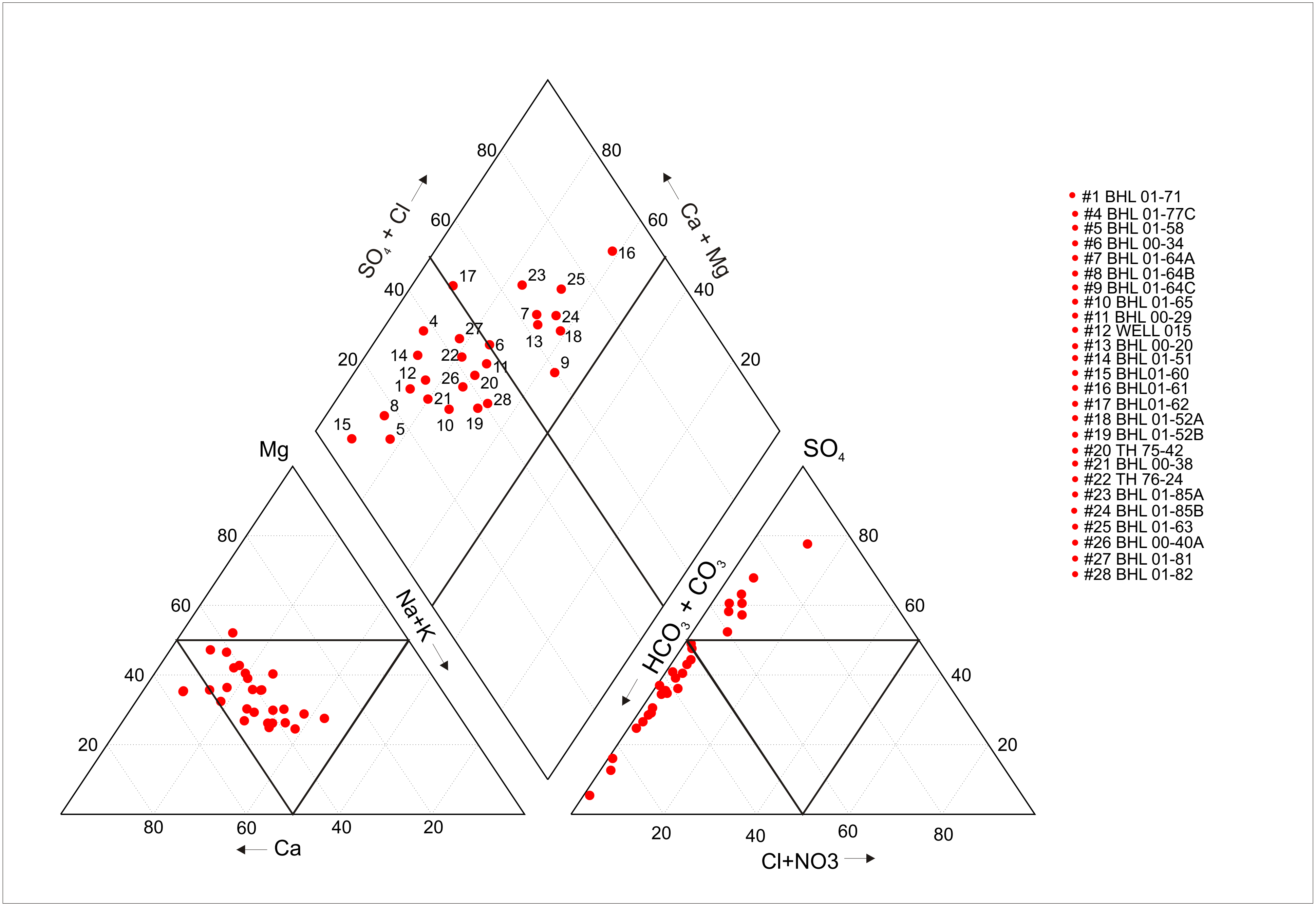

Figure 46 Piper-plot of water quality data for the Sturdee aquifer

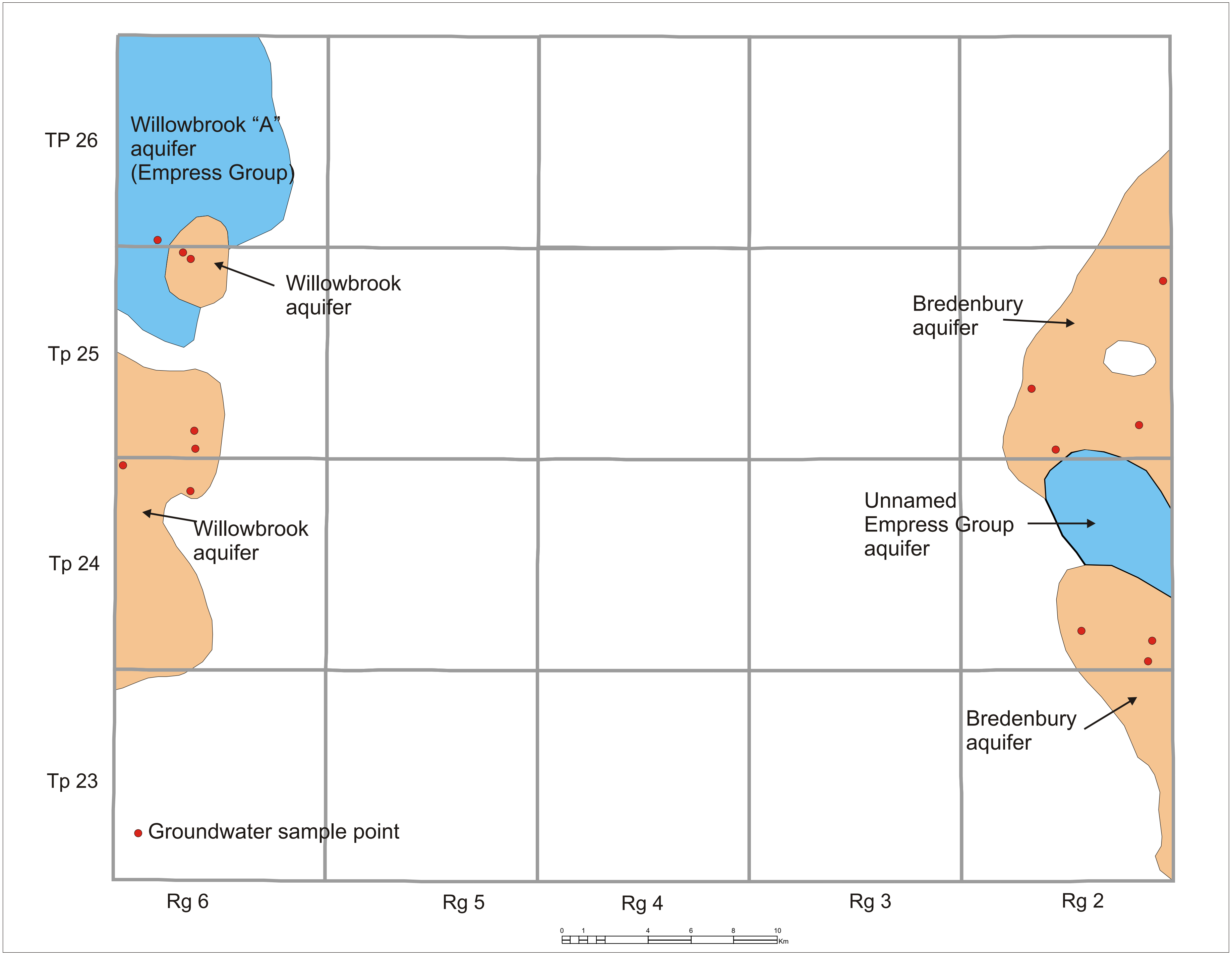

Figure 47 Location and extent of the Bredenbury and Willowbrook aquifers

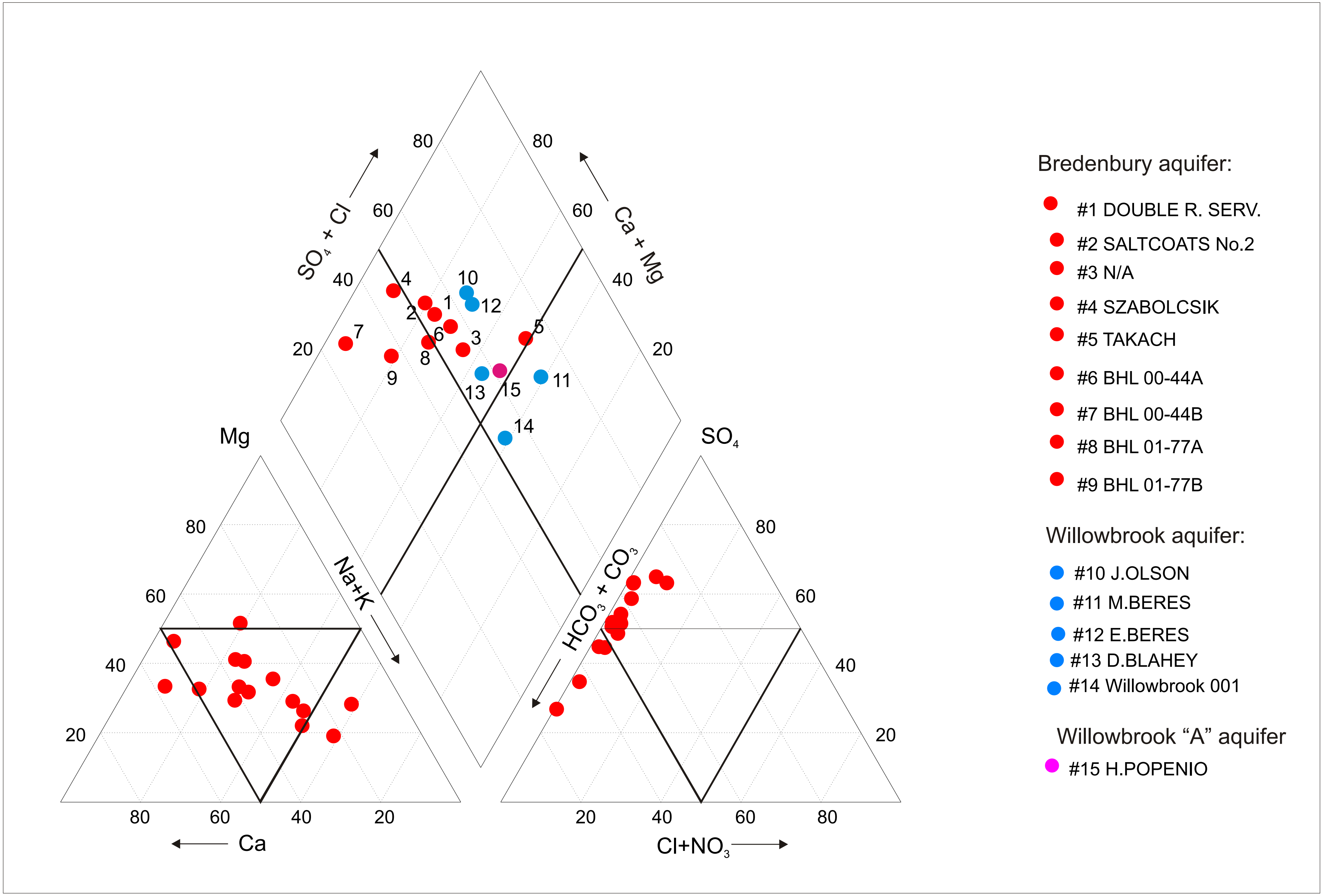

Figure 48 Piper-plot of water quality data for the Bredenbury, Willowbrook and Willowbrook "A" aquifers

LIST OF APPENDICES

APPENDIX A: DATABASES

Table A-1 SUMMARY DATA FOR MONITOR WELLS IN THE YORKTON STUDY AREA.

PIEZ. NAME	LAND LOCATION	Aquifer	NORTHING	EASTING	ELEV. TOP PIEZO.	GROUND ELEV.	DATE ELEV. CHANGE OR DATE OF SURVEY	SOURCE ELEV. DATA	MEAS. DEPTH BELOW GROUND	MEAS. STICK-UP	MEAS. TOTAL LENGTH FROM TOP	REPORTED TOT. LENGTH BELOW TOP	REPORTED LENGTH BELOW GROUND	SOURCE	DIFF. IN TOTAL LENGTH	REPORTED SCREEN LENGTH	COMMENTS
					M ASL	M ASL	YYMMDD		M	M	M	M	M		M	M	
TH 65-01	W2-04-25-15-15-SW				514.14	513.2		PFRA				64.6		IWS		6.1	Abandoned, BHL/COY unable to locate
TH 65-08	W2-03-25-31-11-NE	Logan east	5675718.39	680526.81	499.912			IWS									
					500.704	499.7	740613	PFRA									PLUGGED
TH 65-09	W2-04-26-06-01-SW		5676124.87	671291.88	517.855	517.3		PFRA	29.9	0.5	30.4	33.5		IWS	-3.1	6.1	Decommissioned Nov 26/01
TH 65-10E	W2-04-25-31-05-NW		5675080.03	669952.51	514.188			IWS									
					514.822	514	750821	PFRA	29	0.8	29.8	29.8	29	IWS	0	6.1	
TH 65-10W	W2-04-25-31-12-SW				513.939			IWS									
					515.563	514	750821	PFRA	7.7	1.6	9.3	10.7	9.1	IWS	-1.4	1.5	PARTLY PLUGGED
TH 65-12	W2-04-26-06-13-NW				517.681			IWS					10.1	IWS		1.5	NOT USED AFTER TESTING IN 1965
TH 65-13	W2-04-26-08-13-NW				519.346			IWS					27.4	IWS		6.1	NOT USED AFTER TESTING IN 1965
TH 65-15	W2-04-26-17-04-NW				519.269			IWS									
					520.038	519.1	750821	PFRA	7.2	0.3	7.5	28.9	28	IWS	-21.4	1.5	Abandoned, BHL/COY unable to locate
TH 65-17	W2-04-26-20-04-NW		5681190.23	671396.19	517.447	516.3		PFRA	24.5	1.15	25.65	21.9	20.7	IWS	3.8	1.5	Decommissioned Nov 26/01
TH 65-18	W2-04-26-30-01-SE				515.56			IWS					22.6	IWS		4.6	Abandoned, BHL/COY unable to locate
TH 65-19	W2-04-26-07-13-NW		5679147.6	669814.77	516.249			IWS									Decommissioned, Nov 27/01
					517.041	515.6	750821	PFRA	25.7	1.4	27.1	27.4	25.9	IWS	-0.3	3	
TH 65-22	W2-04-25-31-13-SW		5675666.28	669923.81	516.667			IWS									Decommissioned, Nov 27/01
					517.846	516.5	750821	PFRA	18.8	1.3	20.1	16.9	15.5	IWS	3.2	1.5	LENGTH GREATER THAN REPORTED
TH 65-23	W2-04-25-31-05-NW		5675042.35	669951.97	515.569	513.9		PFRA	28.7	1.6	30.3	24.2	22.6	IWS	6.1	6.1	Decommissioned June 28/02
TH 65-24	W2-05-26-02-01-SE		5675912.24	668257.63	515.356			IWS									
					516.282	514.9	750821	PFRA	22.15	1.3	23.45	18.1	16.8	IWS	5.4	6.1	Decommissioned, Nov 27/01
TH 65-25	W2-05-25-36-12-SW		5675130.93	668295.71	513.052			IWS									BHL redeveloped 06/26/01
					513.576	512.5	750821	PFRA	17.75	0	17.75	31.5	30.5	IWS	-13.8	3	
TH 65-26	W2-05-26-11-01-SE		5677491.15	668171.39	515.627	514.8		PFRA	30.3	0.8	31.1	32.2	31.4	IWS	-1.1	3	BHL redeveloped 06/26/01
TH 65-26A	W2-05-26-11-01-SE		5677491.15	668171.39	515.301	514.8		PFRA	14.2	0.5	14.7	17.3	16.8	IWS	-2.6	1.5	BHL redeveloped 06/26/01
TH 66-02	W2-04-26-01-16-NW												8.8	IWS		6.1	Abandoned, BHL/COY unable to locate
TH 66-08	W2-04-25-27-01-NW												16.2	IWS		4.6	Abandoned, BHL/COY unable to locate
TH 66-09	W2-03-25-32-03-SE		5674549.91	681738.69	501.506			IWS									
					501.786	501	750612	PFRA	7.3	0.8	8.1	9.1	7.6	IWS	-1	3.4	PARTLY PLUGGED
TH 66-10	W2-04-25-27-09-NW	Logan west	5664398.33	672340.62	512.536	512.2		PFRA	15.1	0.35	15.45	24.8	24.4	IWS	-9.3	6.1	Abandoned, BHL/COY unable to locate
TH 66-11	W2-04-25-27-07-SW				517.7			PFRA					24.4	IWS		6.4	Abandoned, BHL unable to locate
TH 66-12	W2-04-24-24-03-SE	Other	5661631.82	679299.35	511.973			IWS									Decommissioned June 26/02
					512.86	512	750903	PFRA	7.4	0.9	8.3	18.9	18	IWS	-10.6	2.1	
TH 66-13	W2-04-24-25-13-NW	Leech Lake aquifer	5664602.93	678540.82	512.78			IWS									Decommissioned Nov 30/01
					514.271	512.7	750421	PFRA	18.8	1.6	20.4	25.1	23.5	IWS	-4.7	6.1	
TH 66-14	W2-04-24-35-16-NE	Leech Lake aquifer			512.369	512.4		IWS					21.3	IWS		6.1	Abandoned, BHL unable to locate
TH 66-15	W2-04-24-35-13-NW	Leech Lake aquifer	5666381.426	676754.689	512.485		721000	IWS									Decommissioned June 26/02
			5666162.91	676794.59	513.018		760202	IWS									
					513.067	512.4	760203	IWS	4.15	0.7	4.85	30.6	29.9	IWS	-25.7	6.1	
					513.121	512.4	fall 2000	SWC									
TH 66-16	W2-04-25-04-01-SE	Leech Lake aquifer			514.926	514.8		IWS					21.3	IWS		6.1	Abandoned, BHL unable to locate
TH 66-17	W2-04-25-03-01-SE	Leech Lake aquifer	5666449.277	676743.528	512.86	512.7		IWS									
			5666234.17	676782.64	513.847	512.8	750825	PFRA	32.4	0.85	33.25	35.9	35.1	IWS	-2.7	6.1	Decommissioned Nov 30/01
			566231.823	676782.973	513.096	512.2	fall 2000	SWC									
TH 66-18	W2-04-25-03-01-SE	Leech Lake aquifer			512.555			IWS					32.6	IWS		6.1	TEST WELL; CASING PULLED

Table A-1 SUMMARY DATA FOR MONITOR WELLS IN THE YORKTON STUDY AREA.

PIEZ. NAME	LAND LOCATION	Aquifer	NORTHING	EASTING	ELEV. TOP PIEZO. (M ASL)	GROUND ELEV. (M ASL)	DATE ELEV. CHANGE OR DATE OF SURVEY (YYMMDD)	SOURCE ELEV. DATA	MEAS. DEPTH BELOW GROUND (M)	MEAS. STICK-UP (M)	MEAS. TOTAL LENGTH FROM TOP (M)	REPORTED TOT. LENGTH BELOW TOP (M)	REPORTED LENGTH BELOW GROUND (M)	SOURCE	DIFF. IN TOTAL LENGTH (M)	REPORTED SCREEN LENGTH (M)	COMMENTS
TH 67-01	W2-04-24-28-04-SW	Leech Lake aquifer	5663027.001	673575.125	513.713	513.3		PFRA	21.8	0.4	22.2	22.4	21.9	IWS	-0.2	6.7	Decommissioned Nov 30/01
			5662811.61	673619.33	513.054		fall 2000	SWC									
TH 67-02	W2-04-24-28-08-NW	Leech Lake aquifer			512.735	512.2		PFRA					18.9	IWS		6.7	Abandoned, BHL/COY unable to locate
TH 67-03	W2-04-24-34-02-SW	Leech Lake aquifer	5664518.91	676075.15	512.387	512		PFRA	42.35	0.25	42.6	43.5	43.3	IWS	-0.9	6.7	BHL redeveloped 06/26/01
TH 75-02	W2-04-24-35-13-SW	Leech Lake aquifer	5666140.519	676742.613	512.844	512.4		PFRA	15.4	0.4	15.8	21.8		PFRA	-6	6.7	SRC redeveloped 08/22/00
			5665923.83	676783.5	512.90	512.4	fall 2000	SWC									
TH 75-03	W2-04-24-35-13-SW	Leech Lake aquifer	5665920.83	676783.5	512.735	512.3		PFRA	35	0.45	35.45	36.6		PFRA	-1.1	6.6	Decommissioned Nov 30/01
TH 75-04	W2-04-24-35-12-SW	Leech Lake aquifer	5665773.581	676753.963	513.561	513.3		PFRA				30.9		PFRA		6.7	SRC redeveloped 08/21/00, replaced by 1-99, BHL unable to decommission
			5665558.28	676794.73	513.641	513.4	fall 2000	SWC									
TH 75-05	W2-04-25-02-04-NW	Leech Lake aquifer	5666745.163	676747.983	512.728	512.4		PFRA	38.1	0.3	38.4	40.1		PFRA	-1.7	6.8	SRC redeveloped 08/21/00
			5666522.69	676788.97	512.781	512.5	fall 2000	SWC									
TH 75-06	W2-04-24-33-16-NE	Leech Lake aquifer	5666332.733	675069.029	516.319	515.6		PFRA	20.4	0.7	21.1	23.7		PFRA	-2.6	6.9	SRC redeveloped 08/22/00
			5666112.59	675104.32	516.399	515.7	fall 2000	SWC									
TH 75-07	W2-04-25-10-04-SW	Leech Lake aquifer	5667989.915	675089.309	516.648	516.1		PFRA	23.5	0.6	24.1	26.8		PFRA	-2.7	4.9	SRC redeveloped 08/22/00
			5667777.53	675128.2	516.732	516.2	fall 2000	SWC									
TH 75-08	W2-04-24-35-14-NE		5666039.05	677608.63	514.95	513.8		PFRA				30.2		PFRA		6.7	Decommissioned Nov 29/01
TH 75-09	W2-04-24-34-16-SE	Leech Lake aquifer	5666035.031	676625.721	512.732	512.1		PFRA	32.6	0.65	33.25						
			5665820.15	676663.62	512.795	512.1	fall 2000	SWC									SRC redeveloped 08/21/00
TH 75-10	W2-04-24-34-15-NW	Leech Lake aquifer	5666355.43	675930.14	514.283	513.5		PFRA	22.5	0.8	23.3						SRC redeveloped 08/22/00
			5666137.73	675965.2	514.41	513.7	fall 2000	SWC									
TH 75-11	W2-04-24-34-16-SE	Leech Lake aquifer	5666095.076	676696.871	512.643	512.2		PFRA									Decommissioned June 26/02
			5665880.24	676735.99	513.786	512.9	fall 2000	SWC									
TH 75-12	W2-04-24-24-13-NW	Other			514.658			PFRA				60.4		PFRA		3.4	Abandoned, BHL unable to locate
TH 75-13	W2-04-25-02-01-SE	Leech Lake aquifer	5666446.625	678323.145	513.344	512.4		PFRA	17.3	0.9	18.2	26.9		PFRA	-8.7	6.3	Decommissioned Nov 29/01
			5666232.3	678361.18	513.01		fall 2000	SWC									
TH 75-14	W2-04-24-21-01-SW	Leech Lake aquifer	5661418.636	674861.124	515.414	514.1		PFRA	27	1.2	28.2	29.4		PFRA	-1.2	6.7	SRC redeveloped 08/24/00
			5661198.78	674902.21	515.623	514.4	fall 2000	SWC									
TH 75-15	W2-04-24-20-04-SE	Leech Lake aquifer	5661316.665	672233.278	516.974	516.4		PFRA	30	0.6	30.6	38.4		PFRA	-7.8	6.4	SRC redeveloped 08/24/00
			5661097.58	672275.09	517.161	516.6	fall 2000	SWC									
TH 75-16	W2-04-24-09-04-SE		5657912.92	674204.52	512.738	512.2		PFRA	4.6	0.3	4.9	38.1		PFRA	-33.2	6.4	Decommissioned Dec 4/01
TH 75-17	W2-04-24-21-01-SW	Leech Lake aquifer	5661198.78	674915.21	514.682	513.3		PFRA	2.85	1.35	4.2	4.6		PFRA	-0.4	1.5	Decommissioned June 25/02
TH 75-18	W2-04-24-28-04-SW	Leech Lake aquifer	5662811.61	673629.33	514.402	513.2		PFRA	5.15	1.1	6.25	7.7		PFRA	-1.5	1.5	Decommissioned June 25/02
TH 75-19D	W2-04-24-24-02-NE	Other	5661622.82	679299.35	512.823	512.1		PFRA	3	0.75	3.75	4.7		PFRA	-0.9	1.5	Decommissioned June 25/02
TH 75-20	W2-04-24-24-04-SE	Other	5661497.29	678948.33	513.402	512.2		PFRA	1.5	1.25	2.75	6.1		PFRA	-3.4	3.1	Decommissioned June 26/02
TH 75-21C	W2-04-24-27-15-NW	Leech Lake aquifer	5664512.91	676069.15	512.631	512.1		PFRA	3.5	0.5	4	4.6		PFRA	-0.6	1.5	Decommissioned June 26/02
TH 75-22	W2-04-24-27-15-NW	Leech Lake aquifer	5664463.31	676045.77	512.85	511.9		PFRA	3.2	0.9	4.1	4.5		PFRA	-0.4	1.4	Decommissioned June 26/02
TH 75-23	W2-04-24-34-16-SE	Leech Lake aquifer	5674690.27	685544.33	512.991	512.4		PFRA				4.6		PFRA			NOT LOCATED BUT WL DATA, unable to locate
TH 75-24	W2-04-24-34-16-SE	Leech Lake aquifer	5665813.15	676663.62	512.582	512.2		PFRA	2.9	0.5	3.4	4.7		PFRA	-1.3	1.5	Decommissioned June 26/02
TH 75-25	W2-04-24-34-16-SE	Leech Lake aquifer	5665825.04	676614.58	512.607	511.7		PFRA	0.5	0.93	1.43	4.5		PFRA	-3.1	1.4	Decommissioned June 26/02
TH 75-26	W2-04-24-20-04-SE	Leech Lake aquifer	5661093.9	672279.07	517.657	516.5		PFRA		1.09		4.5		PFRA		1.5	Decommissioned June 25/02
TH 75-27	W2-04-25-35-04-SE	Logan west	5674435.43	676886.42	509.184	508.1		PFRA	11.7	1.15	12.85	20.1		PFRA	-7.3	6.7	Decommissioned Nov 28/01
TH 75-28	W2-04-25-35-03-SE	Logan west	5674502.59	677208.14	508.583	507.8		PFRA				21.6		PFRA		6.7	Decommissioned Nov 28/01
TH 75-29	W2-04-25-35-02-SW	Logan west	5674558.73	677360.03	505.913	505.2		PFRA	7.72	0.7	8.42	20.1		PFRA	-11.7	6.7	Decommissioned Nov 28/01
TH 75-30	W2-04-25-35-02-SW	Logan west	5674603.08	677396.55	506.322	505.7		PFRA	8.8	0.65	9.45	19.8		PFRA	-10.4	6.7	Decommissioned Nov 28/01
TH 75-31	W2-04-25-35-02-NW	Logan west	5674644.18	677473.24	506.145	504.7		PFRA	12.25	1.5	13.75	20.1		PFRA	-6.3	6.7	Decommissioned Nov 28/01
TH 75-32	W2-04-25-35-02-NE	Logan west	5674708.45	677579	505.105	504.2		PFRA	12.25	1	13.25	19.9		PFRA	-6.6	6.7	Decommissioned
TH 75-33	W2-04-25-35-02-NW	Logan west	5674749.5	677656.78	505.358	504		PFRA	4.97	1.35	6.32	20.1		PFRA	-13.7	6.7	Decommissioned Nov 28/01
TH 75-34	W2-04-25-35-02-NW	Logan west			504.688	504		PFRA				16.9		PFRA		6.8	Unable to remove; broken at ground; decommissioned
TH 75-35	W2-04-25-35-02-NW	Logan west	5674784.53	677758.32	505.2	504		PFRA	12.85	1.1	13.95	20.2		PFRA	-6.2	6.8	Decommissioned Nov 28/01
TH 75-36	W2-04-25-35-07-SE	Logan west	5674839.89	677851.71	506.602	505.3		PFRA	17.7	1.3	19	20.2		PFRA	-1.2	6.8	BHL redeveloped 06/27/01
TH 75-37	W2-04-24-24-13-NW	Other															
TH 75-38	W2-04-24-24-13-NW	Other			514.518	512.5		PFRA				65.9		PFRA		3.3	Abandoned, BHL/COY unable to locate
TH 75-39	W2-04-23-32-02-SE				518.962	517.5		PFRA				41.3		PFRA		3.4	Decommissioned Dec 4/01
TH 75-40	W2-04-23-22-13-NW		5653006.16	675560.42	518.12	516.6		PFRA	6	1.5	7.5	34.2		PFRA	-26.7	3.2	Decommissioned Dec 4/01
TH 75-41	W2-04-23-16-13-NW		5651298.98	673983.95	520.76	519.3		PFRA	12.5	1.5	14	61.5		PFRA	-47.5	6.2	Decommissioned Dec 4/01
TH 75-42	W2-03-25-34-01-SW	Sturdy aquifer			507.257	506.4		PFRA	15.75	0.8	16.55	18		PFRA	-1.4	6.7	Abandoned, BHL/COY unable to locate

Table A-1 SUMMARY DATA FOR MONITOR WELLS IN THE YORKTON STUDY AREA.

PIEZ. NAME	LAND LOCATION	Aquifer	NORTHING	EASTING	ELEV. TOP PIEZO.	GROUND ELEV.	DATE ELEV. CHANGE OR DATE OF SURVEY	SOURCE ELEV. DATA	MEAS. DEPTH BELOW GROUND	MEAS. STICK-UP	MEAS. TOTAL LENGTH FROM TOP	REPORTED TOT. LENGTH BELOW TOP	REPORTED LENGTH BELOW GROUND	SOURCE	DIFF. IN TOTAL LENGTH	REPORTED SCREEN LENGTH	COMMENTS
					M ASL	M ASL	YYMMDD		M	M	M	M	M		M	M	
TH 75-43	W2-03-25-34-01-SE	Sturdy aquifer	5674716.06	686118.68	507.023	505.5		PFRA	10.6	2.25	12.85	16.9		PFRA	-4.1	6.7	Abandoned, BHL/COY unable to locate
TH 75-44	W2-03-25-34-01-SE	Sturdy aquifer			506.581	505.7		PFRA				9.1		PFRA			Abandoned, BHL/COY unable to locate
TH 75-45	W2-03-26-10-04-SW		5677930.91	684657.92	503.865	503		PFRA	4.8	1	5.8	7.4		PFRA	-1.6	3.4	Decommissioned, Dec 6/01 BHL
TH 75-46	W2-05-24-23-01-SE		5660995.45	668693.87	525.402	523.7		PFRA	5.1	1.6	6.7	40		PFRA	-33.3	3.4	Decommissioned Dec 4/01
TH 75-47	W2-04-24-09-04-SE		5657911.92	674204.52	513.649	512.3		PFRA	3.5	1.2	4.7	5.9		PFRA	-1.2	1.5	Decommissioned June 25/02
TH 75-48	W2-04-23-32-02-SE				519.41	517.6		PFRA				6.4		PFRA		3	Decommissioned June 26/02
TH 75-49	W2-04-23-22-13-NW		5653003.16	675560.42	517.672	516.5		PFRA	4.4	1.06	5.46	5.8		PFRA	-0.3	1.5	Decommissioned June 25/02
TH 75-50	W2-04-23-16-13-NE		5651300.98	673985.95	521.022	519.3		PFRA	3.1	1.75	4.85	5.9		PFRA	-1.1	2.9	Decommissioned June 25/02
TH 75-51	W2-05-24-23-01-SE		5665387.747	675132.014	525.213	523.8		PFRA	4.3	1.3	5.6	6.3		PFRA	-0.7	3.1	Decommissioned June 25/02
TH 75-52	W2-03-25-34-02-SE	Sturdee	5674707.67	685862.79	513.582	512.3		PFRA	20.8	1.1	21.9	22.9		PFRA	-1	6	Decommissioned, Dec 6/01 BHL
TH 75-53	W2-03-25-34-02-SE		5674697.97	685706.12	512.786	511.6		PFRA	8.8	1.2	10	33.4		PFRA	-23.4	3.2	Decommissioned, Dec 6/01 BHL
TH 75-54	W2-03-25-33-01-SE	Sturdee	5674656.29	684638.34	507.212	506.4		PFRA	4.6	0.85	5.45	6.7		PFRA	-1.2	3.3	BHL redeveloped 06/21/00
TH 75-55	W2-03-25-23-15-NW				511.363	510.5		PFRA	3.95	0.85	4.8	14.7		PFRA	-9.9	3	Abandoned, BHL unable to locate
TH 75-56	W2-03-25-34-16-NE		5676173.51	686173.33	507.166	506.2		PFRA	3	1.1	4.1	7		PFRA	-2.9	3.4	Decommissioned, Dec 6/01 BHL
TH 75-57	W2-03-25-32-04-NW		5674852.42	681408.17	501.204	500		PFRA	27.2	1.3	28.5	38.2		PFRA	-9.7	3.4	PLUGGED
TH 75-58	W2-03-25-32-01-SE		5674612.19	682905.22	509.555	508		PFRA	4.8	1.55	6.35	7.8		PFRA	-1.4	3.1	PARTLY PLUGGED
TH 75-59	W2-03-25-32-01-SE		5674613.19	682905.22	509.354	508		PFRA	12.85	1.35	14.2	16.3		PFRA	-2.1	3.3	PARTLY PLUGGED
TH 75-60	W2-03-26-04-01-NE	Sturdee	5676479.85	684598.73	507.76	506.6		PFRA	6.3	1.15	7.45	8.7		PFRA	-1.2	3	BHL redeveloped 07/07/00
TH 75-61	W2-03-25-35-04-SW				513.518	512.6		PFRA				10.8		PFRA			Destroyed during highway construction
TH 76-06	W2-04-25-35-01-SE	Logan South (Bred Fm)	5674474.15	678023.91	506.148	504.5		IWS				11.3		IWS		3	Abandoned, assumed decommissioned Nov 28/01
TH 76-08	W2-04-25-35-08-SE		5674473.8	678091.97	504.417	504		IWS	3.87	0.38	4.25	22.3		IWS		3.4	Abandoned, BHL unable to locate
TH 76-09	W2-04-25-36-05-NE	Logan west	5675052.35	678402.87	505.203			IWS				18.3		IWS		3.4	Decommissioned, Dec 7/01 BHL
					505.214		910610	YRK									
TH 76-10	W2-04-25-36-03-SE		5674605.47	678394.4	503.502			IWS									Unable to locate, appears to be working
TH 76-14	W2-04-25-36-11-SW	Logan west	5675316.66	678599.92	503.828			IWS				10.1		IWS		3.4	
					503.757		910610	YRK		0.46							NOT LOCATED BUT WL DATA
TH 76-15	W2-04-25-36-12-SE	Logan west			504.234			IWS				14.4		IWS		3.3	Abandoned, BHL unable to locate
TH 76-16	W2-04-25-36-06-NE	Logan west			503.078			IWS				7.5		IWS		3.2	Abandoned, BHL unable to locate
TH 76-17	W2-04-25-23-16-NW		5672789.76	678018.37	509.815			IWS				16.1		IWS		3.2	BHL redeveloped 06/27/01
TH 76-22	W2-03-26-10-03-SE		5677968.42	685194.87								6.4	5.5	PFRA		3	Decommissioned, BHL unable to locate
TH 76-23	W2-03-25-34-02-SW	Sturdee	5674695.33	685659.99					9.1	0.6	9.7	15.9	15.2	IWS	-6.2	3	BHL redeveloped 06-21-00
TH 76-24	W2-03-25-34-02-SW	Sturdee	5674697.97	685696.12									32.9	IWS		3	Decommissioned, Dec 06-01
TH 76-25	W2-04-25-36-03-SE	Logan South (Bred Fm)										10.2	9.8	IWS		3.2	Abandoned, BHL unable to locate
TH 76-26	W2-04-25-33-04-SE		5674275.35	673580.28								35.1	34.4	IWS		3	Decommissioned June 26/02
TH 76-27	W2-04-25-22-13-NW											41.8	41.1	IWS		3.4	Abandoned, BHL unable to locate
TH 76-29	W2-03-25-34-02-SE	Sturdee	5674697.97	685713.12								29.3	28.7	IWS		3	Decommissioned, Dec 06-01
TH 76-30	W2-03-25-34-02-SE	Sturdee							14.6	0.67	15.27	19.8	19.5	IWS	-4.5	3.4	SaskWater Data Logger Inside
TH 76-31	W2-03-25-31-11-NE	Logan east	5675735.47	680515.63	500.469	499.6			7.93	0.82	8.75	7.6	6.8	IWS	1.1	1.5	FEW WL DATA ONLY
TH 76-32	W2-04-25-36-11-SW	Logan west			503.566		910610	YRK		0.15		10.7		IWS		3	Abandoned, BHL unable to locate
TH 76-33	W2-04-25-36-11-SW	Logan west										11.2		IWS			Abandoned, BHL unable to locate
TH 76-34	W2-03-25-31-13-NW	Logan west	5676014.31	679728.71								9.8		IWS		3.4	
TH 76-50	W2-04-25-02-05-NE	Leech Lake aquifer										44.2	43.9	IWS		6.7	Abandoned, BHL unable to locate
TH 76-51	W2-04-24-34-05-NW	Leech Lake aquifer	5665171.87	675172.68	514.96	514.6	fall 2000	SWC	15.55	0.45	16	18.6	18.3	IWS	-2.6	6.1	Decommissioned Nov 30/01
TH 76-52	W2-04-24-34-05-SE	Leech Lake aquifer										26.8	26.2	IWS		6.7	Abandoned, BHL unable to locate
TH 76-53	W2-04-24-34-05-NE	Leech Lake aquifer										9.8	9.1	IWS		3	Abandoned, BHL unable to locate
TH 76-55	W2-04-25-36-12-SW											12.2	11.9	IWS		2.4	Abandoned, BHL unable to locate
TH 79-01	W2-04-24-33-08-NE	Leech Lake aquifer	5665569.597	675110.695					17.8	0.8	18.6	21.3	21	IWS	-2.7	3.7	SRC redeveloped 08/23/00
			5665357.18	675151.56	513.64	512.8	fall 2000	SWC									
TH 79-02	W2-04-24-33-08-NE	Leech Lake aquifer	5665558.74	675024.91								21.9	21	IWS		3.7	SRC attempted to redevelop 08/22/00
			5665342.82	675064.69	514.404	513.0	fall 2000	SWC									
TH 79-03	W2-04-24-33-08-NE	Leech Lake aquifer	5665140.6	675052.75	514.633			IWS				19.8	19.2	IWS		3	Abandoned, COY unable to locate
TH 79-04	W2-04-24-33-07-NE	Leech Lake aquifer	5664963.2	674639.72	510.397	509.6			18	0.6	18.6	17.4	16.8	IWS	1.2	3.4	Decommissioned June 27/02

Table A-1 SUMMARY DATA FOR MONITOR WELLS IN THE YORKTON STUDY AREA.

PIEZ. NAME	LAND LOCATION	Aquifer	NORTHING	EASTING	ELEV. TOP PIEZO. (M ASL)	GROUND ELEV. (M ASL)	DATE ELEV. CHANGE OR DATE OF SURVEY (YYMMDD)	SOURCE ELEV. DATA	MEAS. DEPTH BELOW GROUND (M)	MEAS. STICK-UP (M)	MEAS. TOTAL LENGTH FROM TOP (M)	REPORTED TOT. LENGTH BELOW TOP (M)	REPORTED LENGTH BELOW GROUND (M)	SOURCE	DIFF. IN TOTAL LENGTH (M)	REPORTED SCREEN LENGTH (M)	COMMENTS
TH 79-05	W2-04-24-34-SW		5664479.41	674404.44	513.567			IWS				22.3	21.6	IWS		3.4	Decommissioned Nov 30/01
TH 79-06	W2-04-24-33-03-SE	Leech Lake aquifer	566475.64	673867.08	512.052	511.5		IWS				22.6	21.9	IWS		3.4	Abandoned, COY unable to locate
TH 79-07	W2-04-24-33-07-NW	Leech Lake aquifer	5665097.48	674201.319	513.509	512.6		IWS	20.7	0.9	21.6	22.6	21.9	IWS	-1	3.4	SRC redeveloped 08/25/00
			5664877.47	674238.13	513.562	512.5	fall 2000	SWC									
TH 79-08	W2-04-24-33-15-NW	Leech Lake aquifer	5666323.98	674175.257	512.216	511.7		IWS	16	0.5	16.5	16.2	15.9	IWS	0.3	3.4	
			5666108.83	674216.82	512.259	511.8	fall 2000	SWC									
TH 79-09	W2-04-24-33-14-NW	Leech Lake aquifer	5666310.655	673701.04	512.424	511.9		IWS	19.7	0.5	20.2	20.7	20.1	IWS	-0.5	3.4	Decommissioned Dec 3/01
			5666097.48	673736.83	512.511	512.0	fall 2000	SWC									
TH 79-11	W2-04-25-35-08-SE	Logan west	5675032.09	678058.28	505.412		910610	YRK	21.47	1.1	22.57	22.3	21.6	IWS	0.3	3.4	Decommissioned Nov 29/01
TH 79-12	W2-04-25-33-04-SE		5674263.27	673393.28					17.6	0.7	18.3	69.5	69.2	IWS	-51.2	3	Decommissioned Nov 27/01
TH 79-14	W2-04-25-33-04-SE		5674335.56	673495.56					5.8	1.4	7.2	39	38.4	IWS	-31.8	3	Decommissioned Nov 28/01
TH 79-15	W2-04-25-35-08-SW	Logan west	5675003.32	677908.46	505.572		910610	YRK	23.2	0.5	23.7	26.2	25.6	IWS	-2.5	3	PARTLY PLUGGED
TH 79-17	W2-04-25-35-08-SE	Logan west										16.5	15.9	IWS		3	Decommissioned Nov 29/01
TH 79-18	W2-04-25-35-08-SW				508.988		910610	YRK				16.5	15.9	IWS		3	Abandoned, BHL unable to locate
TH 79-19	W2-04-25-35-SE		5674902.14	677934.35								23.2	22.6	IWS		3	Decommissioned Nov 29/01
TH 79-20	W2-04-25-36-05-NW	Logan west	5675040.05	678168	505.817	504.1	891212	YRK	20.05	1.85	21.9	21.3	20.7	IWS	0.6	3	
					505.814		910610	YRK									BHL redeveloped 06/27/01
TH 79-21	W2-04-25-35-08-SW											15.5	15.2	IWS		3.4	Abandoned, BHL unable to locate
TH 79-22	W2-03-25-31-14-SE	Logan east	5675809.23	680462.81	500.11	499.5		IWS	21.1	0.62	21.72	24.1	23.5	IWS	-2.4	3.4	PARTLY PLUGGED
TH 79-23	W2-03-25-31-13-SE	Logan east	5675864.69	680425.51	500.351	499.6		IWS	32.4	0.75	33.15	32	31.2	IWS	1.1	3	
TH 79-26	W2-04-24-32-04-SE	Leech Lake aquifer	5664619.463	672296.786	513.713	513.2		IWS	21.2	0.5	21.7	23.5	22.9	IWS	-1.8	3.4	SRC redeveloped 08/25/00
			5664423.2	672743.39	513.162	512.7	fall 2000	SWC									
TH 79-27	W2-04-24-32-03-SE	Leech Lake aquifer	5664640.584	672703.761	514.262	513.2		IWS	19	1.1	20.1	20.4	19.8	IWS	-0.3	3.4	SRC redeveloped 08/25/00
			5664420.75	673057.38	513.743	512.6	fall 2000	SWC									
TH 79-28	W2-04-24-32-01-SW	Leech Lake aquifer	5664634.69	673018.6	513.631	512.5		IWS	19.1	1.1	20.2	19.2	18.6	IWS	1	3.4	Decommissioned Dec 3/01
			5664416.75	673057.38	513.135		fall 2000	SWC									
TH 79-30	W2-04-24-20-13-NW	Leech Lake aquifer	5662758.31	672048.15	514.888	513.3	fall 2000	SWC	19.6	1.2	20.8	19.8	19.2	IWS	1	3	SRC redeveloped 08/24/00
TH 79-31	??????	Leech Lake aquifer ??															
TH 79-32	W2-04-24-34-04-SW	Leech Lake aquifer	5662976.16	672008.156	512.046			IWS				18.3	17.7	IWS		3	Abandoned, BHL unable to locate
TH 79-33	W2-04-25-28-13-NW		5674252.43	673313.8								48.2	47.5	IWS		6.7	Decommissioned June 28/02
TH 79-34	W2-04-25-29-01-SW		5674254.35	673190.57								36.9	36.3	IWS		3.4	DESTOYED? BHL notes indicate it was built into the road
TH 79-35	W2-04-24-28-16-NE	Leech Lake aquifer			512.058	511.4		IWS	24.1	0.65	24.75	25.3	24.7	IWS	-0.5	3.4	Abandoned, BHL unable to locate
TH 79-36	W2-04-24-28-10-SW	Leech Lake aquifer	5663860.251	674326.625	514.316	512.6		IWS	29.6	1.7	31.3	25	24.4	IWS	6.3	3.4	Decommissioned Nov 30/01
			5663643.64	674366.38	514.379	512.8	fall 2000	SWC									
TH 79-37	W2-04-24-28-02-NE	Leech Lake aquifer			512.485	511.5		IWS	17.05	0.95	18	23.2	22.6	IWS	-5.2	3.4	Abandoned, BHL unable to locate
TH 79-38	W2-04-24-28-09-SE	Leech Lake aquifer			513.177	513.1		IWS	19.04	0.1	19.14	17.1	16.5	IWS	2.1	3.4	SRC redeveloped 08/24/00
TH 79-39	W2-03-25-31-14-SW	Logan east	5675842.59	680338.52	500.689	500.1		IWS	15	0.6	15.6	17.4	16.8	IWS	-1.8	3.4	PARTLY PLUGGED
TH 79-40	W2-03-25-31-11-NW	Logan east	5675760.32	680287.7	501.929	500.8		IWS	15.1	1.1	16.2	17.1	16.1	IWS	-0.9	3.4	PARTLY PLUGGED
TH 79-41	W2-03-25-31-14-SW	Logan east	5675770.75	680336.22	501.079	500		IWS	9.2	1.05	10.25	14	13	IWS	-3.8	3.4	PLUGGED
TH 79-42	W2-03-25-31-11-NW	Logan east	5675716.59	680378.67	500.756	499.7		IWS	15.5	1.1	16.6	17.1	16.6	IWS	-0.5	3.4	PARTLY PLUGGED
TH 79-43	W2-03-25-31-11-NE		5675675.6	680430.08	501.765	500.5		IWS	8.96	1.25	10.21	10.7	9.4	IWS	-0.5	3.4	PARTLY PLUGGED
TH 79-46	W2-03-25-31-11-NW	Logan east	5675735.91	680277.73	502.96	502.1	890824	IWS	9.93	0.82	10.75	10.1	9.1	IWS	0.7	2.4	TOP RECONSTRUCTED 24/08/89
					503.193		910610	YRK									
TH 79-47	W2-03-25-31-12-SE	Logan east	5675583.57	679987.07	502.896	501.9		IWS	34	1	35	38.7	37.7	IWS	-3.7	3.4	PLUGGED
					503.981		910610	YRK									
TH 79-48	W2-03-25-31-14-SW	Logan east	5675918.24	680526.03	503.859	502.8		IWS	24	1.1	25.1	27.7	26.6	IWS	-2.6	3.4	PARLY PLUGGED
TH 79-49	W2-03-25-31-14-SE	Logan east	5675878.37	680467.19	502.539	501.6		IWS	21.5	0.95	22.45	24.7	23.5	IWS	-2.2	3.4	PARTLY PLUGGED
TH 79-50	W2-03-25-34-15-SW											16.8	16.2	IWS		3.4	Abandoned, can not find (Jun 21/22 '01)
TH 79-51	W2-03-25-34-15-SW	Sturdee										13.7	13.1	IWS		3	Abandoned, can not find (Jun 21/22 '01)
TH 79-52	W2-03-25-34-15-SE	Sturdee			507.413			IWS				14.3	13.7	IWS		3.4	Abandoned, BHL unable to locate
TH 79-53	W2-03-25-34-15-SE	Sturdee			507.081			IWS				14.6	10	IWS		3	Abandoned, BHL unable to locate
TH 79-54	W2-03-25-34-15-SE	Sturdee			507.65			IWS				35.4	34.7	IWS		3.4	Abandoned, BHL unable to locate
TH 79-56	W2-03-25-34-15-SE	Sturdee															Abandoned, BHL unable to locate
TH 79-64	W2-03-25-34-10-SE	Sturdee										26.8	26.2	IWS		3.4	Abandoned, BHL unable to locate
TH 79-65	W2-03-25-34-10-SE	Sturdee															Located in Field by COY
TH 79-66	W2-03-25-34-10-SE	Sturdee										15.2	14.3	IWS		3	Abandoned, BHL unable to locate
TH 79-67	W2-03-25-34-09-SE	Sturdee										9.8	9.1	IWS		3	Abandoned, BHL unable to locate

Table A-1 SUMMARY DATA FOR MONITOR WELLS IN THE YORKTON STUDY AREA.

PIEZ. NAME	LAND LOCATION	Aquifer	NORTHING	EASTING	ELEV. TOP PIEZO. M ASL	GROUND ELEV. M ASL	DATE ELEV. CHANGE OR DATE OF SURVEY YYMMDD	SOURCE ELEV. DATA	MEAS. DEPTH BELOW GROUND M	MEAS. STICK-UP M	MEAS. TOTAL LENGTH FROM TOP M	REPORTED TOT. LENGTH BELOW TOP M	REPORTED LENGTH BELOW GROUND M	SOURCE	DIFF. IN TOTAL LENGTH M	REPORTED SCREEN LENGTH M	COMMENTS
MW #1	W2-04-24-34-06-SW	Leech Lake aquifer										23.5	23.2	IWS		3	4" CASING
MW #2	W2-04-24-34-03-NW	Leech Lake aquifer										22.7	22.3	IWS		3	4" CASING
MW #3	W2-04-25-02-05-NE	Leech Lake aquifer										36.9	36.6	IWS		3	4" CASING
MW #4	W2-04-24-33-16-NE	Leech Lake aquifer										22.4	21.9	IWS		3	4" CASING
MW #5	W2-04-24-34-05-SE	Leech Lake aquifer										19.5	19.2	IWS		3	4" CASING
TH 80-01	W2-04-24-33-14-NW	Leech Lake aquifer	5666310.927	673731.391	511.166	510.2			10	1.4	11.4	11	10.7	IWS	0.4	3.4	SRC redeveloped 06/23/00
			5666097.48	673770.83	513.459	512.1	fall 2000	SWC									
TH 80-02	W2-04-24-33-14-NW	Leech Lake aquifer	5666100.6	673800.28	510.531	509.6			13.3	0.8	14.1	15.5	15.2	IWS	-1.4	3.4	Decommissioned Dec3/01
TH 80-03	W2-04-24-33-14-NW	Leech Lake aquifer			510.161	509.2						9.4	9.1	IWS		3.4	Abandoned, BHL unable to locate
TH 80-08	W2-04-25-36-09-SE	Logan west			510.196	509						9.4	9.1	IWS		3	Abandoned, BHL unable to locate
TH 80-09	W2-04-25-36-08-NE	Logan west										13.4	12.2	IWS		3.4	Abandoned, BHL unable to locate
TH 80-10	W2-03-25-31-14-SW											36.9	36.3	IWS		6.7	Abandoned, BHL unable to locate
TH 80-11	W2-03-25-31-14-SW				500.466	500.4		IWS				40.2	40.1	IWS		6.7	Abandoned, BHL unable to locate
TH 80-12	W2-03-25-31-14-SW		5675760.32	680279.7	501.619	500.6		IWS	44.47	1	45.47	48.2	47.3	IWS	-2.7	6.7	Decommissioned Dec 6/01
TW 80-12	W2-04-24-33-14-NW											20.1	20.1	IWS		7.6	Decommissioned Dec 6/02
TH 80-13	W2-04-25-36-12-SW	Logan west	5675365.71	679731.07	504.194	503.3		IWS	28.5	0.9	29.4	32.9	31.9	IWS	-3.5	6.7	Abandoned, BHL unable to locate
					504.321		910610	YRK									
TH 80-14	W2-04-25-36-11-SE	Logan west										9.4	9.1	IWS		3	Abandoned, BHL unable to locate
TH 80-15	W2-04-25-36-11-NE											13.7	13.1	IWS		3	Abandoned, BHL unable to locate
TH 81-01	W2-04-25-28-13-NW		5674207.38	673403.89	510.571	509.5	881030	YRK	68.8	1.1	69.9	80.5	80.5	IWS	-10.6	6.7	Decommissioned June 28/02
TH 81-02	W2-04-25-28-13-NW		5674200.99	673438.6	510.531	509.1	881030	YRK	37.5	1.4	38.9	39.9	39.6	IWS	-1	6.7	Decommissioned June 28/02
TH 81-03	W2-04-25-28-13-NW		5674214.77	673364.47	510.161	509.1	881030	YRK	40.8	1.1	41.9	47.2	46.3	IWS	-5.3	6.7	Decommissioned Nov 28/01
TH 81-04	W2-04-25-28-13-NW		5674164.14	673417.57	510.196	509	881030	YRK	68.8	1.2	70	70.1	69.5	IWS	-0.1	3.4	Decommissioned June 28/02
TH 81-05	W2-04-25-28-13-NW		5674162.1	673410.77									75.6	IWS		5.8	Inside Well House #13 (storage side)
TH 81-06	W2-04-25-28-13-NW											49.7	49.1	IWS		6.7	Decommissioned Nov 27/01
TH 81-07	W2-04-25-28-13-NW											50	50	IWS		6.7	Abandoned, BHL/COY unable to locate
TH 87-35	W2-04-25-35-01-SW		5674473.8	678090.97	505.855	504.3		IWS	10.9	1.55	12.45						Pipe is broken, unable to decommission or to redevelop
TH 87-36	W2-04-25-36-04-SW		5674460.96	678259.24	505.825	504.4		IWS	8.9	1.44	10.34						Destroyed during highway construction
TH 87-37	W2-04-25-36-04-SW		5674476.49	678446.04	504.255	503.3		IWS	8.5	1.23	9.73						BHL redeveloped 06/27/01
TH 87-42																	Located in Field By COY Decommissioned Nov 29/01
MW 93-01	W2-04-26-04-03-NE		5676358.5	673570.6	517.816	517	951024	YKTN	52.03	0.87	52.9	53.02	52.15	SRC		0.93	
MW 93-02	W2-04-26-04-03-NE		5676341.5	673575.3	517.62	516.7	951024	YKTN				22.22	23.16	SRC		0.93	
MW 93-03	W2-03-25-31-13-NW		5676156	679704	502.61	502.03	951024	YKTN	9.26	0.64	9.9	10	9.36	SRC		0.96	
MW 93-04	W2-03-25-31-12-SW		5676156	679704	503.667	503.02	951024	YKTN	41.14	0.75	41.89	41.99	41.24	SRC		0.94	
MW 93-05	W2-03-25-31-12-SW		5675601	679721	503.565	503.01	951024	YKTN	10.18	0.64	10.82	10.93	10.29	SRC		0.95	
MW 93-06	W2-04-25-36-09-SW		5675541	679291	503.185	502.27	951024	YKTN	10.84	0.9	11.74	11.86	10.96	SRC		0.95	
MW 93-07	W2-04-25-35-02		5674844	677384	505.889	505.41	951024	YKTN	16.05	0.56	16.61	16.72	16.16	SRC		0.94	
MW 93-08	W2-04-25-27-09-NE		5674088	676470	512.889	512.38	951024	YKTN	19.5	0.6	20.1	21.19	20.59	SRC		0.95	
MW 93-09	W2-04-25-33-14-C		5675807.7	673648.5	520.501	519.56	951024	YKTN	41.23	1	42.23	42.35	41.35	SRC		0.95	
MW 93-10	W2-04-25-29-15-NW		5674438.9	672420.7	517.227	516.36	951024	YKTN	32.17	0.9	33.07	33.16	32.26	SRC		0.97	
MW 95-04A	W2-03-25-31-14-SW		5675725	680325	501.037	500.22	951024	YKTN	19.01	0.95	19.96	20.01	19.06			1.58	
MW 95-04B	W2-03-25-31-14-SW		5675725	680325	500.907	500.22	951024	YKTN	12.94	0.82	13.76	13.89	13.07			1.57	
MW 95-04C	W2-03-25-31-14-SW		5675725	680325	500.962	500.22	951024	YKTN	6.06	0.87	6.93	6.98	6.11				
MW 96-01	W2-03-25-31-11-SW				504.725	503.76	961000	YKTN		0.97		15.03	14.06			1.43	
MW 96-02	W2-03-25-31-11-SW		5675723	680109	503.9	502.88	961000	YKTN		1.02		12.06	11.04			1.12	
MW 96-03	W2-03-25-31-14-SW		5675941	680482	500.28	499.33	961000	YKTN		0.95		9.63	8.68			1.43	
MW 96-04	W2-03-26-05-15-NW		5678063	682231	503.24	502.46	961000	YKTN		0.78		49.14	48.36			1.6	
MW 96-05	W2-03-26-06-08-SE		5676986	681289	501.345	500.47	961000	YKTN		0.88		49.15	48.27			1.61	

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PIEZ. NAME	LAND LOCATION	Aquifer	NORTHING	EASTING	ELEV. TOP PIEZO. M ASL	GROUND ELEV. M ASL	DATE ELEV. CHANGE OR DATE OF SURVEY YYMMDD	SOURCE ELEV. DATA	MEAS. DEPTH BELOW GROUND M	MEAS. STICK-UP M	MEAS. TOTAL LENGTH FROM TOP M	REPORTED TOT. LENGTH BELOW TOP M	REPORTED LENGTH BELOW GROUND M	SOURCE	DIFF. IN TOTAL LENGTH M	REPORTED SCREEN LENGTH M	COMMENTS
YRK 99-01	W2-04-24-34-09-SE		5665595.379	676765.57	513.487		fall 2000	SWC									
YRK 99-02	W2-04-25-04-09-SE		5667111.212	675067.324	515.487	514.83	fall 2000	SWC									
YRK 99-03	W2-04-24-33-01-SW		5664700.882	674838.104	513.42		fall 2000	SWC									
YRK 99-04	W2-04-24-33-14-NW		5666310.397	673719.993	512.666		fall 2000	SWC									
BHL 00-01			5675494.2	678872.7	506.2												
BHL 00-02			5675254	678764.6	497												
BHL 00-03			5675246.4	678511.8	510.4												
BHL 00-04			5675494.5	678572	505.4												
BHL 00-05			5674992.9	679366.2	504.5												
BHL 00-17	W2-03-26-04-14-NE	Empress Gr	5678118	683664	502.963							76.74	75.9	BHL		1.73	
BHL 00-20	W2-03-25-27-08-NE	Sturdee	5674228	686281	504.2							30.94	30.18	BHL		1.73	
BHL 00-21	W2-03-26-09-15-NW	Logan east	5679781	683875	497.9							30.94	30.18	BHL		1.73	
BHL 00-25	W2-03-26-15-13-NE	Logan east	5681436	684777	493.3							56.49	55.78	BHL		1.73	
BHL 00-29	W2-03-25-26-01-SW	Sturdee	5673373	687777	515.6							30.94	30.18	BHL		1.73	
BHL 00-30	W2-04-25-32-08-SE		5675057.8	673172.8	503							36.12	35.97	BHL		0.76	
BHL 00-34	W2-03-25-24-03-SE	Sturdee	5671882	688797	514.6							35.15	34.44	BHL		1.73	
BHL 00-36	W2-03-26-03-15-NW	Sturdee	5678191	685458	503.3							11.45	10.67	BHL		0.76	
BHL 00-40A	W2-03-26-03-01-SW	Sturdee	5676577	685734	502.6							20.46	19.66	BHL		0.76	
BHL 00-40B	W2-03-26-03-01-SW	Sturdee	5676577	685735	502.6							13.95	13.11	BHL		0.76	
BHL 00-44A	W2-02-25-36-01-SW	Bredenbury	5675426	698980	523.2							60.23	59.44	BHL		1.6	
BHL 00-44B	W2-02-25-36-01-SW	Bredenbury	5675428	698980	524.9							21.56	20.73	BHL		0.76	
BHL 00-49	W2-03-26-05-14-NE	Logan east	5677994	682058	504							55.61	54.86	BHL		1.63	
2000-01a (shallow)	W2-04-24-28-SW	Leech Lake aquifer	5663506.93	674465.332	513.197 513.197	512.76	00-1130 fall 2000	SaskWater SWC									
2000-01b (deep)	W2-04-24-28-SW	Leech Lake aquifer	5663506.858	674465.342	513.726 513.726	512.78	00-1130 fall 2000	SaskWater SWC									
2000-02		Leech Lake aquifer	5666232.562	671215.793	515.368 515.368	514.39	00-1130 fall 2000	SaskWater SWC									
2000-03	W2-04-24-34-NE	Leech Lake aquifer	5666375.774	676491.202	512.953 512.953	512.09	00-1130 fall 2000	SaskWater SWC									
2000-04	W2-04-24-35-N	Leech Lake aquifer	5666247.46	677569.03	515.159 515.159	514.12	00-1130 fall 2000	SaskWater SWC									
2000-05	W2-04-24-34-SW	Leech Lake aquifer	5665660.01	675775.295	513.958 513.958	512.96	00-1130 fall 2000	SaskWater SWC									
2001-01		Leech Lake aquifer	5664727	676048	512.4												
2001-02		Leech Lake aquifer	5664771	677350	516.8												
2001-03		Leech Lake aquifer	5665988	676385	511.7												
2001-04		Leech Lake aquifer	5666735	676710	511												
2002-01		Leech Lake aquifer	5665988	676388	512												
2002-2A		Leech Lake aquifer	5666680	676991	513.1												
2002-2B		Leech Lake aquifer	5666680	676991	513.1												
2002-03		Leech Lake aquifer	5667453	676964	518												
BHL 01-51	W2-03-25-27-13-NW	Sturdee										10.05	9.14	BHL		0.81	
BHL 01-52A	W2-03-25-34-01-SW	Sturdee				508						28.65	27.8	BHL		0.54	
BHL 01-52B	W2-03-25-34-01-SW	Sturdee				508						8.23	7.4	BHL		0.81	
BHL 01-58	W2-03-25-23-13-NE	Sturdee										16.17	15.24	BHL		0.81	
BHL 01-60	W2-03-25-28-13-NE	Sturdee										13.71	12.8	BHL		0.81	
BHL 01-61	W2-03-25-32-09-SE	Sturdee										16.38	15.24	BHL		0.81	
BHL 01-62	W2-03-25-33-08-NE	Sturdee										16.97	16.15	BHL		0.81	
BHL 01-63	W2-03-25-36-12-SW											24.94	24.08	BHL		0.86	
BHL 01-64A	W2-03-25-24-05-SW	Sturdee										32.31	31.58	BHL		0.73	
BHL 01-64B	W2-03-25-24-05-SW	Sturdee										16.76	15.97	BHL		0.79	

Table A-1 SUMMARY DATA FOR MONITOR WELLS IN THE YORKTON STUDY AREA.

PIEZ. NAME	LAND LOCATION	Aquifer	NORTHING	EASTING	ELEV. TOP PIEZO.	GROUND ELEV.	DATE ELEV. CHANGE OR DATE OF SURVEY	SOURCE ELEV. DATA	MEAS. DEPTH BELOW GROUND	MEAS. STICK-UP	MEAS. TOTAL LENGTH FROM TOP	REPORTED TOT. LENGTH BELOW TOP	REPORTED LENGTH BELOW GROUND	SOURCE	DIFF. IN TOTAL LENGTH	REPORTED SCREEN LENGTH	COMMENTS
					M ASL	M ASL	YYMMDD		M	M	M	M	M		M	M	
BHL 01-64C	W2-03-25-24-05-SW	Sturdee										12.5	11.64	BHL		0.86	
BHL 01-65	W2-03-25-25-12-NW	Sturdee										22.17	21.34	BHL		0.81	
BHL 01-71	W2-02-25-07-16-NE	Sturdee										22.37	21.64	BHL		0.81	
BHL 01-77A	W2-02-25-09-13-NW	Bredenbury										45.72	44.93	BHL		0.87	
BHL 01-77B	W2-02-25-09-13-NW	Bredenbury										22.56	21.72	BHL		0.87	
BHL 01-77C	W2-02-25-09-13-NW	Sturdee										10.97	10.23	BHL		0.87	
BHL 01-78	W2-03-25-12-08-NW	Sturdee										21.95	21.21	BHL		0.87	
BHL 01-81	W2-03-26-11-03-SE	Sturdee										12.8	11.96	BHL		0.87	
BHL 01-82	W2-03-26-11-14-NE	Sturdee										16.15	15.29	BHL		0.87	
BHL 01-85A	W2-03-25-34-08-NE											14.63	13.92	BHL		0.88	
BHL 01-85B	W2-03-25-34-08-NE											9.75	8.99	BHL		0.87	
BHL 01-90A	W2-04-25-36-06-NW				504							24.08	23.37	BHL		0.87	
BHL 01-90B	W2-04-25-36-06-NW				504							9.14	8.25	BHL		0.87	
BHL 01-92A	W2-04-25-36-06-NE				504							33.07	32.28	BHL		0.87	
BHL 01-92B	W2-04-25-36-06-NE				504							16.15	15.27	BHL		0.87	
BHL 01-92C	W2-04-25-36-06-NE				504							9.75	9.02	BHL		0.87	
BHL 01-93	W2-04-25-36-07-NW											10.67	9.86	BHL		0.87	
BHL 01-94	W2-04-25-36-06-NE											12.5	11.81	BHL		0.87	
BHL 01-97A	W2-04-25-36-06-NW				505							30.18	29.34	BHL		0.86	
BHL 01-97B	W2-04-25-36-06-NW				505							13.72	12.86	BHL		0.86	
BHL 01-97C	W2-04-25-36-06-NW				505							5.79	5.06	BHL		3.82	
BHL 01-98	W2-04-25-36-05-NE	Logan east										32.18	31.39	BHL		0.87	
BHL 01-105	W2-04-23-13-01-NE											8.06	7.32	BHL		2.24	
BHL 01-110A	W2-03-25-31-12-NE											39.01	38.1	BHL		0.87	
BHL 01-110B	W2-03-25-31-12-NE											25.6	24.76	BHL		0.87	
BHL 01-111A	W2-03-25-31-12-NE	Logan east										38.55	37.8	BHL		0.86	
BHL 01-111B	W2-03-25-31-12-NE	Logan east										22.11	21.34	BHL		0.87	
BHL 01-113A	W2-04-25-36-08-NW	Logan east			505							28.24	27.43	BHL		0.87	
BHL 01-113B	W2-04-25-36-08-NW	Logan east			505							13.24	12.5	BHL		0.87	
BHL 01-116	W2-3-26-08-08-NE											12.69	11.89	BHL		0.87	
BHL 01-122	W2-04-26-04-09-SE											45.29	44.5	BHL		0.87	
BHL 01-123	W2-04-26-09-01-NE											29.15	28.35	BHL		0.87	
BHL 02-125	W2-03-26-09-10-NW	Logan east										49.68	48.77	BHL		0.85	
BHL 02-127	W2-03-26-09-10-NW	Logan east										13.1	12.19	BHL		0.86	
BHL 02-128	W2-04-25-28-13-NE											31.93	31.1	BHL		0.83	
BHL 02-129	W2-04-26-04-04-NE											20.64	19.81	BHL		0.83	
BHL 02-130A	W2-02-25-11-01-SE											57.12	56.39	BHL		0.83	
BHL 02-130B	W2-02-25-11-01-SE											32.75	32	BHL		0.82	

Table A-2 Water quality data for the Yorkton study area

LAND LOCATION QTR-LSD-S-TP-RG-M	DATE SAMPLED	WELL NAME	WELL DEPTH M	AQUIFER	PH	CA	MG	NA	K	FE	MN	CO3	HCO3	SO4 MG/L	CL	NO3- NO3	PO4- PO4	F	C TOT.	C INORG.	C ORG.	COND uS/CM	Sum MG/L	T.H. CACO3 MG/L	T.A CACO3	ERROR	REFERENCE
NE- -06-23-02-W2	1966		33.5	ND	7.70	338	244	44	10.0				582	1361	54								2633	1850	477	-0.36	Rutherford, 1967
SE- -07-23-02-W2	1966		8.5	ND	7.85	45	23	3	7.0				240	21	2								341	342	207	0.23	Rutherford, 1967
NW-03-01-24-02-W2	6-Jun-75	DOUBLE R. SERV.	27.4	Bredenbury Aq	7.92	108	74	74	8.9	3.55	0.10		418	364	7	6.20	<0.05	0.23				1110	1064	574	343	0.67	SRC
NW-11-01-24-02-W2	18-May-77	SALTCOATS No.2	65.5	Bredenbury Aq	7.50	85	89	62		2.40	0.13		410	343	12	<1							1004	580	336	0.22	KEITH, 1977
NW-11-01-24-02-W2	18-May-77	SALTCOATS No.2	65.5	Bredenbury Aq	7.50	86	87	61		2.60	0.13		395	340	12	<1							984	572	324	0.76	KEITH, 1977
NW-15-04-24-02-W2	14-Apr-75	BRADFORD	46.0	ND	7.20	314	121	577	13.0	1.30	0.87		448	1180	693	3.50	0.10	0.18				4270	3352	1280	367	-0.45	SRC
NE- -05-24-02-W2	1966		54.3	ND		272	113	1077					153	764	1819								4198	1145	125	-0.01	Rutherford, 1967
SW- -10-24-02-W2	1966		22.9	Bredenbury Aq	8.02	76	55	100	7.0				363	328	20								949	416	298	-1.89	Rutherford, 1967
SE-13-32-24-02-W2	17-Mar-75	SHARP	14.9	ND	7.26	192	61	114	8.8	14.40	0.13		519	518	32	7.50	<0.05	0.38				1570	1467	731	425	-1.32	SRC
NW-08-34-24-02-W2	19-Mar-75	AICHELLE	51.2	Empress unnamed	7.42	176	59	113	7.8	3.90	0.10		576	425	25	5.50	0.09	0.27				1450	1391	681	472	-0.87	SRC
SW-13-01-25-02-W2	17-Mar-75	SZABOLCSIK	17.7	Bredenbury Aq	7.32	195	68	32	7.4	9.50	0.36		553	362	11	3.30	<0.05	0.56				1260	1242	765	453	-0.17	SRC
NW-02-04-25-02-W2	6-Sep-74	TAKACH	43.0	Bredenbury Aq	7.18	185	84	355	10.0	10.30	0.26		539	978	111	4.40	<0.05	0.20				2540	2277	804	442	-0.87	SRC
NE-16-07-25-02-W2	25-Jun-01	BHL 01-71	21.6	Sturdee	8.12	88	38	25.0	6.30	1.9	0.38		398	105	4	3.10						794	670	376	326	-0.60	Pasloske, 2002
NW-13-09-25-02-W2	4-Jul-01	BHL 01-77A	44.5	Bredenbury Aq	8.09	63	45	50.0	7.00	2	0.35		296	198	10	4.60						833	676	342	243	-0.70	Pasloske, 2002
NW-13-09-25-02-W2	9-Aug-01	BHL 01-77B	22.6	Bredenbury Aq	7.92	121	48	47.0	7.40	2.5	0.44		487	208	10	<0.04						1060	931	449	339	-1.50	Pasloske, 2002
NW-13-09-25-02-W2	9-Aug-01	BHL 01-77C	11.0	Sturdee	8.01	108	41	16.0	5.80	1.2	0.43		376	175	2	<0.04						844	725	438	308	-1.31	Pasloske, 2002
NE- -33-25-02-W2	1966		6.1	ND	7.88	75	54	9	6.0				373	128	2								647	410	306	-0.59	Rutherford, 1967
SW- -36-25-02-W2	1966		4.9	ND		122	57	30					415	184	47								855	538	340	0.52	Rutherford, 1967
SW-01-36-25-02-W2	8/10/2000	BHL 00-44A	47.37	Bredenbury Aq	7.62	160	67	120.0	9.40	2.9	0.13		526	487	24	<0.04						1640	1396	674	431	-1.25	Pasloske, 2001
SW-01-36-25-02-W2	8/11/2000	BHL 00-44B	19.47	Bredenbury Aq	7.83	119	68	11.0	5.30	2.4	0.28		539	154	2	<0.04						1030	901	576	442	0.21	Pasloske, 2001
SE- -09-26-02-W2	1966		12.2	ND	7.76	149	85	72	9.0				383	505	32								1235	723	314	0.28	Rutherford, 1967
NE- -28-26-02-W2	1966		22.3	ND	8.05	81	56	17	5.0				337	190	6								692	433	276	-0.68	Rutherford, 1967
SW-09-32-23-03-W2	19-Mar-75	D.MADDAFORD	9.1	ND	7.42	74	48	54	6.9	3.50	0.70		416	135	6	3.50	<0.05	0.29				1130	748	384	341	1.57	SRC
SW-01-02-24-03-W2	11-Apr-75	J.MADDAFORD	55.8	ND	7.35	163	29	619	10.0	4.80	0.30		494	500	658	2.10	0.18	0.11				3540	2480	526	405	0.80	SRC
NE-07-32-24-03-W2	17-Mar-75	MILLER	18.3	ND	7.15	198	65	88	8.6	6.80	0.21		475	544	22	3.10	<0.05	0.33				1500	1411	762	389	-1.29	SRC
SE-02-06-25-03-W2	17-Mar-75	LOEWEN	26.8	ND	7.38	259	77	88	8.4	6.10	0.40		401	766	46	4.40	<0.05	0.30				1750	1656	963	329	-1.24	SRC
NE-16-21-25-03-W2	8/24/2000	HAHN J.	11.58	ND	7.1	380	171	134		3.5	0.40		476	1480	10	1						2910	2656	1653	390	-0.07	Pasloske, 2001
NE-13-23-25-03-W2	21-Jun-01	BHL 01-58	15.2	Sturdee	8.29	59	38	25.0	6.50	<0.001	<0.002		378	44	5	1.50						640	557	303	310	0.33	Pasloske, 2002
SE-03-24-25-03-W2	13-Jul-00	BHL 00-34	27.7	Sturdee	7.65	142	58	85.0	10.00	5.60	0.36		505	376	13	0.24						1230	1195	593	414	-2.06	Pasloske, 2002
SW-05-24-25-03-W2	20-Jun-01	BHL 01-64A	32.3	Sturdee	7.79	122	56	103.0	11.00	3.1	0.26		334	446	20	1.20						1380	1097	535	274	0.37	Pasloske, 2002
SW-05-24-25-03-W2	20-Jun-01	BHL 01-64B	16.8	Sturdee	8.15	51	35	15.0	4.80	0.12	0.21		310	47	2	<0.04						567	465	271	254	0.69	Pasloske, 2002
SW-05-24-25-03-W2	20-Jun-01	BHL 01-64C	12.5	Sturdee	7.78	69	39	110.0	9.60	1.3	0.082		284	291	30	2.10						1080	836	332	233	0.38	Pasloske, 2002
NW-12-25-25-03-W2	21-Jun-01	BHL 01-65	21.3	Sturdee	8.28	70	39	49.0	6.30	2.3	0.33		382	128	8	2.10						819	687	335	313	-1.05	Pasloske, 2002
SW-01-26-25-03-W2	4-Jul-00	BHL 00-29	26.4	Sturdee	7.79	116	47	77.0	9.20	2.20	0.25		455	287	16	2.50						1080	1012	483	373	-2.52	Pasloske, 2002
NE-03-26-25-03-W2	8/25/2000	CHERRYDATE GOLF COURSE	13.72	ND	7.5	104	43	41		0.5	0.23		417	184	6	4						934	800	437	342	-1.81	Pasloske, 2001
SE-02-27-25-03-W2	8/24/2000	WLOCK THOMAS	9.75	ND	7.6	74	38	4		<0.1	<0.01		371	40	<2	4						608	531	341	304	0.11	Pasloske, 2001
NW-15-27-25-03-W2	15-Nov-01	BHL 01-115PW15	33.5	Sturdee	7.91	63	38	32.0	6.80	4	0.5		336	105	7	<0.04						707	592	313	275	-0.34	Pasloske, 2001
NW-15-27-25-03-W2	24-Oct-03	WELL 015	33.5	Sturdee	7.8	60	37	27	6.1	3.76	0.48		323	97	7	0.26					3.8	703	562	302	265	-0.98	SRC
NW-15-27-25-03-W2	16-Jun-04	WELL 015	33.5	Sturdee	7.6	67	41	30		1.9	0.47		348	113	7			0.2				731	608	336	285	-1.42	PROV LAB
NE-08-27-25-03-W2	19-Jun-00	BHL 00-20	27.3	Sturdee	7.85	159	61	138.0	9.80	3.30	0.23		443	548	34	<0.04						1640	1396	647	363	-1.09	Pasloske, 2001
NW-13-27-25-03-W2	21-Jun-01	BHL 01-51	9.1	Sturdee	7.91	62	53	18.0	5.50	0.01	0.00		342	122	6	1.90						739	610	373	280	0.20	Pasloske, 2001
NE-08-28-25-03-W2	11-Aug-00	SCREPNEK ERNEST	?~15	ND	7.3	166	74	52		1.9	0.01		547	355	7	4						1390	1207	719	448	0.05	Pasloske, 2001
NE-13-28-25-03-W2	21-Jun-01	BHL01-60	12.8	Sturdee	8.2	73	28	8.6	7.80	2.5	0.92		376	17	3							585	517	297	308	-0.62	Pasloske, 2002
NW-14-30-25-03-W2	25-Aug-95	FIEGE	38.4	ND	7.49	239	192	385	7.2	0.19	1		354	1360	338	<0.04			74	70	3.6	3650	2876			1.14	SRC
NE-11-31-25-03-W2	11-Aug-76	TH 65-06	9.1	Logan Valley	7.76	55	33	36	5.0	0.27	0.41		333	75	6							596	544	272	273	-0.24	IWS
NE-11-31-25-03-W2	1976	TH 76-31	9.1	Logan Valley	7.62	58	30	36	4.6	1.65	0.24		328	77	4	0.01	0.17					598	540	269	269	-0.36	IWS
NE-11-31-25-03-W2	9-Nov-78	TH 76-31	9.1	Logan Valley	7.60	59	30	75	5.0	1.63	0.24		398	82	18	0.01	0.18				24	600	669	271	326	0.37	IWS
NE-11-31-25-03-W2	18-Dec-79	TH 76-31	9.1	Logan Valley	8.18	49	40	40	4.6	2.02	0.25		339	86	13	3.05			70			658	577	288	278	-1.10	IWS
SE-11-31-25-03-W2	28-Feb-81	WELL 011	39.6	Logan Valley		124	62	54	8.2	2.50	0.59		525	233	14	0.09						1040	1023	565	431	-0.01	IWS
SE-11-31-25-03-W2	8-Nov-88	WELL 011	39.6	Logan Valley	7.96	73	34	35	4.9	1.90	0.41		302	133	6	0.04	0.12	0.38	62	59	2.8	722	590	323	248	1.25	SRC
SE-11-31-25-03-W2	27-Mar-92	WELL 011	39.6	Logan Valley		167	64	44					369	396	22	1.00		0.20				1130	1063	681	303	1.92	YORKTON
SE-11-31-25-03-W2	25-Aug-95	WELL 011	39.6	Logan Valley	7.43	150	64	58	7.7	3.20	0.71		383	370	28	0.08			86	75	11	1290	1065			2.31	SRC
SE-11-31-25-03-W2	5-Nov-96	WELL 011	39.6	Logan Valley	7.30	142	58	60		3.00	0.76		372	392	24	<0.04		0.29				1260	1052	593	305	-1.59	beckie 99
SE-11-31-25-03-W2	25-Jun-97	WELL 011	39.6	Logan Valley	7.30	187	91	83					442	546	33	1.00		0.30				1540	1383	842	362	2.18	prov lab, beckie 99
SE-11-31-25-03-W2	1999	WELL 011	39.6	Logan Valley	7.47	139	62	57.0	7.70	2.72	0.66		399	345	21	0.27						1197	1034	645	340	1.36	Pasloske, 2002
SE-11-31-25-03-W2	10-Apr-00	WELL 011	39.6	Logan Valley	7.30	128	78.7	75.2	13.9	1.3	0.99		430	334	29.4	<0.4		0.33	102	94	8	1310	1091	644	350	5.30	Enviro-Test
SE-11-31-25-03-W2	22-Aug-01	WELL 011	39.6	Logan Valley	7.87	117	61	48	10.0	2.9	0.96		329	358	14		0.10				4.7	1170	941	543	270	-0.15	SRC
SE-11-31-25-03-W2	20-Mar-02	WELL 011	39.6	Logan Valley	7.49	108	61	55	13.0	2.7	1		379	316	20	<0.2	0.11	0.27				1140	956	520	311	-0.84	SRC
SE-11-31-25-03-W2	11-Feb-03	WELL 011	39.6	Logan Valley	7.26	111	64	55	13.0	2.9	1.1		405	309	20	0.4	0.11					1130	981	540	332	-0.41	SRC
SE-11-31-25-03-W2	24-Oct-03	WELL 011	39.6	Logan Valley	7.63	117	61	35	7.1	3	0.88		329	330	12	<0.04					3.5	1120	895	543	270	-0.16	SRC
SE-11-31-25-03-W2	16-Jun-04	WELL 011	39.6	Logan Valley	7.8	113	62	46		2.8	1.04		390	281.3	19.3			0.2				1113	915	537	320	-0.20	Prov. Lab
SW-11-31-25-03-W2	10-Sep-96	MW 96-02	12.1	Logan Valley	7.4	176	70	73	11	3.8	1.3		540	419	19	0.58	0.25	0.17				1500	1314	727	443	-0.33	SRC

Table A-2 Water quality data for the Yorkton study area

LAND LOCATION QTR-LSD-S-TP-RG-M	DATE SAMPLED	WELL NAME	WELL DEPTH M	AQUIFER	PH	CA	MG	NA	K	FE	MN	CO3	HCO3	SO4 MG/L	CL	NO3- NO3	PO4- PO4	F	C TOT.	C INORG.	C ORG.	COND uS/CM	Sum MG/L	T.H. CACO3 MG/L	T.A CACO3	ERROR	REFERENCE
NE-12-31-25-03-W2	22-Aug-01	BHL 01-110A	39.0	Logan Valley	7.40	87	66	66	7.4	0.01	0.75		425	202	60	0.27						1140	914	488	368	-0.14	Pasloske, 2002
NE-12-31-25-03-W2	13-Nov-01	BHL 01-111A	37.8	Logan Valley	7.58	116	60	48.0	7.90	2.40	0.74		522	191	31	<0.04						1140	979	536	428	-1.48	Pasloske, 2002
SW-12-31-25-03-W2	13-Oct-93	MW 93-04	41.9	Logan Valley	7.26	150	74	66	8.2	3.1	0.68		561	258	52	<0.04	0.33	0.27				1290	1173	678	460	1.90	SRC
SW-12-31-25-03-W2	22-Aug-95	MW 93-04	41.9	Logan Valley	7.44	138	73	63	7.1	2.3	0.69		547	232	54	0.08			114	108	5.6	1330	1117			1.59	SRC
SW-12-31-25-03-W2	13-Oct-93	MW 93-05	10.8	Logan Valley	7.22	151	76	55	7.8	4.2	1		552	246	54	<0.04	0.20	0.25				1370	1147	689	452	2.15	SRC
SW-12-31-25-03-W2	22-Aug-95	MW 93-05	10.8	Logan Valley	7.41	144	75	65	7.4	4.9	0.97		566	235	57	<0.04			117	111	5.7	1400	1155			1.86	SRC
NE-13-31-25-03-W2	10/17/2001	DENESCHUK HOMES	10.36	ND	7.8	115	55	52		0.3	0.03		517	168	15	4						1093	926	514	424	0.27	Pasloske, 2002
NW-13-31-25-03-W2	10/16/2001	MCDIARMID LUMBER	???	ND	7.7	103	58	42		1.4	0.02		512	99	43	3						1048	861	496	420	0.11	Pasloske, 2002
NW-13-31-25-03-W2	13-Oct-93	MW 93-03	9.9	Logan North	7.36	99	49	23	5.2	2.7	0.42		462	84	25	<0.04	0.55	0.30				856	750	448	379	0.39	SRC
NW-13-31-25-03-W2	22-Aug-95	MW 93-03	9.9	Logan North	7.5	108	61	21	5.7	2.3	0.55		511	98	28	0.18			104	100	3.5	976	836			1.15	SRC
SW-14-31-25-03-W2	23-Aug-95	MW 80-12	45.5	Logan Valley	7.26	186	76	82	9.5	8.4	0.89		421	537	34	0.02			96	83	13	1600	1355			0.80	SRC
SW-14-31-25-03-W2	25-Aug-95	MW 95-04A	19	Logan Valley	7.34	171	90	70	12	0.5	1.4		328	618	21	0.22			74	64	9.6	1580	1312			1.19	SRC
SW-14-31-25-03-W2	25-Aug-95	MW 95-04B	12.9	Logan Valley	7.64	83	82	75	18	1.2	0.99		434	304	32	0.09			110	85	25	1240	1030			0.92	SRC
SW-14-31-25-03-W2	25-Aug-95	MW 95-04C	6.1	Logan Valley	7.66	75	85	80	15	0.06	1.9		439	286	32	0.53			105	86	19	1210	1014			1.88	SRC
SW-14-31-25-03-W2	10-Sep-96	MW 96-03	9.6	Logan Valley	7.31	187	95	100	12	12	1.4		451	661	38	2.04	0.31	0.25				1800	1559	857	370	-1.03	SRC
SW-14-31-25-03-W2	26-Jan-87	WELL 012	40.8	Logan Valley	7.56	90	61	45	6.4	8.90	0.67		457	201	9	0.09						1000	879	476	374	-1.27	IWS
SW-14-31-25-03-W2	10-Dec-87	WELL 012	40.8	Logan Valley	7.50	115	58	43					492	188	16	<1							912	526	403	-0.19	YORKTON
SW-14-31-25-03-W2	8-Nov-88	WELL 012	40.8	Logan Valley	7.59	135	66	51	6.7	3.70	0.76		437	333	15	0.04	0.06	0.31	91	86	4.8	1200	1048	661	358	0.13	SRC
SW-14-31-25-03-W2	20-Apr-89	WELL 012	40.8	Logan Valley		107	61	98					499	268	44								1077	520	409	-1.27	YORKTON
SW-14-31-25-03-W2	8-Apr-93	WELL 012	40.8	Logan Valley		161	70	55					441	392	27							1370	1146	690	362	0.11	YORKTON
SW-14-31-25-03-W2	20-Jun-95	WELL 012	40.8	Logan Valley	7.4	159	78	86	11.0				461	449	33	<0.08	0.37				14	1510	1277	718	378	1.49	Ballagh, 2001
SW-14-31-25-03-W2	21-Aug-95	WELL 012	40.8	Logan Valley	7.2	153	71	78	9.0				459	415	34	<0.08	0.37				11.1	1490	1219	674	376	-0.06	Ballagh, 2001
SW-14-31-25-03-W2	22-Aug-95	WELL 012	40.8	Logan Valley	7.28	172	76	72	10.0	3.70	0.99		440	450	33	0.08			101	86	15	1530	1258			1.99	Ballagh, 2001
SW-14-31-25-03-W2	23-Oct-95	WELL 012	40.8	Logan Valley	7.2	152	74	75	10.0				468	405	30	0.93	0.21				10	1460	1215	684	384	0.67	Ballagh, 2001
SW-14-31-25-03-W2	27-May-96	WELL 012	40.8	Logan Valley	7.2	146	71	72	9.0				451	394	34	0.35	0.18				11	1420	1177	657	370	-0.21	Ballagh, 2001
SW-14-31-25-03-W2	6-Aug-96	WELL 012	40.8	Logan Valley	7.3	143	64	70	8.0				447	363	28	0.27	0.28				10	1400	1123	621	366	-0.08	Ballagh, 2001
SW-14-31-25-03-W2	16-Oct-96	WELL 012	40.8	Logan Valley	7.3	140	68	70	9.0				454	357	32	0.50	0.11				9	1350	1130	630	372	0.23	Ballagh, 2001
SW-14-31-25-03-W2	27-May-97	WELL 012	40.8	Logan Valley	7.6	146	75	68	9.0				464	376	33	0.20	0.18				11	1400	1171	673	380	0.84	Ballagh, 2001
SW-14-31-25-03-W2	25-Jun-97	WELL 012	40.8	Logan Valley	7.2	154	77	70					481	419	31	<1		0.30				1430	1232	702	394	-1.20	prov lab, beckie 99
SW-14-31-25-03-W2	8-Sep-97	WELL 012	40.8	Logan Valley	7.30	145	71	55	7				527	283	38						7	1340	1126	654	432	0.15	Ballagh, 2001
SW-14-31-25-03-W2	26-Nov-97	WELL 012	40.8	Logan Valley	7.70	135	69	54	8				532	240	34						7	1236	1072	621	436	0.99	Ballagh, 2001
SW-14-31-25-03-W2	3-Jun-98	WELL 012	40.8	Logan Valley	7.30	144	72	54	8				523	287	27						6.4	1267	1115	656	429	1.15	Ballagh, 2001
SW-14-31-25-03-W2	14-Sep-98	WELL 012	40.8	Logan Valley	7.20	142	70	53	8				471	315	27						6.7	1263	1086	643	386	1.04	Ballagh, 2001
SW-14-31-25-03-W2	26-Oct-98	WELL 012	40.8	Logan Valley	7.10	139	70	56	8				470	320	30						7.6	1243	1093	635	385	0.41	Ballagh, 2001
SW-14-31-25-03-W2	1999	WELL 012	40.8	Logan Valley	7.43	141	69	68	8.76	5.00	0.85		463	357	28	0.31						1380	1141	628	381	0.25	Pasloske, 2002
SW-14-31-25-03-W2	26-May-99	WELL 012	40.8	Logan Valley	7.10	132	71	65	9				418	366	30	<1					9.6	1320	1091	622	343	0.55	Ballagh, 2001
SW-14-31-25-03-W2	4-Aug-99	WELL 012	40.8	Logan Valley	7.20	126	70	62	8				425	336	25	1					9.9	1224	1053	603	348	0.90	Ballagh, 2001
SW-14-31-25-03-W2	7-May-02	WELL 012	40.8	Logan Valley	7.42	126	58	12	8.7	0.43	1.1		506	327	54							1500	1093	553	415	-16.95	
SW-14-31-25-03-W2	11-Aug-03	WELL 012	40.8	Logan Valley	7.30	122	60	54	7.7	3.29	0.97		427	270	24						5.4	1170	969	551	350	1.02	SRC
SW-14-31-25-03-W2	16-Jun-04	WELL 012	40.8	Logan Valley	7.70	137	66	51		4.2	0.82		537	226.5	33.4			0.26				1231	1056	614	440	0.09	Prov. Lab
SW-14-31-25-03-W2	24-Oct-94	Yorkt. Creek		surface water	8.15	86	121	146					437	622	63	0.18					42	1890	1475			-3.04	
SW-14-31-25-03-W2	24-Apr-95	Yorkt. Creek		surface water	7.6	40	31	33					161	140	14	<0.01		0.04			19	560	419	227	132	0.28	SRC
SW-14-31-25-03-W2	25-Aug-95	Yorkt. Creek		surface water	8.4	83	76	68	17	0.037	0.04	8	400	271	26	0.04			101	80	21	1180	949			3.20	
SW-14-31-25-03-W2	6-Apr-98	Yorkt. Creek		surface water	7.7	34	21	18					132	92	5	0.95	0.37				19	444	303	171		-0.33	prov health lab
SE-09-32-25-03-W2	21-Jun-01	BHL01-61	15.24	Sturdee	7.69	465	244	602	14	0.2	2.7		439	2600	302							5080	4669	2160	360	-0.01	Pasloske, 2002
NE-08-33-25-03-W2	21-Jun-01	BHL01-62	16.15	Sturdee	7.8	105	68	20	6.1	0.4	0.52		365	283	6							1020	854	541	299	-0.76	Pasloske, 2002
NE-16-32-25-03-W2	15-Oct-01	REIMER ERNIE	9.75	ND	8.1	74	116	31		<0.1	<0.01		608	106	6	118						1234	1059	662	498	1.19	Pasloske, 2002
NW-13-33-25-03-W2	25-Sep-00	YORKTON MEMORIAL GARDENS	24.99	ND	7.8	94	38	113		<0.1	0.44		425	231	25	4						1099	930	391	348	0.74	Pasloske, 2001
NW-14-33-25-03-W2	25-Aug-00	MCDOUGALL JIM SR	?9	ND	7.7	65	58	8		<0.1	0.09		432	34	5	25						716	627	401	354	0.19	Pasloske, 2001
SW-01-34-25-03-W2	22-Jun-01	BHL 01-52A	28.7	Sturdee	7.77	156	62	177.0	12.00	0.00	<0.002		414	598	45	7.10						1810	1471	644	338	0.66	Pasloske, 2002
SW-01-34-25-03-W2	22-Jun-01	BHL 01-52B	29.9	Sturdee	7.88	94	35	76.0	7.20	<0.001	<0.002		417	188	9	2.80						957	829	378	342	0.06	Pasloske, 2002
SW-01-34-25-03-W2	4-Feb-76	TH 75-42	15.9	Sturdee	7.45	125	43	75	8.0	3.60	0.30		475	264	7							1020	1001	489	389	-0.88	IWS
SE-02-34-25-03-W2	27-Oct-00	BHL 00-38	31.0	Sturdee	7.52	62	38	31.0	6.30	4.00	0.45		336	98	6	0.40						691	582	311	275	0.05	Pasloske, 2002
SW-02-34-25-03-W2	11-Aug-76	TH 76-24	32.9	Sturdee	7.49	88	49	44	7.0	4.20	0.52		396	180	15							846	784	422	325	-0.68	IWS
SW-02-34-25-03-W2	5-Nov-78	TH 76-24	32.9	Sturdee	7.44	78	45	79	7.0	4.85	0.45		370	205	32	0.02	0.08				27	771	821	382	303	-0.11	IWS
SW-02-34-25-03-W2	18-Dec-79	TH 76-24	32.9	Sturdee	8.07	92	54	50	7.7	3.03	1.92		409	217	9	6.77			91			972	851	451	335	-0.79	IWS
NW-05-34-25-03-W2	20-Jul-00	LUTZ TIM	16.76	ND	7.9	101	55	22		0.2	0.06		442	155	7	<1						901	782	479	362	-0.69	Pasloske, 2001
NE-08-34-25-03-W2	9-Aug-01	BHL 01-85A	14.6	Sturdee	7.65	130	69	81.0	8.00	0.045	0.17		337	438	22	54.00						1410	1139	608	276	-0.75	Pasloske, 2002
NE-08-34-25-03-W2	9-Aug-01	BHL 01-85B	9.8	Sturdee	7.65	174	72	176.0	11.00	2.5	0.3		433	679	37	8.50						1920	1593	730	355	0.29	Pasloske, 2002
SW-13-34-25-03-W2	20-Jul-00	SMITHSON MORLEY	~3.6	ND	7.7	72	65	10		<0.1	<0.01		490	58	3	4						788	702	447	402	-0.06	Pasloske, 2001
NE-14-34-25-03-W2	4-Aug-00	STAMPEDE AUCTION	10.97	ND	7.7	97	48	33		2.3	0.58		405	171	2	2						885	761	440	332	-0.30	Pasloske, 2001
NE-15-34-25-03-W2	21-Jul-00	FORD NELSON	16.76	ND	7.7	86	50	44		3.6	0.47		405	179	6	2						904	776	421	332	-1.18	Pasloske, 2001

Table A-2 Water quality data for the Yorkton study area

LAND LOCATION QTR-LSD-S-TP-RG-M	DATE SAMPLED	WELL NAME	WELL DEPTH M	AQUIFER	PH	CA	MG	NA	K	FE	MN	CO3	HCO3	SO4	CL	NO3- NO3	PO4- PO4	F	C TOT.	C INORG.	C ORG.	COND uS/CM	Sum MG/L	T.H. CACO3 MG/L	T.A CACO3	ERROR	REFERENCE
														MG/L													
NW-14-35-25-03-W2	24-Aug-00	ADAM GERRY	~4.5	ND	7.5	135	50	70		<0.1	0.56		427	333	21	4						1240	1041	543	350	-2.43	Pasloske, 2001
SW-12-36-25-03-W2	25-Jun-01	BHL 01-63	24.1	Sturdee	7.77	196	69	164.0	12.00	<0.002	0.52		372	741	44	<0.04						1970	1599	772	305	0.29	Pasloske, 2002
SE-01-01-26-03-W2	25-Aug-00	WHEELER ALLAN	16.15	ND	7.3	202	64	23		<0.1	0.59		456	380	14	49						1430	1189	768	374	-0.68	Pasloske, 2001
SW-01-03-26-03-W2	2-Aug-00	BHL 00-40A	17.4	Sturdee	7.75	80	44	55.0	7.40	2.60	0.42		388	171	12	0.32						876	761	380	318	-0.34	Pasloske, 2002
SE-03-03-26-03-W2	8-Aug-00	BENKO EMIL	~7.9	ND	7.9	71	63	16		<0.1	<0.01		415	65	22	31						816	683	437	340	0.79	Pasloske, 2001
SE-08-03-26-03-W2	11-Aug-00	PHILLIPS FRED	6.71	ND	7.5	162	137	122		<0.1	0.77		771	471	66	10						2020	1740	969	632	0.40	Pasloske, 2001
NE-16-03-26-03-W2	11-Aug-00	PHILLIPS MARTIN	12.5	ND	7.5	123	56	40		0.1	0.41		405	267	14	1						1081	907	538	332	-0.49	Pasloske, 2001
NW-02-04-26-03-W2	24-Aug-00	BROWN DARWIN	8.53	ND	7.7	97	57	29		2.2	0.26		544	94	13	3						955	839	477	446	-2.25	Pasloske, 2001
SW-03-04-26-03-W2	25-Aug-00	MCDOUGALL JIM JR	8.23	ND	7.5	110	89	19		<0.1	0.04		615	58	77	22						1193	990	641	504	-0.64	Pasloske, 2001
NW-15-04-26-03-W2	Sep-96	SRC 96-04	49.1	Logan Valley	7.72	95	36	22.0	8.60	2.40	0.44		339	133	7							771	643	385	278	2.05	Pasloske, 2002
SE-01-05-26-03-W2	16-Oct-01	YAHOLNITSKY FRANK	9.1	ND	7.8	97	94	22		<0.1	<0.01		561	57	100	56						1268	987	629	460	-2.07	Pasloske, 2002
NE-14-05-26-03-W2	8-Nov-01	BHL 01-114PW14	51.8	Logan Valley	7.93	91	40	25.0	8.70	2.00	0.47		364	144	9	<0.04						814	684	391	298	-0.41	Pasloske, 2002
NE-14-05-26-03-W2	24-Oct-03	WELL 014	35.9	Logan Valley	7.84	95	42	27	8.4	2.13	0.52		376	150	<0.04						3.3	860	701	410	308	1.59	SRC
NE-14-05-26-03-W2	16-Jun-04	WELL 014	35.9	Logan Valley	7.7	91	39	26		1.6	0.39		368	135.2	9			0.14				805	670	388	302	-1.22	Prov. Lab
NW-15-05-26-03-W2	17-Jul-96	MW 96-04	49.1	Logan Valley	7.4	91	35	22	8.6	2.5	0.46		345	132	8	<0.04						758	645	371	283	-0.18	
NW-15-05-26-03-W2	9-Sep-96	MW 96-04	49.1	Logan Valley	7.72	95	36	22	8.6	2.4	0.44		339	133	7	<0.04	0.52	0.11				771	643	385	278	2.05	SRC
SE-03-06-26-03-W2	16-Oct-01	NEW HOLLAND	13.41	ND	7.7	114	67	104		2.0	0.29		517	292	18	5						1350	1119	561	424	1.89	Pasloske, 2002
SE-04-06-26-03-W2	18-Oct-01	IMPERIAL OIL	????	ND	7.6	135	71	66		<0.1	0.02		483	325	6	4						1289	1090	629	396	1.76	Pasloske, 2002
SE-04-06-26-03-W2	17-Oct-01	L&B ENTERPRISES	10.67	ND	7.7	126	68	43		1.9	0.34		473	243	11	3						1149	969	595	388	2.17	Pasloske, 2002
SW-04-06-26-03-W2	17-Oct-01	OCH'S SE KIA	????	ND	7.9	3	3	742		<0.1	<0.01		603	1006	33	22						3170	2412	20	494	0.86	Pasloske, 2002
SE-08-06-26-03-W2	17-Jul-96	MW 96-05	49.2	Logan Valley	7.58	54	26	31	5.3	0.75	0.18		289	66	5	0.05						568	477	242	237	0.52	SRC
SE-08-06-26-03-W2	9-Sep-96	MW 96-05	49.2	Logan Valley	7.87	56	28	24	4.8	0.37	0.07		284	64	4	<0.04	0.25	0.23				565	465	255	233	1.34	SRC
NW-12-06-26-03-W2	17-Oct-01	BLOMMAERT WILFRED	10.97	ND	7.6	183	130	290		0.4	0.28		517	1080	82	3						2800	2286	992	424	-1.33	Pasloske, 2002
NE-09-07-26-03-W2	16-Oct-01	ABRAMETZ TOM	5.79	ND	7.5	307	169	153		<0.1	1.23		576	1217	30	1						2780	2454	1463	472	0.34	Pasloske, 2002
NW-15-09-26-03-W2	20-Jun-00	BHL 00-21	25.81	Logan Valley	7.86	96	37	70.0	8.00	2.1	0.22		414	196	17	<0.04						996	840	392	339	-1.16	Pasloske, 2001
NE-16-09-26-03-W2	19-Oct-01	PINNO GARY	7.62	ND	7.5	170	71	46		<0.1	0.06		434	401	26	9						1410	1157	717	356	-0.04	Pasloske, 2002
SW- -10-26-03-W2	1966		9.1	ND		193	84	137					104	955	37								1510	831	85	-0.29	RUTHERFORD
SE-03-11-26-03-W2	9-Aug-01	BHL 01-81	12.8	Sturdee	7.83	92	44	37.0	6.00	0.67	0.75		337	192	13	1.10						875	724	410	276	0.35	Pasloske, 2002
NE-14-11-26-03-W2	9-Aug-01	BHL 01-82	16.2	Sturdee	7.73	103	51	100.0	10.00	4.9	0.22		508	244	23	4.20						1200	1048	467	416	-0.64	Pasloske, 2002
NE-13-15-26-03-W2	28-Jun-00	BHL 00-25	53.27	Logan E.	7.95	67	31	364.0	11.00	1.9	0.066		461	531	128	9.40						1970	1604	295	378	-0.82	Pasloske, 2001
NW-04-35-26-03-W2	24-Aug-00	DUBNYK APRIL	~7.3	ND	7.4	159	148	132		<0.1	1.01		664	542	97	57						2200	1800	1006	544	0.06	Pasloske, 2001
NE-15-34-28-03-W2	21-Jul-00	FORD NELSON	6.71	ND	7.7	85	53	37		1.3	0.56		417	139	22	5						900	760	430	342	-1.05	Pasloske, 2001
NE-08-02-23-04-W2	26-Feb-70	CRATER LAKE T.H.	43.4	ND	7.90	30	13	850	18.0				2080	178	117	NIL	NIL					3500	3286	127	1705	-1.35	SRC
NE-08-02-23-04-W2	26-Feb-70	CRATER LAKE T.H.	41.2	ND	7.90	28	14	860	18.0				2120	180	128	NIL	NIL					3500	3348	127	1735	-2.04	SRC
NW-08-02-23-04-W2	26-Jan-70	CRATER LAKE		surface water	8.50	18	102	36	66.0	<0.10		3.6	559	129	19	NIL	NIL					1080	933	463	464	0.65	SRC
NW-08-02-23-04-W2	25-Oct-73	SRC CRATER L.	11.9	ND	7.25	551	173	32	22.0	1.70	4.40		598	1560	67	1.20	<0.01	0.30				2870	3010	2090	490	-0.57	SRC
NW-08-02-23-04-W2	20-Jul-83	SRC CRATER L.	11.9	ND	7.66	504	188	32	24.0	0.82	2.20		320	1690	80	0.18	<0.03	0.27				2730	2841	2000	262	-0.08	SRC
NW-08-02-23-04-W2	5-Jun-84	SRC CRATER L.	11.9	ND	7.53	542	196	32	20.0	1.70	1.80		484	1580	91	1.02	0.60	0.20				2970	2950	2120	397	1.88	SRC
SE-09-02-23-04-W2	4-Mar-70	SMULAN		ND	7.40	184	148	95	10.0	1.00			700	655	22	NIL	NIL					2100	1815	1065	573	0.04	SRC
SE- -07-23-04-W2	19-May-05		9.1	ND	7.92	54	23	4	9.0				194	66	20								370	229	159	-1.25	RUTHERFORD
NE-09-09-23-04-W2	2-Oct-81	HALAREWICH	37.5	Leech Lake	7.09	115	50	44	9.1	1.95	0.30		480	216	3	1.30	<0.02	0.22				880	921	492	393	-1.92	SRC
01-14-23-04-W2	1-Oct-81	MICHAEL	40.2	Leech Lake	7.10	132	61	153	12.2	3.38	0.13		500	450	10	5.50	<0.02	0.18				1170	1327	580	410	1.75	SRC
NE- -18-23-04-W2	1966		18.3	ND	7.85	266	153	109	12.0				328	1150	47								2065	1295	269	0.43	RUTHERFORD
SE-01-22-23-04-W2	6-Mar-70	BECK	4.6	ND	7.80	129	47	12	9.0	<0.1			268	67	30	270	NIL					1160	832	515	220	0.31	SRC
NW-13-22-23-04-W2	7-Nov-75	TH 75-40	32.7	Leech Lake	8.00	122	64	179	11.0				468	477	53							1460	1374	569	384	0.84	IWS
SE-01-23-23-04-W2	29-Nov-66	WISEMEN	14.3	ND	7.23	108	32	10	5.9	0.19			467	38	1							730	662	401	383	0.70	SRC
SE-09-23-23-04-W2	3-Mar-70	HARLEWICH	18.0	ND	8.20	109	36	27	8.0	1.00			471	96	10	NIL	NIL					900	758	421	386	-1.11	SRC
SE-04-09-24-04-W2	22-Oct-75	TH 75-16	37.8	Leech Lake	8.12	90	35	125	3.0				323	301	60							1230	937	369	265	-1.41	IWS
SE-04-20-24-04-W2	24-Aug-00	TH 75-15	38.4	Leech Lake	7.19	179	81	144	7.4	4.1	0.39		481	642	39	<0.04						1810	1578	779	394	-0.67	SRC
SE-04-20-24-04-W2	24-Aug-00	TH 75-15	38.4	Leech Lake	7.2	175	81	132	7				498	591	42	0.31						1850	1526	771	408	-0.79	Health/Duplic
NW-13-20-24-04-W2	25-Aug-00	TH 79-30	19.8	Leech Lake	7.2	161	80	192	7	18	0.43		459	661	67	0.40						2040	1646	731	376	-0.07	SRC
SW-01-21-24-04-W2	24-Aug-00	TH 75-14	29.4	Leech Lake	7.4	81	38	44	4	2	0.5		407	113	9	0.49						816	699	359	334	-0.54	SRC
NW-14-26-24-04-W2	2-Nov-01	YRK 2001-02	32.3	Leech Lake	7.51	137	70	300	13	2.2	0.15		425	720	131	<0.04						2360	1798	629	348	0.63	SRC
NW-14-26-24-04-W2	22-Oct-02	YRK 2001-02	32.3	Leech Lake	7.1	146	74	303		2.2	0.15		429	741	138	<0.04						2280	1833	669	352	0.38	SRC/HEALTH
NW-14-26-24-04-W2	21-Oct-03	YRK 2001-02	32.3	Leech Lake	7.4	144	72	301	13	2.4	0.18		428	750	100	<0.04						2330	1811	655	351	2.09	SRC
16-26-24-04-W2	8-Nov-88	S.CAGELAYERS	28.0	Leech Lake	7.64	220	92	400	11	3.2	0.29		453	1100	215	0.04	0.02	0.29		5.2		3090	2495	927	371	-0.22	SRC
16-26-24-04-W2	3-Nov-99	S.CAGELAYERS	25.0	Leech Lake	7.55	213	96	408	12	2.8	0.28		459	1100	213	0.05						3010	2504	926	376	0.20	SRC/SWC
NW-16-27-24-04-W2	3-Nov-99	Bates	20.7	Leech Lake	7.44	136	72	187	9.6	0.59	0.94		473	556	64	0.05						1770	1499	635	388	-0.10	SRC/SWC
SW-04-28-24-04-W2	18-Sep-67	TH 67-01	22.0	Leech Lake	7.28	164	69	218	11				479	670	90							1900	1701	693	393	-1.49	IWS
SW-07-28-24-04-W2	24-Aug-00	YRK 2000-01deep	24.9	Leech Lake	7.40	139	75	202	7.0	0.32	2.8		382	609	70	0.44						1960	1488	656	466	2.68	SRC
SW-07-28-24-04-W2	1-Nov-01	YRK 2000-01deep	24.9	Leech Lake	7.41	141	66	219	8.0	2.6	0.34		451	601	78	<0.04						2000	1567	623	370	0.21	SRC
SW-07-28-24-04-W2	23-Oct-02	YRK 2000-01deep	24.9	Leech Lake	7.1	145	70	219		2.7	0.32		454	608	80	<0.04						1920	1579	650	372	0.37	SRC/HEALTH

Table A-2 Water quality data for the Yorkton study area

LAND LOCATION QTR-LSD-S-TP-RG-M	DATE SAMPLED	WELL NAME	WELL DEPTH M	AQUIFER	PH	CA	MG	NA	K	FE	MN	CO3	HCO3	SO4 MG/L	CL	NO3-NO3	PO4-PO4	F	C TOT.	C INORG.	C ORG.	COND uS/CM	Sum MG/L	T.H. CACO3 MG/L	T.A CACO3	ERROR	REFERENCE
SW-07-28-24-04-W2	24-Aug-00	YRK 2000-01shallow	7.9	Leech Lake	7.30	177	106	173	8.0	5.5	0.48		468	723	40	0.35						2130	1701	878	571	2.91	SRC
SW-07-28-24-04-W2	1-Nov-01	YRK 2000-01shallow	7.9	Leech Lake	7.25	180	96	168	8.8	5.8	0.54		560	674	38	<0.04						2080	1731	844	459	0.27	SRC
SW-07-28-24-04-W2	23-Oct-02	YRK 2000-01shallow	7.9	Leech Lake	7.0	196	106	173		6.2	0.53		598	703	38	<0.04						2060	1821	926	490	1.01	SRC/HEALTH
NW-08-28-24-04-W2	18-Sep-67	TH 67-02	18.9	Leech Lake	7.28	164	72	196	9.0				464	660	77							1800	1642	706	380	-1.41	IWS
SW-01-32-24-04-W2	25-Aug-00	TH 79-28	19.2	Leech Lake	7.60	87	40	76	5.0	1.6	0.23		466	142	22							983	840	750	382	-0.66	SRC
SW-01-32-24-04-W2	31-Oct-01	TH 79-28	19.2	Leech Lake	7.55	81	38	75	5.5	1.6	0.20		447	136	20	<0.04						979	804	358	366	-0.70	SRC
SW-01-32-24-04-W2	23-Oct-02	TH 79-28	19.2	Leech Lake	7.2	117	51	87		2.8	0.30		451	252	26	<0.04						1149	987	502	370	1.65	SRC/HEALTH
SE-03-32-24-04-W2	25-Aug-00	TH 79-27	20.4	Leech Lake	7.31	100	42	49	5.3	1.7	0.26		460	138	17	<0.04						935	813	422	377	-0.83	SRC
SE-03-32-24-04-W2	25-Aug-00	TH 79-27	20.4	Leech Lake	7.40	102	42	48	5.0				473	132	17	0.49						951	819	428	388	-1.04	Health/Duplic
SE-03-32-24-04-W2	31-Oct-01	TH 79-27	20.4	Leech Lake	7.49	99	43	47	5.4	2.2	0.28		456	136	17	<0.04						968	806	424	374	-0.58	SRC
SE-03-32-24-04-W2	21-Oct-02	TH 79-27	20.4	Leech Lake	7.0	103	44	46		2.1	0.28		459	133	18	<0.04						913	805	438	376	-0.18	SRC/HEALTH
SE-04-32-24-04-W2	25-Aug-00	TH 79-26	23.5	Leech Lake	7.80	111	52	89	6.0	2.0	0.28		461	261	27	0.44						1198	1010	491	378	0.31	SRC
SE-04-32-24-04-W2	31-Oct-01	TH 79-26	23.5	Leech Lake	7.59	106	52	88	6.0	2.7	0.29		448	265	27	<0.04						1230	995	478	367	-0.26	IWS
SE-04-32-24-04-W2	23-Oct-02	TH 79-26	23.5	Leech Lake	7.20	117	51	87		2.8	0.30		451	252	26	<0.04						1149	987	502	370	1.65	IWS
SW-01-33-24-04-W2	5-Nov-99	YRK 99-03	23.5	Leech Lake	7.35	148	75	216	8.1	3.4	0.35		449	667	76	0.14						1910	1643	677	368	-0.50	SRC/SWC
SW-01-33-24-04-W2	25-Aug-00	YRK 99-03	23.5	Leech Lake	7.30	152	78	208	7.0	3.0	0.33		468	634	80	0.35						2030	1631	701	384	0.21	SRC
SW-01-33-24-04-W2	30-Oct-01	YRK 99-03	23.5	Leech Lake	7.38	145	71	213	8.0	3.50	0.36		450	615	77	<0.04						2050	1583	654	369	0.44	SRC
NW-07-33-24-04-W2	24-Aug-00	TH 79-07	22.6	Leech Lake	7.40	101	153	210	7.0	4.5	0.32		493	836	51	0.31						2260	1856	882	404	0.03	SRC
NW-07-33-24-04-W2	30-Oct-01	TH 79-07	22.6	Leech Lake	7.52	132	296	368	11	6.40	0.31		466	1720	72	<0.04						3690	3072	1550	382	1.89	SRC
NE-08-33-24-04-W2	22-Aug-00	TH 79-01	21.3	Leech Lake	7.30	120	64	17	4.0	0.36	0.92		486	167	14	0.49						1006	874	563	398	1.05	SRC
NE-08-33-24-04-W2	31-Oct-01	TH 79-01	21.3	Leech Lake	7.42	115	52	16	4.8	0.43	1.40		465	145	14	<0.04						983	814	501	381	-0.91	SRC
NE-08-33-24-04-W2	22-Oct-02	TH 79-01	21.3	Leech Lake	7.0	119	52	15		1.00	1.59		466	139	16	<0.04						913	810	511	382	-0.52	SRC/HEALTH
NW-14-33-24-04-W2	23-Aug-00	TH 79-09	20.7	Leech Lake	7.45	86	45	108	6.5	2.2	0.23		456	239	18	<0.04						1090	961	399	374	-0.38	SRC
NW-14-33-24-04-W2	23-Aug-00	TH 79-09	20.7	Leech Lake	7.50	84	46	101	6.0				471	216	18	0.49						1113	942	399	386	-0.83	Health/Duplic
NW-14-33-24-04-W2	23-Aug-00	TH 80-01	11.0	Leech Lake	7.40	77	47	87	6.0	2.5	0.29		464	181	13							1030	878	386	380	-0.39	SRC
NW-14-33-24-04-W2	25-Aug-00	YRK 99-04	23.5	Leech Lake	7.50	100	56	151	6.0	1.9	0.22		386	368	40	0.44						1440	1110	480	471	3.80	SRC
NW-14-33-24-04-W2	26-Aug-00	YRK 99-04	23.5	Leech Lake	7.55	99	54	147	7.0	1.9	0.22		453	358	35	0.19						1340	1155	469	371	0.28	SRC/SWC
NW-14-33-24-04-W2	31-Oct-01	YRK 99-04	23.5	Leech Lake	7.53	92	49	151	6.9	2.0	0.22		456	330	38	<0.04						1450	1125	431	374	-0.16	SRC
NW-15-33-24-04-W2	5-Nov-99	TH 75-08	16.0	Leech Lake	7.66	81	53	117	6.5	2.7	0.31		443	267	25	0.24						1110	996	420	363	0.48	SRC/SWC
NW-15-33-24-04-W2	23-Aug-00	TH 75-08	16.0	Leech Lake	7.50	82	50	112	6.0	3.5	0.35		464	246	22	0.18						1185	986	411	380	-0.45	SRC
NW-15-33-24-04-W2	31-Oct-01	TH 75-08	16.0	Leech Lake	7.68	73	50	112	6.7	3.2	0.30		440	240	24	<0.04						1190	949	388	361	-0.33	SRC
NW-15-33-24-04-W2	21-Oct-02	TH 75-08	16.0	Leech Lake	7.3	73	50	112		2.8	0.29		439	238	21	<0.04						1095	936	388	360	-0.45	SRC/HEALTH
NE-16-33-24-04-W2	18-Dec-79	MW #4	22.0	Leech Lake	8.00	114	41	28	4.0	3.4	0.64		547	53	25	0.10						853	816	452	448	-1.86	IWS
NE-16-33-24-04-W2	5-Nov-99	Sandercock	22.9	Leech Lake	7.35	112	40	27	4.2	2.0	0.48		503	71	10	0.10						839	770	444	412	0.77	SRC/SWC
NE-16-33-24-04-W2	5-Nov-99	TH 75-06	20.4	Leech Lake	7.36	108	49	14	4.3	6.4	0.49		492	89	22	0.10						879	785	471	403	-1.93	SRC/SWC
NE-16-33-24-04-W2	22-Aug-00	TH 75-06	20.4	Leech Lake	7.30	126	47	10	22	3.5	0.65		520	88	4	0.35						940	822	508	426	3.14	SRC
NE-16-33-24-04-W2	30-Oct-01	TH 75-06	20.4	Leech Lake	7.40	129	43	10	3.6	3.9	0.62		497	88	23	<0.04						989	798	499	407	-0.59	SRC
NE-16-33-24-04-W2	22-Oct-02	TH 75-06	20.4	Leech Lake	7.0	105	50	8		10.2	0.44		471	66	18	<0.04						815	729	468	386	0.52	SRC/HEALTH
SE-01-34-24-04-W2	3-Nov-99	Woloshuck	21.3	Leech Lake	7.57	131	70	163	9.3	1.2	0.93		473	511	60	0.04						1370	1419	615	388	-1.16	SRC/SWC
SW-02-34-24-04-W2	18-Sep-67	TH 67-03	43.9	Leech Lake	7.32	134	67	165	9.0				522	470	53							1550	1420	609	428	-0.58	IWS
SW-02-34-24-04-W2	29-Oct-01	TH 67-03	43.9	Leech Lake	7.53	140	78	217	9.1	1.4	1.4		465	608	83	<0.04						2050	1603	670	381	1.00	SRC
SW-02-34-24-04-W2	22-Oct-02	TH 67-03	43.9	Leech Lake	7.30	146	79	215		2.7	1.3		471	603	85	<0.04						1970	1603	690	386	1.02	SRC/HEALTH
SW-02-34-24-04-W2	21-Oct-03	TH 67-03	43.9	Leech Lake	7.40	138	75	219	8.6	3.7	1.4		459	610	82	<0.04						1980	1597	653	376	0.59	SRC
SW-02-34-24-04-W2	1-Nov-01	YRK 2001-01	43.1	Leech Lake	7.56	140	72	223	9.1	0.7	1.3		464	604	83	<0.04						2060	1597	645	380	0.71	SRC
SW-02-34-24-04-W2	21-Oct-02	YRK 2001-01	43.1	Leech Lake	7.20	147	74	213		0.5	1.39		461	613	86	<0.04						1950	1596	672	378	-0.12	SRC/HEALTH
SW-02-34-24-04-W2	21-Oct-03	YRK 2001-01	43.1	Leech Lake	7.35	146	72	220	8.7	0.6	1.37		461	620	81	<0.04						1990	1611	660	378	0.55	SRC
NW-05-34-24-04-W2	25-Feb-77	TH 76-51	18.3	Leech Lake	7.71	77	60	36	6.1				402	132	15	1.60	0.05					810	730	440	330	3.49	IWS
NW-05-34-24-04-W2	23-Aug-00	TH 76-51	18.3	Leech Lake	7.40	87	43	85	5.0	4.0	0.53		461	187	25	0.44						1067	898	394	378	-1.91	SRC
NW-05-34-24-04-W2	29-Oct-01	TH 76-51	18.3	Leech Lake	7.66	88	45	90	5.8	1.7	0.52		449	199	25	<0.04						1100	904	404	638	-0.20	SRC
SE-05-34-24-04-W2	26-Oct-79	MW #5	19.2	Leech Lake		114	59	61	6.8	2.1	0.82		468	232	35	2.43				6		1087	981	527	384	-0.58	IWS
SW-06-34-24-04-W2	24-Jul-75	R.BUCKLE	19.5	Leech Lake	7.66	76	41	844	12	1.6	1.09		418	1015	597							4080	3006	359	343	-0.72	IWS
SE-05-34-24-04-W2	10-Nov-88	R.BUCKLE	19.5	Leech Lake	7.85	116	56	86	6.8	2.3	0.78		459	277	29	0.03	0.06	0.36		2.8		1020	1033	522	376	0.71	SRC
SE-05-34-24-04-W2	5-Nov-99	R.BUCKLE	19.5	Leech Lake	7.52	115	59	110	6.8	1.6	0.60		458	331	36	0.04						1250	1118	529	375	0.45	SRC/SWC
SE-05-34-24-04-W2	25-Aug-00	R.BUCKLE	19.5	Leech Lake	7.50	110	58	107	6.0	1.6	0.53		476	301	33	0.35						1340	1093	514	390	0.22	SRC
SE-05-34-24-04-W2	31-Oct-01	R.BUCKLE	19.5	Leech Lake	7.53	109	54	105	6.6	1.80	0.59		458	295	34	<0.04						1350	1064	494	375	0.04	SRC
SE-05-34-24-04-W2	22-Oct-02	R.BUCKLE	19.5	Leech Lake	7.1	114	55	108		1.80	0.58		459	299	36	<0.04						1252	1073	511	376	0.50	SRC/HEALTH
SW-06-34-24-04-W2	22-Oct-03	R.BUCKLE	19.5	Leech Lake	7.6	110	53	105	6.4	1.89	0.60		454	300	33	<0.04						1260	1064	492	372	-0.12	SRC
SE-09-34-24-04-W2	22-Aug-00	TH 75-04	30.9	Leech Lake	7.50	130	81	130	8.0	7.1	1.10		466	462	63	0.27						1680	1348		382	-0.07	SRC
SE-09-34-24-04-W2	29-Oct-01	TH 75-04	30.9	Leech Lake	7.67	146	75	131	8.2	6.4	1.10		458	483	59	<0.04						1730	1368	672	375	0.36	SRC
SE-09-34-24-04-W2	21-Oct-02	TH 75-04	30.9	Leech Lake	7.1	128	82	141		19.3	0.94		422	484	66	<0.04						1610	1343	657	346	1.08	SRC/HEALTH
SE-09-34-24-04-W2	4-Nov-99	YRK 99-01	42.2	Leech Lake	7.67	81	47	372	9.7	0.24	0.56		531	545	136	0.08						2060	1723	395	435	0.94	SRC/SWC

Table A-2 Water quality data for the Yorkton study area

LAND LOCATION	DATE SAMPLED	WELL NAME	WELL DEPTH	AQUIFER	PH	CA	MG	NA	K	FE	MN	CO3	HCO3	SO4	CL	NO3- NO3	PO4- PO4	F	C TOT.	C INORG.	C ORG.	COND	Sum	T.H. CACO3	T.A CACO3	ERROR	REFERENCE
QTR-LSD-S-TP-RG-M			M											MG/L								uS/CM	MG/L	MG/L			
SE-09-34-24-04-W2	25-Aug-00	YRK 99-01	42.2	Leech Lake	7.60	78	49	339	10	0.27	0.50		554	522	136	0.49						2200	1689	397	454	-1.85	SRC
SE-09-34-24-04-W2	30-Oct-01	YRK 99-01	42.2	Leech Lake	7.73	77	44	339	9.7	0.30	0.55		533	501	120	<0.04						2160	1625	373	437	-0.21	SRC
SE-11-34-24-04-W2	27-Aug-00	YRK 2000-05	16.2	Leech Lake	7.45	131	55	89	7.7	0.35	1.00		464	330	36	<0.04						1280	1114	553	380	-1.17	SRC
SE-11-34-24-04-W3	27-Aug-00	YRK 2000-05	16.2	Leech Lake	7.50	124	59	86	7.0				478	319	37	0.44						1360	1110	553	392	-1.85	Health/duplic
SE-11-34-24-04-W4	30-Oct-01	YRK 2000-05	16.2	Leech Lake	7.0	135	56	93		0.30	0.94		464	313	38	<0.04						1268	1100	568	380	0.64	SRC/HEALTH
SE-11-34-24-04-W5	22-Oct-02	YRK 2000-05	16.2	Leech Lake	7.46	125	53	92	8.0	0.36	1.00		462	306	36	<0.04						1360	1083	530	379	-0.51	SRC
NW-15-34-24-04-W2	5-Nov-99	TH 75-10	22.5	Leech Lake	7.52	95	47	64	6.3	4.8	0.35		451	163	22	0.17						937	854	430	370	0.63	SRC/SWC
NW-15-34-24-04-W2	22-Aug-00	TH 75-10	28.3	Leech Lake	7.40	92	46	59	6.0	3.6	0.35		468	155	22							1003	852	419	384	-1.87	SRC
NW-15-34-24-04-W2	30-Oct-01	TH 75-10	28.3	Leech Lake	7.45	95	45	61	6.2	3.70	0.35		450	165	23	<0.04						1040	849	422	369	-0.90	SRC
NW-15-34-24-04-W2	22-Oct-02	TH 75-10	28.3	Leech Lake	6.7	105	50	66		7.50	0.37		444	181	23	<0.04						983	877	468	364	2.22	SRC/HEALTH
NW-16-34-24-04-W2	26-Aug-00	YRK 2000-03	41.8	Leech Lake	7.40	93	139	167	11	1.5	0.65		547	647	36	0.44						1960	1643	805	448	0.35	SRC
NW-16-34-24-04-W2	30-Oct-01	YRK 2000-03	41.8	Leech Lake	7.40	155	71	158	9.8	1.20	0.67		484	526	61	<0.04						1820	1467	678	397	0.23	SRC
NW-16-34-24-04-W2	22-Oct-02	YRK 2000-03	41.8	Leech Lake	7.1	78	59	76		0.60	0.52		468	180	23	<0.04						1019	885	438	384	-0.06	SRC/HEALTH
NW-16-34-24-04-W2	21-Oct-03	YRK 2000-03	41.8	Leech Lake	7.4	82	52	66	7.3	0.68	0.55		460	160	22	<0.04						1000	851	418	377	-0.27	SRC
SE-16-34-24-04-W2	21-Aug-00	TH 75-09	38.4	Leech Lake	7.40	155	82	145	10	1.5	1.40		498	532	65	0.27						1840	1490	725	408	-0.07	SRC
SE-16-34-24-04-W2	21-Aug-00	TH 75-11	36.6	Leech Lake	7.30	148	83	144	9.0	1.7	1.50		498	523	69	0.31						1860	1478	711	408	-0.70	SRC
SE-16-34-24-04-W2	31-Jan-76	WELL 009	33.5	Leech Lake	7.50	122	57	113	8.0	0.25	0.95		536	276	62					<1		1320	1175	537	439	-1.19	IWS
SE-16-34-24-04-W2	3-Nov-79	WELL 009	33.5	Leech Lake	7.53	108	62	131	14	<0.001	0.92		488	278	74	0.04						1350	1156	526	400	2.08	IWS
SE-16-34-24-04-W2	24-Mar-80	WELL 009	33.5	Leech Lake	8.11	104	51	108	8.0	0.50	0.80		521	230	54	<0.02						1163	1077	469	427	-1.93	IWS
SE-16-34-24-04-W2	30-Aug-88	WELL 009	33.5	Leech Lake	7.70	125	56	96		0.80	0.80		478	252	38	<1						1186	1047	542	392	2.98	YORKTON
SE-16-34-24-04-W2	8-Nov-88	WELL 009	33.5	Leech Lake	7.78	110	52	93	7.4	0.72	0.78		456	264	35	0.04	0.03	0.29		3.2		1220	1019	491	374	0.16	SRC
SE-16-34-24-04-W2	20-Apr-89	WELL 009	33.5	Leech Lake		107	61	98			0.72		499	268	44	2.00		0.20					1080	520	409	-1.38	YORKTON
SE-16-34-24-04-W2	27-Mar-92	WELL 009	33.5	Leech Lake		125	58	93			0.73		476	270	48	<1		0.20				1330	1071	552	390	0.93	YORKTON
SE-16-34-24-04-W2	8-Apr-93	WELL 009	33.5	Leech Lake		126	60	91			0.78		476	310	49	2.00		0.30				1370	1115	562	390	-1.58	YORKTON
SE-16-34-24-04-W2	27-Oct-96	WELL 009	33.5	Leech Lake		125	62	109	8.9	0.84	0.96		476	335	52	0.94							1171			0.15	SRC
SE-16-34-24-04-W2	25-Jun-97	WELL 009	33.5	Leech Lake		124	76	113					486	434	57	<1						1600	1290			-3.48	YORKTON
SE-16-34-24-04-W2	5-Nov-99	WELL 009	33.5	Leech Lake	7.56	161	82	127	9.4	1.2	1.10		465	530	62	0.04						1660	1439	722		0.34	SRC
SE-16-34-24-04-W2	25-Aug-00	WELL 009	33.5	Leech Lake	7.30	160	85	123	9.0	0.87	1.10		488	527	68	0.18						1820	1462	750	400	-0.80	SRC
SE-16-34-24-04-W2	23-Apr-01	WELL 009	33.5	Leech Lake	7.31	145	72	122	9.1	0.85	1.00		465	445	56	<0.04						1650	1316	658	381	0.63	SRC
SE-16-34-24-04-W2	31-Oct-01	WELL 009	33.5	Leech Lake	7.33	170	80	129	9.7	0.82	1.30		470	541	73	<0.04						1880	1475	753	385	-0.24	SRC
SE-16-34-24-04-W2	20-Mar-02	WELL 009	33.5	Leech Lake	7.46	148	72	126	9.5	0.97	1.10		472	477	61	<0.2	0.02	0.27				1690	1368	665	387	-0.92	SRC
SE-16-34-24-04-W2	23-Oct-02	WELL 009	33.5	Leech Lake	7.1	172	85	136		0.80	1.16		473	548	72	<0.04						1760	1488	780	388	0.70	SRC/HEALTH
SE-16-34-24-04-W2	11-Aug-03	WELL 009	33.5	Leech Lake	7.45	169	85	139	9.8	1.01	1.14		466	580	68						3.3	1830	1519	771	382	0.22	SRC
SE-16-34-24-04-W2	21-Oct-03	WELL 009	33.5	Leech Lake	7.7	166	83	140	9.8	0.71	1.19		470	570	70	<0.04						1830	1511	755	385	-0.21	SRC
SE-16-34-24-04-W2	16-Jun-04	WELL 009	33.5	Leech Lake	7.70	157	77	137		0.90	1.02		481	499	56			0.26				1720	1409	709	394	0.70	Prov. Lab
SW-16-34-24-04-W2	2-Nov-01	YRK 2001-03	44.5	Leech Lake	7.48	84	96	114	9.7	2.40	0.77		486	410	29	<0.04						1540	1232	604	398	-0.06	SRC
SW-16-34-24-04-W2	21-Oct-02	YRK 2001-03	44.5	Leech Lake	7.1	168	74	162		2.40	0.76		486	539	65	<0.04						1760	1497	724	398	1.17	SRC/HEALTH
SW-16-34-24-04-W2	21-Oct-03	YRK 2001-03	44.5	Leech Lake	7.4	157	71	162	9.5	2.51	0.79		481	540	65	<0.04						1790	1489	683	394	0.02	SRC
SW-16-34-24-04-W2	19-Dec-02	YRK 2002-01	22.5	Leech Lake	7.3	153	74	112	9.2	1.8	1.00		462	461	55	<0.04						1650	1329	686	379	0.29	CLIFTON
SW-16-34-24-04-W2	21-Oct-03	YRK 2002-01	22.5	Leech Lake	7.4	158	74	102	8.7	1.8	0.97		461	460	61	<0.04						1590	1328	698	378	-0.59	CLIFTON
NE-14-35-24-04-W2	26-Aug-00	YRK 2000-04	18.2	Leech Lake	7.49	108	65	93	8.5	1.8	0.38		437	311	27	<0.04						1210	1052	537	358	2.05	SRC
NE-14-35-24-04-W3	26-Aug-00	YRK 2000-04	18.2	Leech Lake	7.50	102	60	89	8.0				368	304	24	0.44						1243	955	502	449	3.90	Health/Duplic
NE-14-35-24-04-W4	31-Oct-01	YRK 2000-04	18.2	Leech Lake	7.56	101	55	91	9.0	1.8	0.38		437	285	28	<0.04						1240	1008	478	358	-0.48	SRC
NE-14-35-24-04-W5	22-Oct-02	YRK 2000-04	18.2	Leech Lake	7.1	106	58	91		1.7	0.35		439	286	25	<0.04						1179	1007	504	360	0.59	SRC/HEALTH
NW-13-35-24-04-W2	2-Sep-66	TH 66-15	29.9	Leech Lake	8.10	108	66	135	11	0.29	1.10		412	377	86	NIL		0.20					1196	542	338	-0.16	IWS
SW-13-35-24-04-W2	22-Aug-00	TH 75-02	21.8	Leech Lake	7.33	144	95	124	10	3.2	0.32		461	569	57	<0.04						1740	1464	750	378	-0.86	SRC
SW-13-35-24-04-W2	29-Oct-01	TH 75-02	21.8	Leech Lake	7.52	155	86	119	10	3.4	0.31		456	527	65	<0.04						1800	1422	740	374	-0.09	SRC
SW-13-35-24-04-W2	21-Oct-02	TH 75-02	21.8	Leech Lake	7.1	167	95	132		4.0	0.32		461	556	70	<0.04						1770	1485	808	378	1.83	SRC/HEALTH
SW-13-35-24-04-W2	24-Aug-00	Th 79-38	17.1	Leech Lake	7.30	139	72	193	7.0	4.0	0.39		478	589	65	0.27						1950	1548	644	392	-1.15	SRC
NE-14-35-24-04-W2	5-Nov-99	TH 75-08	30.2	Leech Lake	7.08	279	103	273	15	21	0.58		229	1390	79	0.03						2660	2390	1120	188	-0.38	SRC/SWC
NE-16-35-24-04-W2	23-Aug-00	TH 75-13	25.4	Leech Lake	7.25	142	63	206	9.1	7.0	0.36		431	610	93	0.08						1970	1562	613	353	-2.11	SRC
NE-16-35-24-04-W2	23-Aug-00	TH 75-13	25.4	Leech Lake	7.30	151	67	214	9.0				444	600	93	0.35						2020	1578	653	364	0.42	Health/Duplic
SE-16-35-24-04-W2	8-Nov-88	D.LANG	24.7	Leech Lake	7.64	200	82	185	10	3.40	0.22		515	668	90	0.09	0.06	0.33		2.1		2110	1754	838	422	0.28	SRC
SE-16-35-24-04-W2	3-Nov-99	R. Stachura	24.7	Leech Lake	7.25	206	93	167	13	0.91	0.21		545	633	113	7.60						2080	1779	896	447	0.21	SRC/SWC
SE-04-01-25-04-W2	6-Sep-74	D.BUCKLE	26.5	Leech Lake	7.15	188	72	201	9.0	21	0.15		469	754	56	4.40	<0.05	0.17				1970	1775	764	384	-1.53	SRC
SE-04-01-25-04-W2	2-Nov-99	D.BUCKLE	26.5	Leech Lake	7.36	183	82	208	9.4	1.80	0.15		471	737	183	0.76						1876	1876	794	386	-5.75	SRC/SWC
NE-04-02-25-04-W2	19-Dec-02	YRK 2002-02A	17	Leech Lake	8.4	66	18	175	9.7	0.1	0.03		153	421	41							1210	884	239	135	0.82	CLIFTON
NE-04-02-25-04-W2	21-Oct-03	YRK 2002-02A	17	Leech Lake	7.6	107	45	109	8.4	0.5	0.49		476	240	42	<0.04						1230	1028	452	390	0.06	CLIFTON
NE-04-02-25-04-W2	19-Dec-02	YRK 2002-02B	44.7	Leech Lake	7.9	86	47	241	12	0.0	0.08		248	629	48							1580	1311	408	203	1.16	CLIFTON
NE-04-02-25-04-W2	21-Oct-03	YRK 2002-02B	44.7	Leech Lake	7.5	156	64	211	9.8	1.0	1.11		503	610	44	<0.04						1910	1600	652	412	0.66	CLIFTON
NW-04-02-25-04-W2	21-Aug-00	TH 75-05	40.1	Leech Lake	7.20	195	104	135	10	9.7	1.60		576	622	67	0.26						2070	1721	915	472	0.27	SRC

Table A-2 Water quality data for the Yorkton study area

LAND LOCATION	DATE SAMPLED	WELL NAME	WELL DEPTH	AQUIFER	PH	CA	MG	NA	K	FE	MN	CO3	HCO3	SO4	CL	NO3- NO3	PO4- PO4	F	C TOT.	C INORG.	C ORG.	COND	Sum	T.H. CACO3	T.A CACO3	ERROR	REFERENCE
QTR-LSD-S-TP-RG-M			M											MG/L								uS/CM	MG/L	MG/L			
NW-04-02-25-04-W2	29-Oct-01	TH 75-05	40.1	Leech Lake	7.40	184	96	126	10	21.0	1.40		525	595	70	<0.04						2010	1628	854	430	-0.33	SRC
NW-04-02-25-04-W2	21-Oct-02	TH 75-05	40.1	Leech Lake	7.0	189	99	131		20.7	1.36		554	546	67	<0.04						1860	1608	880	454	2.06	SRC/HEALTH
NE-05-02-25-04-W2	18-Dec-79	MW #3	36.6	Leech Lake	7.92	162	87	127	10.3	6.20	0.49		575	437	53	6.77						1749	1465	759	472	2.20	IWS
NE-05-02-25-04-W2	4-Nov-99	S. Buckle	37.9	Leech Lake	7.30	226	108	145	12	0.04	2.00		576	764	42	0.08						2020	1875	1010	472	0.46	SRC/SWC
NE-05-02-25-04-W2	25-Aug-00	S. Buckle	37.9	Leech Lake	7.30	212	105	140	11	1.8	0.01		600	745	44	0.18						2170	1859	962	492	-1.91	SRC
NE-05-02-25-04-W2	31-Oct-01	S. Buckle	37.9	Leech Lake	7.35	219	101	145	13	0.052	2.10		581	732	43	<0.04						2220	1836	961	476	-0.19	SRC
NE-05-02-25-04-W2	22-Oct-02	S. Buckle	37.9	Leech Lake	7.0	232	105	143		<0.1	1.99		581	745	43	<0.04						2080	1851	1012	476	0.36	SRC/HEALTH
NE-05-02-25-04-W2	22-Oct-03	S. Buckle	37.9	Leech Lake	7.3	227	106	147	13	0.038	2.09		575	760	43	<0.04						2140	1873	1000	471	0.59	SRC
NW-08-02-25-04-W2	5-Nov-99	Kruk	25.6	Leech Lake	7.55	121	67	149	9.9	0.85	0.45		453	440	55	0.04						1510	1296	577	371	0.41	SRC/SWC
NE-12-02-25-04-W2	19-Dec-02	YRK 2002-03	40.3	Leech Lake	7.2	241	124	181	15	2.6	0.93		622	900	67							2500	2154	1110	510	-0.55	CLIFTON
NE-12-02-25-04-W2	21-Oct-03	YRK 2002-03	40.3	Leech Lake	7.3	261	126	177	15	4.4	0.88		623	930	67	<0.04						2490	2204	1170	511	0.02	CLIFTON
NE-01-03-25-04-W2	9-Nov-01	YRK 2001-04	39.7	Leech Lake	7.30	171	81	142	11	0.13	1.60		572	477	89	<0.04						1930	1545	759	469	-0.37	SRC
NE-01-03-25-04-W2	21-Oct-02	YRK 2001-04	39.7	Leech Lake	6.9	189	85	139		0.10	1.55		571	484	97	<0.04						1840	1567	822	468	0.67	SRC/HEALTH
NE-01-03-25-04-W2	21-Oct-03	YRK 2001-04	39.7	Leech Lake	7.2	180	80	142	11	0.12	1.62		564	480	100	<0.04						1890	1559	778	462	-0.08	SRC
SE-01-03-25-04-W2	11-Oct-66	TH 66-18	26.5	Leech Lake	7.30	164	61	156	13	0.05	1.43		554	405	101			0.19					1455	662	454	-0.10	IWS
SE-01-03-25-04-W2	30-Jul-69	WELL 008	35.1	Leech Lake		144	64	154	10				524	394	99			0.21					1389	625	430	-0.45	IWS
SE-01-03-25-04-W2	29-Jun-71	WELL 008	35.1	Leech Lake	7.73	79	104	128	10	0.30			562	346	66	4.00	<0.1	0.23				1390	1299	630	461	-0.05	SRC
SE-01-03-25-04-W2	28-May-73	WELL 008	35.1	Leech Lake	7.35	135	65	130	9.0	1.3	1.15		543	322	70	<1	<0.1	0.36				1480	1276	603	445	1.10	IWS
SE-01-03-25-04-W2	12-Mar-74	WELL 008	35.1	Leech Lake	7.20	134	60	136	5.0	0.50	1.10		542	342	74							1460	1295	579	444	-1.18	IWS
SE-01-03-25-04-W2	23-Apr-75	WELL 008	35.1	Leech Lake	7.75	154	48	127	9.0	0.64	1.02		539	316	65							1340	1260	582	442	0.41	IWS
SE-01-03-25-04-W2	1-May-75	WELL 008	35.1	Leech Lake	7.51	145	52	128	8.0	0.73	0.99		531	317	72	0.10	0.05	0.38				1340	1255	574	435	-0.14	IWS
SE-01-03-25-04-W2	24-Jul-75	WELL 008	35.1	Leech Lake	7.67	116	71	122	11	0.40	0.98		504	311	75							1350	1211	536	413	1.08	IWS
SE-01-03-25-04-W2	30-Jun-76	WELL 008	35.1	Leech Lake	8.15	130	61	121	8.0	0.43	0.92		539	305	46	0.31	0.03			8		1312	1212	576	442	1.46	IWS
SE-01-03-25-04-W2	3-Nov-79	WELL 008	35.1	Leech Lake	7.63	129	65	91	11	<0.001	0.87		498	272	54	4.87						1260	1126	589	408	1.90	IWS
SE-01-03-25-04-W2	24-Mar-80	WELL 008	35.1	Leech Lake	7.83	115	57	108	8.0	0.60	0.90		534	262	33	0.40						1263	1119	522	438	0.61	IWS
SE-01-03-25-04-W2	10-Jun-80	WELL 008	35.1	Leech Lake	7.52	111	58	104	8.0	0.26	0.69		506	263	43	5.67	0.18						1100	515	415	-0.11	UMA,1980
SE-01-03-25-04-W2	8-Nov-88	WELL 008	35.1	Leech Lake	7.68	153	68	121	8.7	0.48	1.30		562	369	58	0.04	0.03	0.24		4.9		1590	1342	662	461	0.50	SRC
SE-01-03-25-04-W2	17-Oct-96	WELL 008	35.1	Leech Lake	7.34	153	69	118					577	338	64	<0.04							1319			0.40	SRC
SE-01-03-25-04-W2	25-Jun-97	WELL 008	35.1	Leech Lake	7.40	163	75	120					581	388	59	1.00						1530	1387			0.63	Yorkton
SE-01-03-25-04-W2	25-Nov-97	WELL 008	35.1	Leech Lake	8.00	137	66	115		0.40	1.09		549	344	57	1.00						1520	1270			-1.47	Yorkton
SE-01-03-25-04-W2	5-Nov-99	WELL 008	35.1	Leech Lake	7.56	131	62	127	8.2	0.39	1.10		516	345	51	0.04						1660	1242	582	423	0.85	SRC
SE-01-03-25-04-W2	25-Aug-00	WELL 008	35.1	Leech Lake	7.40	128	65	119	8.0	0.33	0.93		436	324	56	0.35						1510	1138	587	532	5.03	SRC
SE-01-03-25-04-W2	11-Oct-00	WELL 008	35.1	Leech Lake	7.4	124	60	122	8.5	0.41	1.1		512	342	52							1470	1222	556	420	-0.98	SRC
SE-01-03-25-04-W2	31-May-01	WELL 008	35.1	Leech Lake	7.34	127	62	122	8.2	0.4	1.1		516	315	53	<0.04		0.24				1460	1205	572	423	1.33	SRC
SE-01-03-25-04-W2	31-Oct-01	WELL 008	35.1	Leech Lake	7.74	123	57	118	8.3	0.42	1.10		499	325	52	<0.04						1530	1184	541	409	-0.73	SRC
SE-01-03-25-04-W2	23-Oct-02	WELL 008	35.1	Leech Lake	7.1	130	62	121		0.40	1.03		498	332	52	<0.04						1420	1196	580	408	0.93	SRC/HEALTH
SE-01-03-25-04-W2	11-Aug-03	WELL 008	35.1	Leech Lake	7.42	125	61	118	8.0	0.43	1.02		501	340	50						3.7	1440	1204	563	411	-0.32	SRC
SE-01-03-25-04-W2	21-Oct-03	WELL 008	35.1	Leech Lake	7.4	124	58	117	8.0	0.42	1.05		493	330	50	<0.04						1430	1181	548	404	-0.33	SRC
SE-01-03-25-04-W2	16-Jun-04	WELL 008	35.1	Leech Lake	7.6	146	68	114		0.4	1.13		560	342	47			0.24				1530	1278	645	459	0.62	prov lab
NW-13-03-25-04-W2	4-Nov-88	POPOFF	25.9	Leech Lake	7.34	155	71	255	12	2.3	0.66		525	533	175	3.00						2080	1732	678	430	0.58	SRC/SWC
NE-08-04-25-04-W2	4-Nov-99	SMITH	7.3	Leech Lake	7.43	83	44	6	3.6	0.09	0.27		417	51	2	0.21						678	607	388	342	0.99	SRC/SWC
SE-09-04-25-04-W2	4-Nov-99	YRK 99-02	38.4	Leech Lake	7.41	100	43	71	5.9	2.8	0.22		551	95	17	0.08						975	886	426	452	1.20	SRC/SWC
SE-09-04-25-04-W2	25-Aug-00	YRK 99-02	38.4	Leech Lake	7.30	100	46	66	5.0	2.5	0.22		576	94	17	0.44						1010	907	439	472	-0.47	SRC
SE-09-04-25-04-W2	30-Oct-01	YRK 99-02	38.4	Leech Lake	7.46	97	41	68	6.3	2.80	0.23		554	94	17	<0.04						1030	880	410	454	-0.80	SRC
NE-16-04-25-04-W2	5-Nov-99	WHITE	24.4	Leech Lake	7.42	109	54	160	8.7	0.44	0.42		486	295	89	0.60						1420	1203	494	398	1.30	SRC/SWC
NE-16-04-25-04-W2	4-Nov-99	ZULYNIAK	24.4	Leech Lake	7.43	161	78	294	12	0.07	1.00		516	619	225	0.86						2370	1907	772	423	-0.28	SRC/SWC
NW-02-06-25-04-W2	25-Aug-00	HUDDY		Otthon	7.40	133	73	86	6.0	1.00	0.67		488	388	15	0.35						1430	1191	633	400	0.10	SRC
SE-02-06-25-04-W2	26-Aug-00	YRK 2000-02	24.7	Otthon	7.40	160	115	176	7.0	2.1	0.71		495	773	16	0.31						2100	1745	873	406	1.24	SRC
SE-02-06-25-04-W2	31-Oct-01	YRK 2000-02	24.7	Otthon	7.44	159	107	189	8.4	2.30	0.81		471	791	16	<0.04						2110	1745	836	386	1.08	SRC
SE-02-06-25-04-W2	22-Oct-02	YRK 2000-02	24.7	Otthon	7.1	169	110	190		2.20	0.75		478	809	15	<0.04						2030	1774	875	392	1.28	SRC/HEALTH
NE-16-07-25-04-W2	6-Sep-74	PACHAL	23.8	Otthon	7.16	312	150	433	12	6.4	1.46		545	1410	362	0.40	<0.05	0.20				3670	3232	1394	447	-1.52	SRC
SW-02-09-25-04-W2	8-Nov-88	B.CUNNINGHAM	21.9	Leech Lake	7.88	152	68	301	11	4.2	0.46		519	613	180	0.04	0.06	0.36		6.3		2340	1849	662	425	0.39	SRC
SW-02-09-25-04-W2	4-Nov-99	HORVATH	21.9	Leech Lake	7.39	155	78	315	11	3.4	0.47		522	650	182	0.08						2260	1917	707	428	1.65	SRC/SWC
SE-08-09-25-04-W2	4-Nov-99	WOLFE	30.5	Leech Lake	7.24	196	100	45	9.2	5.7	0.52		580	483	12	0.04						1530	1431	900	475	0.75	SRC/SWC
SE-08-09-25-04-W2	18-Mar-75	WOLFE & SON	30.5	Leech Lake	7.10	210	90	45	8.5	9.7	0.57		609	494	8	<0.5	<0.05	0.22				1500	1475	891	499	-1.07	SRC
SW-04-10-25-04-W2	23-Aug-00	TH 75-07	26.8	Leech Lake	7.30	158	81	148	12	5.7	0.80		549	427	125	0.22						1910	1507	728	450	-0.29	SRC
SW-04-10-25-04-W2	30-Oct-01	TH 75-07	26.8	Leech Lake	7.29	204	137	159	15	13.0	0.73		432	860	122	<0.04						2400	1943	1070	354	0.57	SRC
SW-04-10-25-04-W2	22-Oct-02	TH 75-07	26.8	Leech Lake	6.9	190	116	158		14.5	0.73		461	648	134	<0.04						2070	1722	952	378	2.11	SRC/HEALTH
SE-01-11-25-04-W2	20-Mar-75	STACHURA	39.9	Leech Lake	7.42	202	75	358	9.6	9.0	0.12		504	1010	111	<0.05	<0.5	0.14				2460	2279	815	413	-0.54	SRC
SE-16-11-25-04-W2	20-Mar-75	CUSTOM FEEDLOT	80.8	Empress unnamed	7.75	176	72	234	11.0	5.60	0.10		437	813	31	7.00	<0.05	0.11				1950	1787	733	358	0.18	SRC
NE-16-20-25-04-W2	19-Mar-75	TRAILER COURT	50.0	Empress unnamed	7.55	329	116	425	14.0	0.80	2.30		274	1720	186	<0.5	<0.05	0.21				3310	3067	1300	225	-0.82	SRC
NE-16-20-25-04-W2	22-Oct-75	TRAILER COURT	50.0	Empress unnamed	7.42	376	122	369	15.0	2.20	2.20		284	1690	173							3240	3033	1440	233	0.57	IWS

Table A-2 Water quality data for the Yorkton study area

LAND LOCATION QTR-LSD-S-TP-RG-M	DATE SAMPLED	WELL NAME	WELL DEPTH M	AQUIFER	PH	CA	MG	NA	K	FE	MN	CO3	HCO3	SO4 MG/L	CL	NO3- NO3	PO4- PO4	F	C TOT.	C INORG.	C ORG.	COND uS/CM	Sum MG/L	T.H. CACO3 MG/L	T.A CACO3	ERROR	REFERENCE
NE-16-20-25-04-W2	19-Mar-75	WEIGH SCALE	67.7	Empress unnamed	7.45	338	167	927	16.0	16.00	0.99		513	2710	295	<0.5	<0.05	0.33				5130	4983	1530	421	-1.25	SRC
SW-02-21-25-04-W2	22-Aug-74	YORK LAKE		surface water	8.65	50	108	75	34.0	<0.1	0.05	38	223	479	14	<0.5	<0.05	0.12				1290	1021	567	247	5.05	SRC
SW-02-21-25-04-W2	21-Jul-83	YORK LAKE		surface water	8.56	43	116	70	33.0	0.03	0.01	32	251	480	24	0.04	<0.03	0.10				1240	1049	583	260	2.62	SRC
SW-02-21-25-04-W2	18-Aug-74	YORKTON 517	40.5	Empress unnamed	7.72	152	123	268	31.0	1.70	0.25		449	1009	97	<0.5	<0.05	0.19				2270	2131	886	368	-1.54	SRC
SW-02-21-25-04-W2	21-Jul-83	YORKTON 517	40.5	Empress unnamed	7.48	171	141	277	27.0	7.10	0.29		550	1040	108	0.03	<0.03	0.19				2560	2321	996	451	-1.26	SRC
SW-02-21-25-04-W2	9-Nov-88	YORKTON 517	40.5	Empress unnamed	7.76	142	121	259	26.0	5.80	0.20		594	848	72	0.03	0.03	0.29	128	117	11	2000	2068	852	487	-0.77	SRC
NW-14-22-25-04-W2	8-Nov-88	H.KOZUSKA	34.4	Logan South	7.38	189	88	125	12.0	15.00	0.84		593	525	80	0.04	<0.03	0.23	127	117	10	1940	1628	834	486	-1.08	SRC
NW-13-23-25-04-W2	8-Nov-88	C.TATARYN	22.6	Logan South	7.51	203	91	88	10.0	0.46	1.40		550	580	25	1.15	0.06	0.27	114	108	5.7	1770	1550	884	451	-0.26	SRC
SW-13-23-25-04-W2	6-Jun-95	Chupa Well	23.16	Logan south	7.3	122	50	37	0.5				542	146	15	<.02	0.1				4	1051	917	511	444	-2.16	Ballagh, 2001
SW-13-23-25-04-W2	14-Aug-95	Chupa Well	23.16	Logan south	7.4	128	51	40	5				542	149	12	<.02	0.16				5	1047	927	530	444	0.52	Ballagh, 2001
SW-13-23-25-04-W2	23-Oct-95	Chupa Well	23.16	Logan south	7.3	126	53	40	6				539	149	6	0.2	0.07				4	1045	919	533	442	1.76	Ballagh, 2001
SW-13-23-25-04-W2	27-May-96	Chupa Well	23.16	Logan south	7.4	133	55	41	6				544	168	13	0.09	0.09				5	1024	960	559	446	1.23	Ballagh, 2001
SW-13-23-25-04-W2	30-Jul-96	Chupa Well	23.16	Logan south	7.3	132	53	38	6				537	167	10	0.12	0.34				5	1066	943	548	440	0.76	Ballagh, 2001
SW-13-23-25-04-W2	15-Oct-96	Chupa Well	23.16	Logan south	7.4	132	54	37	5				539	168	14	0.08	0.09				4	1066	949	552	442	0.16	Ballagh, 2001
SW-13-23-25-04-W2	26-May-97	Chupa Well	23.16	Logan south	7.4	134	55	39	6				540	169	7	0.02	0.1				6	1089	950	561	442.6	1.93	Ballagh, 2001
SW-13-23-25-04-W2	2-Sep-97	Chupa Well	23.16	Logan south	7.3	129	56	36	6				536	169	12	<.02	0.13				5	1071	944	553	439.6	0.48	Ballagh, 2001
SW-13-23-25-04-W2	4-Nov-97	Chupa Well	23.16	Logan south	7.8	131	56	37	6				537	178	8	<.02	0.1				5	1069	953	558	440	0.68	Ballagh, 2001
SW-13-23-25-04-W2	8-Sep-98	Chupa Well	23.16	Logan south	7.1	155	62	28	9				501	302	5	0.06	0.19				6.3	1228	1062	642	411	-1.23	Ballagh, 2001
SW-13-23-25-04-W2	21-Oct-98	Chupa Well	23.16	Logan south	7.4	134	58	35	6				540	192	8	0.04	0.14				4.5	1090	973	573	443	0.23	Ballagh, 2001
SW-13-23-25-04-W2	18-May-99	Chupa Well	23.16	Logan south	7.1	137	59	37	7				540	189	7	0.11	0.14				4.6	1103	976	585	443	1.87	Ballagh, 2001
SW-13-23-25-04-W2	17-Aug-99	Chupa Well	23.16	Logan south	7.1	138	60	36	6				550	216	7	0.13	0.11				4.6	1098	1013	592	451	-0.62	Ballagh, 2001
SW-13-23-25-04-W2	3-Nov-99	Chupa Well	23.16	Logan south	7.4	140	60	36	6				549	192	9	0.02	0.1				4	1118	992	597	450	1.46	Ballagh, 2001
SE-16-23-25-04-W2	17-Mar-75	BITTNER	28.7	Logan South	7.01	286	128	103	8.3	4.60	1.19		646	903	14	<0.05	<0.05	0.19				2030	2094	1240	530	-0.48	SRC
SE-16-23-25-04-W2	6-Jun-95	Bitter-Graves Well	28.7	Logan south	7.5	149	71	25	7				578	176	29	17.49	0.13				7	1276	1035	664	474	1.06	Ballagh, 2001
SE-16-23-25-04-W2	14-Aug-95	Bitter-Graves Well	28.7	Logan south	7.5	173	83	29	7				595	227	24	19.93	0.15				7	1420	1138	774	488	4.41	Ballagh, 2001
SE-16-23-25-04-W2	23-Oct-95	Bitter-Graves Well	28.7	Logan south	7.5	173	84	30	7				593	217	20	24.04	0.11				7	1410	1124	778	486	5.71	Ballagh, 2001
SE-16-23-25-04-W2	27-May-96	Bitter-Graves Well	28.7	Logan south	7.4	160	78	27	7				588	183	26	23.66	0.1				8	1256	1069	721	482	3.94	Ballagh, 2001
SE-16-23-25-04-W2	30-Jul-96	Bitter-Graves Well	28.7	Logan south	7.4	170	83	27	7				593	210	21	26.6	0.15				8	1420	1111	766	486	4.89	Ballagh, 2001
SE-16-23-25-04-W2	15-Oct-96	Bitter-Graves Well	28.7	Logan south	7.4	173	85	27	7				598	230	33	25.85	0.13				7	1430	1153	782	490	3.17	Ballagh, 2001
SE-16-23-25-04-W2	26-May-97	Bitter-Graves Well	28.7	Logan south	7.6	161	75	26	7				573	175	24	19.8	0.12				8	1320	1041	711	470	5.02	Ballagh, 2001
SE-16-23-25-04-W2	2-Sep-97	Bitter-Graves Well	28.7	Logan south	7.4	164	82	26	7				583	202	27	21.58	0.12				8	1380	1091	747	477.6	4.41	Ballagh, 2001
SE-16-23-25-04-W2	4-Nov-97	Bitter-Graves Well	28.7	Logan south	7.9	164	80	26	7				573	206	19	24.29	0.13				7	1330	1075	739	470	4.79	Ballagh, 2001
SE-16-23-25-04-W2	8-Sep-98	Bitter-Graves Well	28.7	Logan south	7.2	132	54	37	6				539	181	15	0.15	0.15				4.3	1087	964	552	442	-0.91	Ballagh, 2001
SE-16-23-25-04-W2	21-Oct-98	Bitter-Graves Well	28.7	Logan south	7.6	176	91	24	7				590	227	20	28.36	0.18				6.8	1370	1135	814	484	6.31	Ballagh, 2001
SE-16-23-25-04-W2	18-May-99	Bitter-Graves Well	28.7	Logan south	7.3	186	95	27	8				632	255	21	25.67	0.18				7.6	1500	1224	856	518	5.13	Ballagh, 2001
SE-16-23-25-04-W2	17-Aug-99	Bitter-Graves Well	28.7	Logan south	7.2	193	103	28	7				650	310	23	28.69	0.12				7.5	1580	1428	906	533	3.40	Ballagh, 2001
SE-16-23-25-04-W2	3-Nov-99	Bitter-Graves Well	28.7	Logan south	7.5	175	91	26	8				617	211	24	25.26	0.13				7	1470	1152	812	506	5.93	Ballagh, 2001
NW-01-26-25-04-W2	17-Mar-75	MID-DALE FARMS	15.2	Logan South	7.28	152	67	44	7.3	0.90	0.29		583	258	11	3.50	<0.05	0.29				1140	1127	653	478	-0.31	SRC
NE-09-27-25-04-W2	19-Oct-93	MW 93-08	22.1	Logan Valley	7.42	73	59	22	5.4	0.7	0.6		415	112	4	<0.04	0.09	0.30				815	692	425	340	1.84	SRC
NE-16-27-25-04-W2	9-Nov-88	A.ENGEL	18.3	Logan Valley	7.98	93	61	24	5.0	<0.01	0.05		489	85	23	36.29	0.15	0.52	100	96	3.6	785	816	485	401	-0.85	SRC
NE-16-27-25-04-W2	19-Mar-75	ENGEL	22.6	Logan Valley	7.40	78	46	16	3.4	<0.10	0.23		442	51	7	8.00	<0.05	0.32				682	652	385	363	-1.01	SRC
NW-13-28-25-04-W2	22-Jun-81	WELL 013	58.6	Collacott		168	48	16	9.0	3.50	0.81		515	213	5							1060	978	613	422	0.92	IWS
NW-13-28-25-04-W2	28-Aug-81	WELL 013	58.6	Collacott	7.26	184	61	14		3.50	0.85		531	254	4							1140	1052	708	435	2.44	IWS
NW-13-28-25-04-W2	9-Nov-88	WELL 013	58.6	Collacott	7.45	198	62	14	8.6	4.20	1.10		556	302	7	0.04	0.06	0.38	113	109	3.8	1270	1153	748	456	0.68	SRC
NW-13-28-25-04-W2	20-Jun-95	WELL 013	58.6	Collacott	7.30	188	63	14	8.0				566	272	14	<0.08	0.34					1310	1125	729	464	0.14	SERM
NW-13-28-25-04-W2	21-Aug-95	WELL 013	58.6	Collacott	7.10	190	65	15	8.0				569	267	16	<0.08	0.49					1290	1130	742	466	1.13	SERM
NW-13-28-25-04-W2	23-Oct-95	WELL 013	58.6	Collacott	7.10	189	65	15	8.0				569	287	12	0.18	0.25					1320	1145	740	466	-0.02	SERM
NW-13-28-25-04-W2	27-May-96	WELL 013	58.6	Collacott	7.10	191	65	14	9.0				583	303	14	0.31	0.21					1360	1179	745	478	-1.70	SERM
NW-13-28-25-04-W2	6-Aug-96	WELL 013	58.6	Collacott	7.10	186	62	14	8.0				578	285	14	0.13	0.31					1360	1147	720	474	-1.96	SERM
NW-13-28-25-04-W2	12-Sep-96	WELL 013	58.6	Collacott	7.21	200	68	14	10.0	3.90	1.20		565	323	14	0.18	0.28	0.34				1380	1199	778	463	0.18	SRC
NW-13-28-25-04-W2	16-Oct-96	WELL 013	58.6	Collacott	7.20	199	68	14	9.0	4.4			583	290	15						5.0	1340	1182	777	478	1.08	SERM
NW-13-28-25-04-W2	27-May-97	WELL 013	58.6	Collacott	7.40	197	68	15	9.0				576	307	12						5.0	1350	1184	772	472	0.42	SERM
NW-13-28-25-04-W2	8-Sep-97	WELL 013	58.6	Collacott	7.20	199	69	14	8.0				576	314	19						5.0	1370	1199	781	472	-0.28	SERM
NW-13-28-25-04-W2	26-Nov-97	WELL 013	58.6	Collacott	7.70	196	71	14	9.0				573	321	11						5.0	1340	1195	782	470	0.24	SERM
NW-13-28-25-04-W2	3-Jun-98	WELL 013	58.6	Collacott	7.20	202	72	15	9.0				590	306	9						5.8	1292	1203	801	484	1.79	SERM
NW-13-28-25-04-W2	14-Sep-98	WELL 013	58.6	Collacott	7.10	169	69	14	9.0				503	309	9						4.6	1330	1082	706	412	0.06	SERM
NW-13-28-25-04-W2	26-Oct-98	WELL 013	58.6	Collacott	7.00	194	69	14	8.0				578	333	15						4.4	1350	1211	769	474	-1.99	SERM
NW-13-28-25-04-W2	27-May-99	WELL 013	58.6	Collacott	8.70	7	51	17	8.0				170	70	23	<1					5.4	497	346	227	161	5.76	SERM
NW-13-28-25-04-W2	5-Aug-99	WELL 013	58.6	Collacott	8.60	6	53	16	8.0				178	71	22	<1					4.2	479	354	233	174	5.15	SERM
NW-13-28-25-04-W2	11-Aug-03	WELL 013	58.6	Collacott	7.17	186	66	13	8.9	3.7	1.15		543	250	44						3.5	1330	1116	735	445	0.52	SRC
NW-13-28-25-04-W2	16-Jun-04	WELL 013	58.6	Collacott	7.40	201	67	13		3.4	1.06		559	271	39			0.31				1360	1154	778	458	0.68	SRC
SW-13-28-25-04-W2	27-Nov-56	WELL 005	31.1	Collacott	8.00	149	53	11	8.4				450	246	3	1.20						1054	921	606	369	-0.50	YORKTON

Table A-2 Water quality data for the Yorkton study area

LAND LOCATION QTR-LSD-S-TP-RG-M	DATE SAMPLED	WELL NAME	WELL DEPTH M	AQUIFER	PH	CA	MG	NA	K	FE	MN	CO3	HCO3	SO4 MG/L	CL	NO3-NO3	PO4-PO4	F	C TOT.	C INORG.	C ORG.	COND uS/CM	Sum MG/L	T.H. CACO3 MG/L	T.A CACO3	ERROR	REFERENCE
SW-13-28-25-04-W2	29-Jun-71	WELL 005	31.1	Collacott	7.33	108	104	15	9.0	2.20			559	274	NIL	2.00	<0.01	0.26				1078	1073	702	458	-0.23	SRC
SW-13-28-25-04-W2	28-May-73	WELL 005	31.1	Collacott	7.34	183	64	15	9.0	3.30	1.07		578	276	14	<1	<0.1	0.38				1200	1143	718	474	-1.08	IWS
SW-13-28-25-04-W2	12-Mar-74	WELL 005	31.1	Collacott	7.05	192	61	16	5.0	3.70	0.59		559	308	4							1200	1149	727	458	-0.85	IWS
SW-13-28-25-04-W2	May-75	WELL 005	31.1	Collacott	7.08	230	37	16	9.0	3.43	1.16		564	301	4	6.00	0.05	0.45				1170	1172	727	462	-0.87	IWS
SW-13-28-25-04-W2	3-Nov-79	WELL 005	31.1	Collacott	7.12	216	63	18	10.0	<0.001	1.19		561	325	19	0.58						1270	1214	799	460	1.48	IWS
SW-13-28-25-04-W2	10-Jun-80	WELL 005	31.1	Collacott	7.04	192	63	39	9.0	2.00	0.96		567	313	25	1.86	0.11						1213	738	465	0.44	UMA,1980
SW-13-28-25-04-W2	30-Aug-88	WELL 005	31.1	Collacott	7.10	206	67	26		2.80	1.34		562	330	6	<1						1296	1201	788	461	2.03	YORKTON
SW-13-28-25-04-W2	8-Nov-88	WELL 005	31.1	Collacott	7.44	193	61	24	9.4	2.90	1.30		544	330	5	0.04	0.03	0.31	111	107	3.9	1330	1171	733	446	0.02	SRC
SW-13-28-25-04-W2	12-Sep-96	WELL 005	31.1	Collacott	7.23	196	67	27	8.7	4.90	1.10		566	347	17	<0.04	0.03	0.34				1390	1235	764	464	-0.86	YORKTON
SW-13-28-25-04-W2	25-Jun-97	WELL 005	31.1	Collacott	7.00	207	69	38					581	336	29	1.00		0.30				1430	1261	801	476	0.88	prov lab, beckie 99
SW-13-28-25-04-W2	20-Mar-02	WELL 005	31.1	Collacott	7.16	173	58	23	9.7	2.4	1.2		553	273	10	<0.2		0.33				1260	1103	670	453	-1.26	SRC
SW-13-28-25-04-W2	11-Aug-03	WELL 005	31.1	Collacott	7.25	181	62	39	10	3.4	1.08		547	310	26						4.3	1370	1179	706	448	-0.21	SRC
SW-13-28-25-04-W2	24-Oct-03	WELL 005	31.1	Collacott	7.34	173	59	25	9.6	1.32	1.18		543	280	8	<0.04					4.2	1280	1100	674	445	-0.45	SRC
SW-13-28-25-04-W2	16-Jun-04	WELL 005	31.1	Collacott	7.5	196	63	22		2.6	1.16		565	284.9	15.7			0.29				1296	1150	749	463	0.91	Prov. Lab
SW-13-28-25-04-W2	10-Apr-00	WELL 005	31.1	Collacott	6.9	198	64.9	33.5	10.4	0.32	1.21		540	285	15.9	<0.4		0.43	119	115	4	1290	1149	762	440	5.32	Enviro-test
NE-14-28-25-04-W2	19-Mar-75	W.RHINAS	34.1	Collacott	7.20	179	107	43	11.0	4.60	1.16		588	497	14	<0.5	<0.05	0.24				1400	1445	887	482	-1.22	SRC
NE-14-28-25-04-W2	24-Jun-81	W.RHINAS	16.2	Collacott		254	160	16	14.0				597	668	104								1813	1280	490	0.50	YORKTON
NE-14-28-25-04-W2	9-Nov-88	W.RHINAS	16.2	Collacott	7.51	192	114	14	8.8	0.03	1.30		636	381	40	8.41	0.03	0.56	131	125	5.8	1300	1396	950	521	0.45	SRC
NW-15-29-25-04-W2	21-Oct-93	MW 93-10	32.96	Bredenbury FM	7.32	114	57	59	6.2	0.98	0.55		522	187	10	<0.04	0.09	0.27				1110	957	519	428	1.44	
NE-16-29-25-04-W2	24-Jun-81	E.PINDUS	23.2	Collacott		180	52	15	11.0				512	271	4								1045	656	420	0.17	YORKTON
NE-16-29-25-04-W2	9-Nov-88	E.PINDUS	23.2	Collacott	7.47	177	53	14	8.4	2.60	1.20		503	260	4	0.04	0.03	0.40	104	99	5	1140	1023	661	412	0.89	SRC
SW-01-31-25-04-W2	6-Jun-95	Matus Well	34.14	collacott	7.3	147	58	39	8				508	291	13	<.02	0.12				5	1215	1064	606	416	-2.58	Ballagh, 2001
SW-01-31-25-04-W2	14-Aug-95	Matus Well	34.14	collacott	7.3	162	60	46	8				505	290	9	<.02	0.14				5	1230	1080	652	414	2.21	Ballagh, 2001
SW-01-31-25-04-W2	23-Oct-95	Matus Well	34.14	collacott	7.2	156	61	44	8				505	286	6	0.16	0.11				5	1236	1066	641	414	1.77	Ballagh, 2001
SW-01-31-25-04-W2	27-May-96	Matus Well	34.14	collacott	7.2	154	61	46	8				510	306	15	0.06	0.11				6	1185	1100	636	418	-0.81	Ballagh, 2001
SW-01-31-25-04-W2	30-Jul-96	Matus Well	34.14	collacott	7.2	150	59	39	7				508	294	9	0.11	0.23				5	1238	1066	618	416	-1.68	Ballagh, 2001
SW-01-31-25-04-W2	15-Oct-96	Matus Well	34.14	collacott	7.2	156	61	45	8				505	307	12	0.06	0.11				5	1235	1094	641	414	-0.14	Ballagh, 2001
SW-01-31-25-04-W2	26-May-97	Matus Well	34.14	collacott	6.9	159	61	42	8				503	308	5	<.02	0.1				7	1143	1086	648	412.2	0.63	Ballagh, 2001
SW-01-31-25-04-W2	2-Sep-97	Matus Well	34.14	collacott	7.2	155	64	43	8				501	293	9	<.02	0.1				5	1241	1073	651	410.4	1.72	Ballagh, 2001
SW-01-31-25-04-W2	4-Nov-97	Matus Well	34.14	collacott	7.8	155	62	42	8				500	319	7	<.02	0.11				5	1229	1093	642	410	-0.55	Ballagh, 2001
SW-01-31-25-04-W2	27-May-98	Matus Well	34.14	collacott	7.2	158	61	41	8				515	301	7	0.04	0.12				4.6	1229	1091	646	422	-0.05	Ballagh, 2001
SW-01-31-25-04-W2	8-Sep-98	Matus Well	34.14	collacott	7.2	120	51	23	9				605	63	15	3.4	0.14				3.3	1000	886	510	496	-1.25	Ballagh, 2001
SW-01-31-25-04-W2	21-Oct-98	Matus Well	34.14	collacott	7.3	159	64	42	8				505	320	6	0.03	0.15				4.8	1235	1103	661	414	0.41	Ballagh, 2001
SW-01-31-25-04-W2	18-May-99	Matus Well	34.14	collacott	7	156	64	40	8				504	291	6	0.14	0.17				4.8	1220	1069	653	413	1.71	Ballagh, 2001
SW-01-31-25-04-W2	17-Aug-99	Matus Well	34.14	collacott	7	154	63	43	8				510	325	6	0.16	0.13				4.7	1217	1109	644	418	-1.17	Ballagh, 2001
SW-01-31-25-04-W2	3-Nov-99	Matus Well	34.14	collacott	7.1	157	64	43	8				510	311	8	0.03	0.11				4	1237	1101	656	418	0.38	Ballagh, 2001
SW-12-31-25-04-W2	25-Nov-65	TH 65-10B	25.0	Collacott	7.80	130	43	62	6.9	2.22	0.35		485	229	8			NIL					966	501	398	-0.32	YORKTON
SE-01-32-25-04-W2	24-Jun-81	B.SHARPE	26.5	Collacott		225	64	14	13.0				573	377	5								1271	819	470	0.15	YORKTON
SE-08-32-25-04-W2	28-May-73	WELL 006	36.0	Collacott	6.51	184	61	13	8.0	3.10	0.83		573	261	23	<1	<0.1	0.40				1160	1127	712	470	-1.65	IWS
SE-08-32-25-04-W2	12-Mar-74	WELL 006	36.0	Collacott	7.08	182	61	13	4.0	3.80	0.84		550	270	4							1160	1089	707	451	0.07	IWS
SE-08-32-25-04-W2	May-75	WELL 006	36.0	Collacott	7.35	232	34	13	8.0	3.52	0.81		556	280	17	0.09	0.05	0.40				1120	1144	720	456	-0.91	IWS
SE-08-32-25-04-W2	30-Jun-76	WELL 006	36.0	Collacott	7.70	169	50	19	9.0	3.98	0.72		522	241	4	0.71	0.03		84	79	5	1073	1019	627	428	-0.34	IWS
SE-08-32-25-04-W2	3-Nov-79	WELL 006	36.0	Collacott	7.43	172	59	14	10.0	<0.001	0.73		516	269	13	1.28						1170	1055	676	423	-0.50	IWS
SE-08-32-25-04-W2	10-Jun-80	WELL 006	36.0	Collacott	6.99	172	55	31	8.0	1.75	0.70		557	256	29	1.86	0.16						1112	684	457	-2.15	UMA,1980
SE-08-32-25-04-W2	9-Nov-88	WELL 006	36.0	Collacott	7.50	192	57	14	8.7	3.10	0.91		522	306	6	0.04	0.06	0.30	107	103	3.7	1230	1110	715	428	0.02	SRC
SE-08-32-25-04-W2	20-Jun-95	WELL 006	36.0	Collacott	7.3	199	63	14	8.0				561	328	8	<0.08	0.40				10	1278	1181	756	460	-1.00	Ballagh, 2001
SE-08-32-25-04-W2	21-Aug-95	WELL 006	36.0	Collacott	7.1	193	62	15	8.0				561	276	14	<0.08	0.40				4	1288	1129	737	460	0.82	Ballagh, 2001
SE-08-32-25-04-W2	23-Oct-95	WELL 006	36.0	Collacott	7.1	195	62	15	9.0				561	284	11	0.18	0.25				4	1293	1137	742	460	0.95	Ballagh, 2001
SE-08-32-25-04-W2	27-May-96	WELL 006	36.0	Collacott	7.0	195	61	15	9.0				566	304	13	0.27	0.21				5	1350	1163	738	464	-1.09	Ballagh, 2001
SE-08-32-25-04-W2	6-Aug-96	WELL 006	36.0	Collacott	7.1	194	55	15	7.0				564	284	16	0.09	0.31				5	1330	1135	711	462	-1.86	Ballagh, 2001
SE-08-32-25-04-W2	16-Oct-96	WELL 006	36.0	Collacott	7.2	204	63	15	9.0				564	289	16	0.04	0.12				4	1320	1160	769	462	1.67	Ballagh, 2001
SE-08-32-25-04-W2	27-May-97	WELL 006	36.0	Collacott	7.4	196	63	15	9.0				566	289	14	<0.02	0.19				5	1295	1152	749	464	0.50	Ballagh, 2001
SE-08-32-25-04-W2	12-Sep-96	WELL 006	36.0	Collacott	7.44	199	68	15	10.0	2.60	1.00		549	318	15	<0.04	0.28	0.32				1300	1178	776	450	1.21	SRC
SE-08-32-25-04-W2	25-Jun-97	WELL 006	36.0	Collacott	7.00	208	65	15					566	296	14	<1						1274	1164	787	464	1.70	prov lab, beckie 99
SE-08-32-25-04-W2	8-Sep-97	WELL 006	36.0	Collacott	7.1	197	63	14	8				556	294	19						5	1330	1151	751	456	0.18	Ballagh, 2001
SE-08-32-25-04-W2	26-Nov-97	WELL 006	36.0	Collacott	7.7	197	65	16	9				561	306	10						5	1285	1164	760	460	0.81	Ballagh, 2001
SE-08-32-25-04-W2	3-Jun-98	WELL 006	36.0	Collacott	6.9	196	65	16	9				493	319	18						4.7	1253	1116	749	404	2.64	Ballagh, 2001
SE-08-32-25-04-W2	14-Sep-98	WELL 006	36.0	Collacott	7.2	204	63	14	9				561	296	15						4.8	1267	1162	777	460	1.32	Ballagh, 2001
SE-08-32-25-04-W2	26-Oct-98	WELL 006	36.0	Collacott	7.1	200	65	14	9				560	319	14						4.4	1272	1181	759	459	-0.14	Ballagh, 2001
SE-08-32-25-04-W2	26-May-99	WELL 006	36.0	Collacott	7	202	63	15	9				560	318	12						4.9	1330	1179	772	459	0.03	Ballagh, 2001
SE-08-32-25-04-W2	5-Aug-99	WELL 006	36.0	Collacott	6.9	198	65	15	9				567	309	8						4.4	1272	1171	762	465	0.50	Ballagh, 2001
SE-08-32-25-04-W2	28-Oct-99	WELL 006	36.0	Collacott	7	209	65	15	9				559	337	13	<0.02	0.39				4	1350	1207	790	458	0.35	Ballagh, 2001

Table A-2 Water quality data for the Yorkton study area

LAND LOCATION QTR-LSD-S-TP-RG-M	DATE SAMPLED	WELL NAME	WELL DEPTH M	AQUIFER	PH	CA	MG	NA	K	FE	MN	CO3	HCO3	SO4	CL	NO3- NO3	PO4- PO4	F	C TOT.	C INORG.	C ORG.	COND uS/CM	Sum MG/L	T.H. CACO3 MG/L	T.A CACO3	ERROR	REFERENCE
														MG/L													
SE-08-32-25-04-W2	7-May-02	WELL 006	36.0	Collacott	7.47	193	56	19	11	2.7	0.8		545	305	5							1280	1138	712	447	-0.25	
SE-08-32-25-04-W2	11-Aug-03	WELL 006	36.0	Collacott	7.21	193	62	15	9.4	2.62	0.86		548	300	12						3.4	1290	1143	736	449	0.19	SRC
NE-12-33-25-04-W2	10-Sep-96	A. PALEY	39	Collacott	7.26	214	68	23	8	1.4	1.2		577	391	4	1.64	0.06	0.26				1460	1289	813	473	-0.73	SRC
SE-12-33-25-04-W2	10-Sep-96	R. DANYLKO	35.1	Collacott	7.33	198	63	17	8.2	2.9	1.1		556	317	8	0.97	0.43	0.30				1260	1172	753	456	0.19	SRC
SE-12-33-25-04-W2	9-Nov-88	R.DANYLKO	35.1	Collacott	7.70	197	63	15	8.2	2.90	0.97		549	314	2	0.04	0.06	0.38	112	108	3.9	1280	1152	749	450	0.90	SRC
NW-13-33-25-04-W2	11-Sep-96	J. PROKOPETZ	17.7	Collacott	7.33	140	54	13	8.5	3.3	0.49		499	177	7	0.35	0.43	0.36				1030	903	571	409	0.60	SRC
SE-13-33-25-04-W2	10-Sep-96	A. WASYLWIN	20.1	Collacott	7.76	273	78	78	13	0.059	1.1		551	425	224	34.97	0.03	0.30				2120	1678	1000	452	-2.05	SRC
SW-13-33-25-04-W2	10-Sep-96	I. SMITH	21.3	Collacott	7.3	219	61	9.9	7.8	1.2	1.6		559	370	3	1.55	0.03	0.30				1400	1234	797	458	-1.18	SRC
C -14-33-25-04-W2	20-Oct-93	MW 93-09	42.2	Collacott	7.24	150	60	17	6.8	2.4	0.48		536	175	15	<0.04	0.49	0.33				1100	963	622	439	1.85	SRC
C -14-33-25-04-W2	10-Sep-96	MW 93-09	42.2	Collacott	7.51	130	51	15	7.9	2.4	0.54		498	138	5	<0.04	0.46	0.34				967	848	534	408	1.59	SRC
SE-14-33-25-04-W2	10-Sep-96	D. JANZEN	40.8	Collacott	7.35	165	54	23	7.4	1.2	0.88		515	255	4	<0.04	0.15	0.28				1130	1025	634	422	0.02	SRC
SE-14-33-25-04-W2	9-Nov-88	D.JANZEN	40.8	Collacott	7.63	163	54	21	7.7	1.90	0.76		505	250	<1	0.04	0.03	0.36	103	99	3.6	1140	1003	632	414	0.76	SRC
NW-01-35-25-04-W2	12-Jun-47	WELL 002	13.2	Logan valley	7.35	131	62	47		0.36			534	231	8	NIL							1013	583	438	-0.38	City of Yorkton
NW-01-35-25-04-W2	27-Nov-56	WELL 002	13.2	Logan valley	7.90	158	71	41	7.2	0.03			545	317	12	1.20						1303	1153	688	447	-0.53	City of Yorkton
NW-01-35-25-04-W2	28-May-73	WELL 002	13.2	Logan valley	7.27	126	69	44	7.0	8.90	0.67		519	232	18	<1	<0.1	0.41				1120	1025	596	425	0.77	IWS
NW-01-35-25-04-W2	12-Mar-74	WELL 002	13.2	Logan valley	7.19	134	65	48	4.0	3.10	0.76		499	267	22							1150	1043	600	409	-0.46	IWS
NW-01-35-25-04-W2	29-May-75	WELL 002	13.2	Logan valley	7.21	148	59	46	7.0	2.60	0.73		508	256	21	0.01	0.05	0.41				1090	1048	613	416	0.60	IWS
NW-01-35-25-04-W2	30-Jun-76	WELL 002	13.2	Logan valley	7.49	138	61	45	6.0	2.20	0.69		529	265	4	0.10	0.03		94	89	5	1094	1051	593	434	-1.01	IWS
NW-01-35-25-04-W2	3-Nov-79	WELL 002	13.2	Logan valley	7.32	137	74	50	9.0	<0.001	0.71		510	280	20	2.66						1187	1083	647	418	1.78	IWS
NW-01-35-25-04-W2	10-Jun-80	WELL 002	13.2	Logan valley	7.21	132	73	52	9.0	2.04	0.60		537	274	31	2.12	0.14						1113	628	440	-1.08	UMA,1980
NW-01-35-25-04-W2	11-Oct-83	WELL 002	13.2	Logan valley	7.30	155	80	51	7.0	2.60	0.90		528	293	11	0.27	0.03	0.27				1210	1129	717	433	5.18	
NW-01-35-25-04-W2	8-Nov-88	WELL 002	13.2	Logan valley	7.56	140	66	50	7.1	2.40	0.86		521	280	14	0.04	0.06	0.23	106	102	3.7	1230	1081	624	427	0.03	SRC
NW-01-35-25-04-W2	20-Jun-95	WELL 002	13.2	Logan valley	7.3	128	65	42	6.0				525	217	15	<0.08	0.31				5	1127	998	587	430	0.63	Ballagh, 2001
NW-01-35-25-04-W2	21-Aug-95	WELL 002	13.2	Logan valley	7.3	120	61	39	5.0				517	170	11	<0.08	0.34				3.3	1069	923	551	424	2.02	Ballagh, 2001
NW-01-35-25-04-W2	23-Oct-95	WELL 002	13.2	Logan valley	7.3	126	64	38	6.0				517	203	18	0.22	0.25				4	1124	972	578	424	0.56	Ballagh, 2001
NW-01-35-25-04-W2	27-May-96	WELL 002	13.2	Logan valley	7.2	126	64	43	6.0				525	214	20	0.53	0.18				5	1132	999	578	430	-0.20	Ballagh, 2001
NW-01-35-25-04-W2	6-Aug-96	WELL 002	13.2	Logan valley	7.3	132	63	40	5.0				529	222	12	0.35	0.21				4	1186	1003	589	434	0.01	Ballagh, 2001
NW-01-35-25-04-W2	16-Oct-96	WELL 002	13.2	Logan valley	7.3	132	68	40	6.0				522	233	19	<0.08	0.20				4	1183	1020	610	428	0.48	Ballagh, 2001
NW-01-35-25-04-W2	27-May-97	WELL 002	13.2	Logan valley	7.6	139	68	42	6.0				527	246	16	<0.08	0.15				4	1191	1044	627	432	1.05	Ballagh, 2001
NW-01-35-25-04-W2	25-Jun-97	WELL 002	13.2	Logan valley	7.1	136	68	43	6.0				430	231	9	<1		0.30				1133	923	620	430	8.66	prov lab, beckie 99
NW-01-35-25-04-W2	8-Sep-97	WELL 002	13.2	Logan valley	7.3	129	66	41	6.0				527	223	16		0.11				4.0	1174	1008	594	432	0.27	Ballagh, 2001
NW-01-35-25-04-W2	26-Nov-97	WELL 002	13.2	Logan valley	7.7	134	70	44	6.0				529	249	11		0.15				4.0	1176	1043	623	434	1.22	Ballagh, 2001
NW-01-35-25-04-W2	3-Jun-98	WELL 002	13.2	Logan valley	7.2	130	67	43	6.0				538	233	12		0.15				3.9	1171	1029	601	441	0.06	Ballagh, 2001
NW-01-35-25-04-W2	14-Sep-98	WELL 002	13.2	Logan valley	7.3	141	72	42	6.0				525	250	21		0.22				4.9	1192	1057	649	430	1.84	Ballagh, 2001
NW-01-35-25-04-W2	26-Oct-98	WELL 002	13.2	Logan valley	7.2	130	67	40	7.0				522	234	19		0.18				4.0	1163	1019	601	428	-0.16	Ballagh, 2001
NW-01-35-25-04-W2	26-May-99	WELL 002	13.2	Logan valley	7.2	131	67	72	7.0				539	272	27	<1	0.17				5.0	1269	1115	603	442	0.33	Ballagh, 2001
NW-01-35-25-04-W2	5-Aug-99	WELL 002	13.2	Logan valley	6.9	123	66	40	6.0				512	213	31	<1	0.16				4.3	1110	991	579	420	-0.88	Ballagh, 2001
NW-01-35-25-04-W2	28-Oct-99	WELL 002	13.2	Logan valley	7.2	116	62	38	6.0				517	191	19	0.03	0.18				3.0	1106	949	545	424	-1.13	Ballagh, 2001
NW-01-35-25-04-W2	11-Oct-00	WELL 002	13.2	Logan valley	7.3	134	67	44	6.90	2.5	0.9		517	265								1200	1037	610	424	1.06	SRC
NW-01-35-25-04-W2	19-Aug-02	WELL 002	13.2	Logan valley	7.3	117	59	39	6.0		0.8		486	205	14	0.13	0.06	0.3				1100	927	534	398	-0.35	SRC
NW-01-35-25-04-W2	13-Aug-03	WELL 002	13.2	Logan valley	7.7	118	57	33	6.40	12.2	1.0		500	180	16						3.3	1100	924	529	410	-0.88	SRC
NW-01-35-25-04-W2	16-Jun-04	WELL 002	13.2	Logan valley	7.5	139	69	46					527	272	13			0.3				1232	1066	631	432	-0.15	Prov. Lab
SW-02-35-25-04-W2	30-Apr-36	WELL 001	16.2	Logan valley	7.60	121	62	62		1.50	NIL		520	201	12								980	558	426	2.94	YORKTON
SW-02-35-25-04-W2	27-Nov-56	WELL 001	16.2	Logan valley	7.90	142	67	44	7.1	0.05	0.00		534	284	10	1.20						1236	1089	674	438	-0.92	YORKTON
SW-02-35-25-04-W2	29-Jun-71	WELL 001	16.2	Logan valley	7.03	78	104	39	7.0	2.80			509	272	7	1.00	<0.1	0.22				1075	1020	629	417	0.37	SRC
SW-02-35-25-04-W2	28-May-73	WELL 001	16.2	Logan valley	7.11	137	75	41	7.0	3.00	1.00		544	246	27	<1	<0.1	0.36				1180	1081	649	446	0.57	IWS
SW-02-35-25-04-W2	12-Mar-74	WELL 001	16.2	Logan valley	7.10	144	68	43	4.0	0.04	1.00		540	275	17							1180	1092	638	443	-1.01	IWS
SW-02-35-25-04-W2	29-May-75	WELL 001	16.2	Logan valley	7.20	160	65	41	7.0	3.35	1.02		537	272	13	0.09	0.05	0.35				1110	1099	666	440	1.54	IWS
SW-02-35-25-04-W2	30-Jun-76	WELL 001	16.2	Logan valley	7.54	143	64	40	7.0	2.26	0.95		559	256	4	0.06	0.03		89	87	2	1100	1076	662	458	-0.98	IWS
SW-02-35-25-04-W2	3-Nov-79	WELL 001	16.2	Logan valley	7.31	157	73	12	9.0	<0.001	1.00		506	250	20	2.66						1130	1031	690	415	1.70	IWS
SW-02-35-25-04-W2	10-Jun-80	WELL 001	16.2	Logan valley	7.13	121	84	39	6.0	1.89	0.76		534	238	37	2.12	0.21						1064	645	438	0.05	UMA,1980
SW-02-35-25-04-W2	8-Nov-88	WELL 001	16.2	Logan valley	7.3	144	67	43	7.3	4.40	1.10		509	290	11	0.04	0.06	0.18	104	100	3.9	1220	1077	637	417	0.22	SRC
SW-02-35-25-04-W2	20-Jun-95	WELL 001	16.2	Logan valley	7.3	126	59	33	6.0				495	208	11	<0.08	0.31				9	1077	938	558	406	-0.09	Ballagh, 2001
SW-02-35-25-04-W2	21-Aug-95	WELL 001	16.2	Logan valley	7.3	120	63	35	6.0				529	195	16	<0.08	0.37				4.4	1033	964	587	434	-1.28	Ballagh, 2001
SW-02-35-25-04-W2	23-Oct-95	WELL 001	16.2	Logan valley	7.2	131	62	37	7.0				517	207	14	0.18	0.28				5	1125	975	577	424	0.93	Ballagh, 2001
SW-02-35-25-04-W2	27-May-96	WELL 001	16.2	Logan valley	7.20	129	57	35	7.0				498	207	17	0.53	0.18				5	1086	951	544	408	-0.51	Ballagh, 2001
SW-02-35-25-04-W2	6-Aug-96	WELL 001	16.2	Logan valley	7.30	138	59	40	8.0		1.10		522	242	13	0.07	0.30				5	1030	1022	588	428	-1.00	Ballagh, 2001
SW-02-35-25-04-W2	16-Oct-96	WELL 001	16.2	Logan valley	7.20	139	53	42	8.0		1.30		525	253	11	0.07	0.32				5	1202	1046	627	430	-3.11	Ballagh, 2001
SW-02-35-25-04-W2	25-Jun-97	WELL 001	16.2	Logan valley	7.10	115	45	81					390	158	18	<1		0.20				1181	807	472	320	11.99	prov lab, beckie 99
SW-02-35-25-04-W2	8-Sep-97	WELL 001	16.2	Logan valley	7.30	140	62	43	7.0				515	256	20	0.02	0.25				5	1216	1043	605	422	-0.69	Ballagh, 2001
SW-02-35-25-04-W2	26-Nov-97	WELL 001	16.2	Logan valley	7.60	142	69	45	8.0				525	264	13	0.02	0.24				5	1201	1066	639	430	1.56	Ballagh, 2001
SW-02-35-25-04-W2	3-Jun-98	WELL 001	16.2	Logan valley	7.20	117	58	37	7.0				497	191	10		0.20				3.4	1058	917	531	407	-0.02	Ballagh, 2001

Table A-2 Water quality data for the Yorkton study area

LAND LOCATION	DATE	WELL	WELL	AQUIFER	PH	CA	MG	NA	K	FE	MN	CO3	HCO3	SO4	CL	NO3-	PO4-	F	C	C	C	COND	Sum	T.H.	T.A	ERROR	REFERENCE
	SAMPLED	NAME	DEPTH													NO3	PO4		TOT.	INORG.	ORG.			CACO3	CACO3		
QTR-LSD-S-TP-RG-M			M											MG/L								uS/CM	MG/L	MG/L			
SW-02-35-25-04-W2	14-Sep-98	WELL 001	16.2	Logan valley	7.30	122	59	30	7.0				594	180	17		0.22				5.2	1041	1009	548	487	-5.82	Ballagh, 2001
SW-02-35-25-04-W2	26-May-99	WELL 001	16.2	Logan valley	7.10	126	61	33	7.0				511	207	13		0.24				4.2	1118	958	566	419	-0.50	Ballagh, 2001
SW-02-35-25-04-W2	5-Aug-99	WELL 001	16.2	Logan valley	6.90	132	66	35	7.0				517	227	10		0.17				4.3	1101	994	601	424	0.87	Ballagh, 2001
SW-02-35-25-04-W2	28-Oct-99	WELL 001	16.2	Logan valley	7.30	120	60	30	6.0				505	184	14	0.02	0.16				3.0	1067	919	547	414	-0.48	Ballagh, 2001
SW-02-35-25-04-W2	11-Oct-00	WELL 001	16.2	Logan valley	7.40	129	62	41	7.2	2.8	1.00		514	256	11							1190	1024	577	421	-2.02	SRC
SW-02-35-25-04-W2	31-May-01	WELL 001	16.2	Logan valley	7.2	121	60	32	6.4	2.1	0.86		486	193.0	15.0			0.2				1070	916	548	398	0.50	SRC
SW-02-35-25-04-W2	22-Aug-01	WELL 001	16.2	Logan valley	7.8	111	58	30	6.7		0.87		490	187.0							2.7	1070	884	515.0	402	-0.57	SRC
SW-02-35-25-04-W2	7-May-02	WELL 001	16.2	Logan valley	7.3	125	58	34	7.3	2.5	0.92		493	211.0	15.0							1100	947	550.0	404.0	-0.86	
SW-02-35-25-04-W2	13-Aug-03	WELL 001	16.2	Logan valley	7.6	116	56	31	6.4	6.1	0.92		493	180.0	13.0						3.1	1040	902	520.0	404.0	-1.19	SRC
SW-02-35-25-04-W2	16-Jun-04	WELL 001	16.2	Logan valley	7.5	136	66	42					515	260.2				0.2				1196	1019	611.0	422.0	0.67	Prov. Lab
SE-08-35-25-04-W2	10-Jun-76	TH 76-08	22.3	Logan valley	7.75	100	43	47	6.0		0.22		454	166	4						7	837	820	428	372	-1.30	IWS
SE-08-35-25-04-W2	25-Oct-79	WELL 010	27.1	Logan valley		114	57	45	6.5				478	247	21	0.09						1092	969	519	392	-4.10	IWS
SE-08-35-25-04-W2	8-Nov-88	WELL 010	27.1	Logan valley	7.57	147	72	52	7.2	3.30	0.81		529	311	7	0.04	0.03	0.27	108	104	3.9	1280	1130	661	434	1.15	SRC
SE-08-35-25-04-W2	25-Jun-97	WELL 010	27.1	Logan valley	7.2	144	73	53					537	273	13	1.00		0.30				1226	1094	660	440	2.08	Yorkton
SE-08-35-25-04-W2	13-Oct-99	WELL 010	27.1	Logan valley	7.20	144	73	53					537	273	13	1.00		0.30				1226	1094	660	440	2.08	prov lab, beckie 99
SE-08-35-25-04-W2	11-Oct-00	WELL 010	27.1	Logan valley	7.26	136	70	48	7.3	3	0.81		538	300	15	<0.04						1300	1118	627	441	-2.20	SRC
SE-08-35-25-04-W2	11-Aug-03	WELL 010	27.1	Logan valley	7.6	137	68	52	7.3	3.8	0.8		532	290	14	<0.04				3.5		1340	1105	621	436	-0.90	SRC
NW-11-35-25-04-W2	30-Apr-36	WELL 003	21.6	Logan valley	7.6	124	78	163		0.40			524	360	19								1268	631	430	8.47	Yorkton
NW-11-35-25-04-W2	27-Nov-56	WELL 003	21.6	Logan valley	7.6	129	75	83	6.6	0.06	0.43		529	360	18	1.60						1383	1203	632	434	-0.94	Yorkton
NW-11-35-25-04-W2	29-Jun-71	WELL 003	21.6	Logan valley	7.33	129	81	80	7.0	2.20			520	370	53	<1	<0.01	0.21				1330	1242	659	427	-2.78	SRC
NW-11-35-25-04-W2	28-May-73	WELL 003	21.6	Logan valley	7.4	131	83	86	7.0	2.90	0.60		557	375	27	<0.1		0.30				1370	1270	670	457	-1.18	SRC
NW-11-35-25-04-W2	12-Mar-74	WELL 003	21.6	Logan valley	7.22	139	86	94	4.0	1.00	0.64		534	395	31							1430	1285	700	438	0.98	IWS
NW-11-35-25-04-W2	May-75	WELL 003	21.6	Logan valley	7.20	160	81	86	7.0	1.23	0.67		543	428	32	0.80	0.05	0.34				1390	1340	732	445	-0.42	IWS
NW-11-35-25-04-W2	30-Jun-76	WELL 003	21.6	Logan valley	7.60	134	67	44	6.0	6.88	0.73		539	259	4	0.18	0.03		91	87	4	1105	1061	609	442	-0.26	IWS
NW-11-35-25-04-W2	10-Jun-80	WELL 003	21.6	Logan valley	7.12	154	85	90	7.0	0.89	0.63		529	438	45	6.33	0.14						1356	733	434	-1.02	UMA,1980
NW-11-35-25-04-W2	9-Nov-88	WELL 003	21.6	Logan valley	7.63	134	78	81	6.6	1.30	0.58		493	368	37	4.43	0.06	0.20	102	97	4.7	1440	1204	656	404	-0.18	SRC
NW-11-35-25-04-W2	7-Apr-98	WELL 003	21.6	Logan valley	7.40	130	77	61					498	279	52	8.00		0.30				234	1105	642	408	-0.29	prov lab, beckie 99
NE-05-36-25-04-W2	22-Aug-01	BHL 01-98	31.4	Logan valley	7.65	125	64	45	7.2	0.10	0.65		516	245	15	<0.04						1200	1018	575	423	-1.21	Pasloske, 2002
SE-02-01-26-04-W2	6-Jun-95	Brown Well	12.8	Logan north	7.4	121	63	55	6				478	277	29	0.12	0.19				6	1185	1029	562	392	-2.32	Ballagh, 2001
SE-02-01-26-04-W2	14-Aug-95	Brown Well	12.8	Logan north	7.4	102	53	50	6				449	195	17	0.08	0.2				5	1022	872	473	368	-0.51	Ballagh, 2001
SE-02-01-26-04-W2	23-Oct-95	Brown Well	12.8	Logan north	7.4	95	50	46	6				437	156	6	0.21	0.17				4	931	796	443	358	1.98	Ballagh, 2001
SE-02-01-26-04-W2	27-May-96	Brown Well	12.8	Logan north	7.6	101	53	48	6				451	166	10	0.15	0.16				6	918	835	470	370	2.24	Ballagh, 2001
SE-02-01-26-04-W2	30-Jul-96	Brown Well	12.8	Logan north	7.4	99	52	43	6				447	162	12	0.15	0.17				5	952	821	461	366	0.91	Ballagh, 2001
SE-02-01-26-04-W2	15-Oct-96	Brown Well	12.8	Logan north	7.5	93	49	41	5				437	154	9	0.1	0.22				4	913	788	434	358	-0.19	Ballagh, 2001
SE-02-01-26-04-W2	26-May-97	Brown Well	12.8	Logan north	7.5	98	52	44	6				450	155	9	0.07	0.11				5	966	814	459	369	1.72	Ballagh, 2001
SE-02-01-26-04-W2	2-Sep-97	Brown Well	12.8	Logan north	7.4	93	52	43	5				433	155	7	0.09	0.16				7	919	788	446	354.6	1.84	Ballagh, 2001
SE-02-01-26-04-W2	4-Nov-97	Brown Well	12.8	Logan north	7.9	93	50	42	6				437	165	5	<.02	0.2				5	912	798	438	358	-0.01	Ballagh, 2001
SE-02-01-26-04-W2	27-May-98	Brown Well	12.8	Logan north	7.4	96	52	42	6				459	167	6	0.18	0.18				4.4	926	828	454	376	-0.55	Ballagh, 2001
SE-02-01-26-04-W2	8-Sep-98	Brown Well	12.8	Logan north	7.3	94	50	41	6				444	164	3	0.09	0.23				4.9	921	802	441	364	-0.17	Ballagh, 2001
SE-02-01-26-04-W2	21-Oct-98	Brown Well	12.8	Logan north	7.5	97	53	40	6				437	166	4	0.16	0.16				4.8	896	803	460	358	1.65	Ballagh, 2001
SE-02-01-26-04-W2	18-May-99	Brown Well	12.8	Logan north	7.2	101	52	41	6				454	160	6	0.24	0.14				4.1	954	820	466	372	1.40	Ballagh, 2001
SE-02-01-26-04-W2	17-Aug-99	Brown Well	12.8	Logan north	7.1	96	54	41	6				454	183	4	0.23	0.18				4.5	929	838	462	372	-0.87	Ballagh, 2001
SE-02-01-26-04-W2	3-Nov-99	Brown Well	12.8	Logan north	7.4	96	54	41	2				454	155	9	0.05	0.22				5	945	811	462	372	0.66	Ballagh, 2001
-06-36-25-04-W2	19-Oct-93	MW 76-20	20.1	Logan valley	7.36	145	68	60	7	5	0.78		536	299	14	<0.04	0.18	0.31	109	105	4	1300	1135	553	406	0.69	
NE-06-36-25-04-W2	11-Nov-01	BHL 01-92A	33.1	Logan valley	8.00	97	63	56	8.6	1.60	0.68		387	252	22	<0.04						1080	888	501	317	1.89	Pasloske, 2002
NE-06-36-25-04-W2	10-Jun-76	TH 76-16	7.5	Logan valley	7.86	90	48	71	7.0		0.08		520	129	18						5	887	883	424	426	-0.03	IWS
NW-08-36-25-04-W2	7-Nov-01	BHL 01-113A	27.4	Logan valley	7.91	81	83	116	12.0	0.52	0.97		577	156	113	<0.04						1460	1139	543	473	1.03	Pasloske, 2002
SW-11-36-25-04-W2	10-Jun-76	TH 76-14	10.1	Logan valley	7.90	96	44	44	6.0		0.33		528	104	4						3	798	826	419	431	-2.12	IWS
SW-11-36-25-04-W2	1976	TH 76-33	8.1	Logan valley	7.22	117	55	40	6.3	1.47	0.54		539	151	21	0.12	0.06					987	931	516	442	-1.24	IWS
SW-11-36-25-04-W2	9-Nov-78	TH 76-33	8.1	Logan valley	7.33	97	55	78	6.0	3.74	0.62		545	122	32	0.05	0.05				15	884	939	467	447	2.12	IWS
NE-15-36-25-04-W2	17-Oct-01	EASTEND SERVICE	???	ND	7.6	317	170	91		5.7	0.65		471	1112	38	5						2510	2210	1492	386	2.65	Pasloske, 2002
NW-16-36-25-04-W2	18-Oct-01	FEDEROWICH CONSTr	???	ND	7.5	213	113	73		5.2	0.66		532	669	42	5						1930	1653	997	436	-1.72	Pasloske, 2002
SW-04-03-26-04-W2	6-Jul-47	WELL 004	17.7	Collacott	7.10	133	53	53		1.90			545	210	4								1000	608	447	-0.44	IWS
SW-04-03-26-04-W2	27-Nov-56	WELL 004	17.7	Collacott	7.80	155	57	24	7.6	0.03	0.38		540	216	5	1.60						1141	1007	622	443	0.62	YORKTON
SW-04-03-26-04-W2	28-May-73	WELL 004	17.7	Collacott	7.09	178	69	30	8.0	5.90	0.75		583	289	10	<1	<0.1	0.29				1230	1174	728	478	0.67	IWS
SW-04-03-26-04-W2	12-Mar-74	WELL 004	17.7	Collacott	7.10	176	61	20	4.0	2.70	0.55		536	292	4							1180	1096	688	440	-0.68	IWS
SW-04-03-26-04-W2	20-Mar-75	WELL 004	17.7	Collacott	7.13	200	53	36	7.1	3.70	0.71		586	317	7	<0.5	<0.05	0.24				1220	1211	717	481	-0.96	SRC
SW-04-03-26-04-W2	May-75	WELL 004	17.7	Collacott	7.12	192	57	35	8.0	3.80	0.70		576	319	11	0.01	0.05	0.33				1230	1203	714	472	-1.22	IWS
SW-04-03-26-04-W2	30-Jun-76	WELL 004	17.7	Collacott	7.50	188	66	33	8.0	3.43	0.91		588	314	4	2.92	0.03		83	76	7	1218	1208	739	482	0.36	IWS
SW-04-03-26-04-W2	3-Nov-79	WELL 004	17.7	Collacott	7.13	179	77	41	10.0	<0.001	0.64		543	376	19	5.31						1280	1251	761	445	-0.12	IWS
SW-04-03-26-04-W2	10-Jun-80	WELL 004	17.7	Collacott	7.04	169	79	39	8.0	2.09	0.60		567	320	25	3.85	0.22						1214	747	465	0.33	UMA,1980
SW-04-03-26-04-W2	1-Dec-87	WELL 004	17.7	Collacott	7.30	186	68	29					574	258	22	<1							1137	745	471	2.34	YORKTON

Table A-2 Water quality data for the Yorkton study area

LAND LOCATION	DATE SAMPLED	WELL NAME	WELL DEPTH	AQUIFER	PH	CA	MG	NA	K	FE	MN	CO3	HCO3	SO4	CL	NO3- NO3	PO4- PO4	F	C TOT.	C INORG.	C ORG.	COND	Sum	T.H. CACO3	T.A CACO3	ERROR	REFERENCE
QTR-LSD-S-TP-RG-M			M											MG/L								uS/CM	MG/L	MG/L			
SW-04-03-26-04-W2	30-Aug-88	WELL 004	17.7	Collacott	7.20	178	75	43		2.90	0.75		570	300	18	<1						1340	1188	752	468	2.51	YORKTON
SW-04-03-26-04-W2	8-Nov-88	WELL 004	17.7	Collacott	7.51	171	68	42	8.0	3.00	0.68		548	315	15	0.04	0.03	0.24	112	108	4.4	1360	1171	715	428	0.61	SRC
SW-04-03-26-04-W2	20-Jun-95	WELL 004	17.7	Collacott	7.2	173	73	47	8.0				573	326	37	<0.08	0.31				12	1390	1237	733	470	-0.98	Ballagh, 2001
SW-04-03-26-04-W2	21-Aug-95	WELL 004	17.7	Collacott	7.1	172	74	50	7.0				573	291	41	<0.08	0.43				5	1410	1208	734	470	1.25	Ballagh, 2001
SW-04-03-26-04-W2	23-Oct-95	WELL 004	17.7	Collacott	7.0	172	73	49	8.0				576	286	37	0.18	0.25				5	1410	1201	730	472	1.45	Ballagh, 2001
SW-04-03-26-04-W2	27-May-96	WELL 004	17.7	Collacott	7.1	165	71	33	8.0				566	237	63	0.35	0.18				6	1390	1143	704	464	-0.88	Ballagh, 2001
SW-04-03-26-04-W2	6-Aug-96	WELL 004	17.7	Collacott	7.2	165	65	44	7.0				576	286	37	0.22	0.21				5	1430	1180	680	472	-2.39	Ballagh, 2001
SW-04-03-26-04-W2	12-Sep-96	WELL 004	17.7	Collacott	7.26	163	75	45	9.3	2.70	0.68		562	317	34	0.18	0.18	0.27				1420	1209	715	461	-0.82	SRC
SW-04-03-26-04-W2	16-Oct-96	WELL 004	17.7	Collacott	7.20	174	73	48	9.0				576	291	36	0.04	0.06				5	1400	1207	735	472	1.47	Ballagh, 2001
SW-04-03-26-04-W2	27-May-97	WELL 004	17.7	Collacott	7.40	169	73	46	8.0				571	297	32	<0.02	0.13				6	1380	1196	723	468	0.61	Ballagh, 2001
SW-04-03-26-04-W2	25-Jun-97	WELL 004	17.7	Collacott	7.10	178	76	47					571	309	31	<1		0.30				1390	1212	757	468	1.52	prov lab, beckie 99
SW-04-03-26-04-W2	8-Sep-97	WELL 004	17.7	Collacott	7.30	169	74	48	8				564	310	37		0.14				6	1420	1210	727	462	0.22	Ballagh, 2001
SW-04-03-26-04-W2	26-Nov-97	WELL 004	17.7	Collacott	7.70	170	76	47	8				569	304	32		0.14				6	1380	1206	737	466	1.28	Ballagh, 2001
SW-04-03-26-04-W2	3-Jun-98	WELL 004	17.7	Collacott	7.10	172	74	44	8				578	248	70		0.08				5.3	1430	1194	734	474	0.54	Ballagh, 2001
SW-04-03-26-04-W2	14-Sep-98	WELL 004	17.7	Collacott	7.30	171	74	41	8				565	297	35		0.23				5	1390	1191	732	463	0.54	Ballagh, 2001
SW-04-03-26-04-W2	26-Oct-98	WELL 004	17.7	Collacott	7.20	179	79	31	8				564	264	57		0.19				5.6	1370	1182	772	462	1.91	Ballagh, 2001
SW-04-03-26-04-W2	26-May-99	WELL 004	17.7	Collacott	7.10	169	76	41	7				580	285	35	<1	0.23				5.5	1400	1193	735	475	0.67	Ballagh, 2001
SW-04-03-26-04-W2	4-Aug-99	WELL 004	17.7	Collacott	6.90	171	74	41	8				582	284	41	<1					5.5	1360	1201	732	477	0.01	Ballagh, 2001
SW-04-03-26-04-W2	28-Oct-99	WELL 004	17.7	Collacott	7.10	172	72	38	8				581	273	40	<0.02	0.16				5.0	1400	1184	726	476	0.09	Ballagh, 2001
SW-04-03-26-04-W2	31-May-01	WELL 004	17.7	Collacott	7.12	168	73	42	8.3	2.7	0.67		559	290	35	1.7		0.21				1370	1180	719	458	0.66	SRC
SW-04-03-26-04-W2	20-Mar-02	WELL 004	17.7	Collacott	7.19	155	68	42	8.6	2.7	0.71		559	274	34	<0.2		0.24				1370	1144	666	458	-1.44	SRC
SW-04-03-26-04-W2	11-Aug-03	WELL 004	17.7	Collacott	7.49	163	69	40	8.1	2.94	0.7		556	290	31						4.2	1400	1161	690	456	-0.84	SRC
SW-04-03-26-04-W2	16-Jun-04	WELL 004	17.7	Collacott	7.70	176	75	42		2.7	0.67		567	296.9	35.4			0.25				1410	1196	748	465	0.93	Prov. Lab
NE-15-03-26-04-W2	10-Aug-82	HOPK. L. WELL	9.8	Collacott		153	83	78	8.6	2.20	0.53		552	436	21							1380	1334	724	453	-1.74	IWS
NE-15-03-26-04-W2	12-Aug-84	HOPK. L. WELL	9.8	Collacott	7.39	160	73	72	8.5	2.70	1.20		520	389	16	7.97	0.06						1250	700	426	0.40	YORKTON
NE-15-03-26-04-W2	2-Jul-86	HOPK. L. WELL	9.8	Collacott	7.20	155	81	68					561	395	16	<1							1276	622	460	-1.45	YORKTON
SW- -04-26-04-W2	12-Sep-96	SMITH STEEL	24.1	Collacott	7.39	182	56	9.2	8.5	3.4	0.75		525	268	2	<0.04	0.34	0.31				1140	1055	684	430	0.23	SRC
NE-01-04-26-04-W2	10-Sep-96	F. VIDOMSKI	15.5	Collacott	7.31	192	70	39	7.7	0.76	0.7		576	382	5	<0.04	0.03	0.17				1380	1273	767	472	-0.86	SRC
NE-01-04-26-04-W2	12-Sep-96	H. ANDERSON	22.3	Collacott	7.35	253	88	85	14	2.2	1.1		620	315	276	<0.04	0.03	0.26				2100	1654	993	508	-1.21	SRC
NW-01-04-26-04-W2	10-Sep-96	N. HESCHKA	37.5	Collacott	7.31	202	74	32	8.9	3.0	0.73		582	417	4	<0.04	0.15	0.18				1500	1324	808	477	-1.51	SRC
NW-01-04-26-04-W2	10-Sep-96	W.M. MCPHEE	40.2	Collacott	7.34	3.2	1.4	405	1.4	0.062	0.015		576	389	4	<0.04	0.18	0.17				1610	1380	14	472	0.77	SRC
SW-01-04-26-04-W2	10-Sep-96	D. TENIUK	39.3	Collacott	7.42	176	63	26	7.4	3.3	0.89		540	318	7	<0.04	0.06	0.25				1330	1142	698	443	-1.23	SRC
NE-03-04-26-04-W2	12-Oct-93	MW 93-01	52.9	Collacott	7.09	169	80	62	8.4	2.2	0.74		578	376	8	<0.04	0.18	0.18				1400	1284	750	473	1.13	SRC
NE-03-04-26-04-W2	10-Sep-96	MW 93-01	52.9	Collacott	7.45	164	77	56	7.9	2.2	0.84		562	365	8	<0.04	0.18	0.17				1370	1243	726	461	0.36	SRC
NE-03-04-26-04-W2	12-Oct-93	MW 93-02	23.0	Collacott	7.3	131	55	16	6.9	2.9	0.46		495	161	5	<0.04	0.46	0.31				963	873	553	406	1.40	SRC
NE-03-04-26-04-W2	10-Sep-96	MW 93-02	23.0	Collacott	7.55	129	55	18	9	3.2	0.551		486	180	4	<0.04	0.46	0.30				972	885	548	398	0.63	SRC
SW-03-04-26-04-W2	20-Apr-67	WELL 007	22.6	Collacott	7.10	139	57	19	9.0	3.65			533	191	3							1000	955	582	437	-0.45	IWS
SW-03-04-26-04-W2	29-Jun-71	WELL 007	22.6	Collacott	7.32	93	99	23	10.0	3.80			575	226	NIL	3.30	<0.01	0.25				1047	1033	644	471	-0.49	SRC
SW-03-04-26-04-W2	28-May-73	WELL 007	22.6	Collacott	7.21	155	65	24	9.0	5.30	0.40		587	219	16	<1	<0.1	0.45				1140	1081	657	481	-0.95	IWS
SW-03-04-26-04-W2	12-Mar-74	WELL 007	22.6	Collacott	7.11	155	61	25	5.0	3.80	0.42		566	193	4							1120	1013	638	464	2.05	IWS
SW-03-04-26-04-W2	May-75	WELL 007	22.6	Collacott	7.25	193	23	18	7.0	4.45	0.39		544	164	11	0.20	0.05	0.44				961	965	575	446	-0.63	IWS
SW-03-04-26-04-W2	3-Nov-79	WELL 007	22.6	Collacott	7.37	114	49	31	9.0	<0.001	0.25		472	132	20	3.28						929	831	485	387	0.88	IWS
SW-03-04-26-04-W2	10-Jun-80	WELL 007	22.6	Collacott	7.18	116	49	21	8.0	2.02	0.26		490	117	16	1.99	0.13						821	492	402	-0.05	UMA,1980
SW-03-04-26-04-W2	30-Aug-88	WELL 007	22.6	Collacott	7.30	137	50	14		3.00	0.43		500	144	2	<1						951	850	548	410	1.36	YORKTON
SW-03-04-26-04-W2	8-Nov-88	WELL 007	22.6	Collacott	7.61	126	48	13	7.4	3.20	0.40		481	157	3	0.04	0.09	0.30	99	95	3.7	966	839	512	394	-1.10	SRC
SW-03-04-26-04-W2	20-Jun-95	WELL 007	22.6	Collacott	7.4	138	52	13	7.0				512	175	5	<0.08	0.34				9	1005	902	559	420	-1.11	Ballagh, 2001
SW-03-04-26-04-W2	21-Aug-95	WELL 007	22.6	Collacott	7.2	134	51	13	7.0				510	150	7	<0.08	0.43				3.6	1012	872	545	418	-0.22	Ballagh, 2001
SW-03-04-26-04-W2	23-Oct-95	WELL 007	22.6	Collacott	7.2	135	52	14	7.0				508	149	6	1.24	0.25				4	999	872	551	416	0.79	Ballagh, 2001
SW-03-04-26-04-W2	27-May-96	WELL 007	22.6	Collacott	7.1	143	53	14	8.0				517	172	13	0.31	0.25				5	1043	920	575	424	-0.47	Ballagh, 2001
SW-03-04-26-04-W2	6-Aug-96	WELL 007	22.6	Collacott	7.2	144	47	14	7.0				517	166	15	0.22	0.31				5	1053	910	553	424	-2.13	Ballagh, 2001
SW-03-04-26-04-W2	12-Sep-96	WELL 007	22.6	Collacott	7.33	140	54	13	8.5	3.30	0.49		499	177	7	0.35	0.43					1030	903	571	409	0.60	SRC
SW-03-04-26-04-W2	16-Oct-96	WELL 007	22.6	Collacott	7.40	148	54	14	8.0				517	167	9	0.09	0.18				4	1046	917	592	424	1.76	Ballagh, 2001
SW-03-04-26-04-W2	27-May-97	WELL 007	22.6	Collacott	7.50	145	55	13	7.0				520	176	9	<0.02	0.24				5	1054	925	589	426	0.26	Ballagh, 2001
SW-03-04-26-04-W2	25-Jun-97	WELL 007	22.6	Collacott	7.10	153	57	13					517	177	6	<1		0.30				1037	923	617	424	2.23	prov lab, beckie 99
SW-03-04-26-04-W2	8-Sep-97	WELL 007	22.6	Collacott	7.30	145	55	13	7.0				512	177	13		0.23				4.0	1074	922	594	420	0.25	Ballagh, 2001
SW-03-04-26-04-W2	26-Nov-97	WELL 007	22.6	Collacott	7.80	147	53	15	7.0				500	136	2		0.21				4.0	941	860	535	410	6.12	Ballagh, 2001
SW-03-04-26-04-W2	3-Jun-98	WELL 007	22.6	Collacott	7.30	127	57	13	7.0				536	178	7		0.25				4.0	1026	925	607	439	-3.75	Ballagh, 2001
SW-03-04-26-04-W2	14-Sep-98	WELL 007	22.6	Collacott	7.20	149	54	12	7.0				503	162	7		0.30				4.1	1017	894	577	412	3.14	Ballagh, 2001
SW-03-04-26-04-W2	26-Oct-98	WELL 007	22.6	Collacott	7.30	120	51	13	7.0				501	127	2		0.26				3.9	899	821	510	411	0.08	Ballagh, 2001
SW-03-04-26-04-W2	26-May-99	WELL 007	22.6	Collacott	7.10	149	57	13	7.0				522	178	11	<1	0.34				4.7	1065	937	607	428	1.17	Ballagh, 2001
SW-03-04-26-04-W2	5-Aug-99	WELL 007	22.6	Collacott	7.00	144	56	12	7.0				526	178	10	<1	0.25				4.2	1000	933	590	431	-0.46	Ballagh, 2001
SW-03-04-26-04-W2	28-Oct-99	WELL 007	22.6	Collacott	7.10	150	55	12	7.0				525	163	10	<0.02	0.22				4.0	1041	922	601	430	1.73	Ballagh, 2001

Table A-2 Water quality data for the Yorkton study area

LAND LOCATION	DATE SAMPLED	WELL NAME	WELL DEPTH	AQUIFER	PH	CA	MG	NA	K	FE	MN	CO3	HCO3	SO4	CL	NO3- NO3	PO4- PO4	F	C TOT.	C INORG.	C ORG.	COND	Sum	T.H. CACO3	T.A CACO3	ERROR	REFERENCE
QTR-LSD-S-TP-RG-M			M											MG/L								uS/CM	MG/L	MG/L			
SW-03-04-26-04-W2	11-Oct-00	WELL 007	22.6	Collacott	7.26	136	51	12	7.4	3.1	0.49		506	175	9	<0.04						1050	900	549	415	-2.08	SRC
SW-03-04-26-04-W2	31-May-01	WELL 007	22.6	Collacott	7.24	141	53	12	7.7	3.1	0.48		505	170	9	<0.04		0.29				1020	901	570	414	0.19	SRC
SW-03-04-26-04-W2	20-Mar-02	WELL 007	22.6	Collacott	7.30	141	51	12	7.8		0.50		508	170	10							1030	900	561	416	-0.80	SRC
SW-03-04-26-04-W2	13-Aug-03	WELL 007	22.6	Collacott	7.32	127	49	12	7.2	2.9	0.45		492	140	6						3.2	962	837	518	403	-0.33	SRC
SW-03-04-26-04-W2	16-Jun-04	WELL 007	22.6	Collacott	7.50	148	53	12		3.1	0.46		515	173.4	9.4			0.33				1050	914	588	422	-0.19	Prov. Lab
NE-08-04-26-04-W2	12-Sep-96	J. MYSKO	33.5	Collacott	7.42	160	74	79	5.8	1.7	0.84		542	422	12	<0.04	0.09	0.18				1440	1297	703	444	-0.98	SRC
SE-09-04-26-04-W2	11/21/2001	BHL 01-122	44.5	Collacott	7.40	134	75	66	7.4	1.6	0.56		521	365	5	0.13						1390	1176	643	427	-1.13	Pasloske, 2002
NE-01-09-26-04-W2	11/21/2001	BHL 01-123	28.4	Collacott	7.20	130	69	81	8.0	0.99	0.87		337	438	22	54.00						1360	1141	608	276	-0.75	Pasloske, 2002
NW- -11-26-04-W2	1966		4.9	ND		122	80	84					427	410	27								1150	635	350	0.09	Rutherford, 1967
SE-07-12-26-04-W2	10/18/2001	BROWN VERN	8.23	ND	7.8	124	137	180		<0.1	0.03		551	733	33	5						2120	1763	874	452	-0.02	Pasloske, 2002
NW-16-12-26-04-W2	6-Jun-95	Wilkinson Well	10.36	Logan north	7.3	122	51	27	9				600	51	37	2.1	0.13				4	1014	897	515	492	-1.20	Ballagh, 2001
NW-16-12-26-04-W2	14-Aug-95	Wilkinson Well	10.36	Logan north	7.3	126	51	30	9				608	50	26	2.22	0.13				3	1021	900	525	498	1.03	Ballagh, 2001
NW-16-12-26-04-W2	23-Oct-95	Wilkinson Well	10.36	Logan north	7.4	124	52	29	9				605	54	18	4.63	0.1				3	1020	891	524	496	1.42	Ballagh, 2001
NW-16-12-26-04-W2	27-May-96	Wilkinson Well	10.36	Logan north	7.3	121	52	29	10				615	60	20	2.87	0.1				4	973	907	516	504	-0.44	Ballagh, 2001
NW-16-12-26-04-W2	30-Jul-96	Wilkinson Well	10.36	Logan north	7.4	124	52	30	9				612	61	16	2.83	0.13				4	1033	904	525	502	0.86	Ballagh, 2001
NW-16-12-26-04-W2	15-Oct-96	Wilkinson Well	10.36	Logan north	7.4	124	53	25	9				603	56	23	2.86	0.11				3	1014	898	528	494	0.52	Ballagh, 2001
NW-16-12-26-04-W2	26-May-97	Wilkinson Well	10.36	Logan north	7.5	110	46	25	9				555	65	4	0.19	0.1				3	938	824	464	454.8	0.12	Ballagh, 2001
NW-16-12-26-04-W2	2-Sep-97	Wilkinson Well	10.36	Logan north	7.3	120	52	31	9				593	61	17	2.18	0.16				4	997	883	514	486	1.46	Ballagh, 2001
NW-16-12-26-04-W2	4-Nov-97	Wilkinson Well	10.36	Logan north	7.8	125	53	29	9				598	62	22	3.29	0.12				3	1015	898	530	490	1.36	Ballagh, 2001
NW-16-12-26-04-W2	8-Sep-98	Wilkinson Well	10.36	Logan north	7.4	157	79	23	7				584	181	18	28.37	0.15				6.5	1350	1049	717	479	4.05	Ballagh, 2001
NW-16-12-26-04-W2	21-Oct-98	Wilkinson Well	10.36	Logan north	7.3	128	55	28	10				604	69	20	4.02	0.14				3.4	1049	914	546	495	1.73	Ballagh, 2001
NW-16-12-26-04-W2	18-May-99	Wilkinson Well	10.36	Logan north	7	123	53	29	10				601	55	18	4.21	0.15				4.2	1011	889	525	493	1.89	Ballagh, 2001
NW-16-12-26-04-W2	17-Aug-99	Wilkinson Well	10.36	Logan north	7.1	120	51	33	9				592	81	7	1.09	0.11				3.3	953	895	510	485	1.05	Ballagh, 2001
NW-16-12-26-04-W2	3-Nov-99	Wilkinson Well	10.36	Logan north	7.4	116	51	31	10				598	54	11	1.21	0.11				3	962	871	500	490	1.46	Ballagh, 2001
SW-16-12-26-04-W2	10/19/2001	WILKINSON BARRY	10.36	Logan north	7.6	123	53	28		<0.1	<0.01		595	79	13	13						1056	904	525	488	-1.08	Pasloske, 2002
NE- -15-23-05-W2	1966		32.0	Otthon	7.92	214	111	209	9.0				507	915	37								2002	992	416	1.27	Rutherford, 1967
NW-15-31-23-05-W2	18-Mar-75	RATHGEBER	50.9	Otthon	7.35	135	62	380	7.1	3.30	0.34		473	892	110	7.00	<0.05	0.26				2380	2070	592	387	-1.70	SRC
NW-13-04-24-05-W2	18-Mar-75	HUDY	45.7	Otthon	7.40	151	63	369	7.5	2.50	0.73		475	848	141	3.50	<0.05	0.33				2380	2061	636	389	-0.88	SRC
SE-01-08-24-05-W2	18-Mar-75	CHILLOG	81.4	ND	7.21	201	104	506	8.4	8.30	0.24		475	1110	351	12.00	<0.05	0.24				3310	2776	927	390	-0.22	SRC
SW-04-15-24-05-W2	18-Mar-75	WASSILL	33.2	Otthon	7.10	251	87	115	7.8	10.50	0.91		677	654	28	2.00	<0.05	0.29				1860	1833	986	555	-1.29	SRC
NE-16-02-25-05-W2	18-Mar-75	AICHELE	22.3	Otthon	7.65	200	92	167	8.1	18.40	0.37		549	710	42	3.10	<0.05	0.22				1860	1790	828	450	0.01	SRC
NW-04-13-25-05-W2	18-Mar-75	SCHRADER	18.3	Otthon	7.40	116	61	265	9.0	3.00	0.79		614	530	56	<0.5	<0.05	0.22				1820	1655	539	503	-0.25	SRC
NE-08-13-25-05-W2	7-Nov-88	J.PROTZ	21.6	Empress unnamed	7.69	130	60	360	8.4	0.09	0.47		560	657	161	0.18	0.09	0.44	113	110	3.3	2010	1937	574	459	-0.19	SRC
NE- -04-26-05-W2	1966		6.1	ND	7.80	179	235	50	14.0				469	890	136								1973	1416	385	1.23	Rutherford, 1967
SW- -14-26-05-W2	1966		13.7	ND	8.31	63	20	3	4.0			11	170	48	6	50.00							375	239	158	2.67	Rutherford, 1967
NW-05-35-26-05-W2	1986	PIEZ. No.2	18.0	ND	8.14	36	50	40	6.3	0.04	0.03		432	20	<1	0.18		0.34				570	585	296	354	2.04	BBT, 1986
NE-10-35-26-05-W2	1986	PIEZ. No.10	4.3	ND	6.70	520	259	276	24	5.20	7.80		768	212	1370	<0.02		0.14				5450	3442	2367	630	3.66	BBT, 1986
SW-13-35-26-05-W2	1986	PIEZ. No.7	4.3	ND	7.17	370	485	103	79	0.11	0.04		644	2540	18	0.18		0.52				3800	4239	2923	528	0.72	BBT, 1986
NE-14-35-26-05-W2	1986	PIEZ. No.1	7.0	ND	7.74	103	91	34	6.7	0.05	0.29		395	387	11	0.13		0.23				1140	1028	632	324	-1.94	BBT, 1986
NE-16-02-23-06-W2	18-Mar-75	POTYONDE	58.5	ND	7.50	175	78	392	8.0	10.10	0.56		499	1070	63	7.10	<0.05	0.21				2520	2303	758	409	0.09	SRC
05-04-23-06-W2	1-Oct-81	KELLER	64.3	ND	7.57	175	74	365	11.0	<0.01	0.74		437	1010	84	8.40	<0.02	0.18				2590	2165	742	358	0.46	SRC
05-04-23-06-W2	1-Oct-81	KELLER	64.3	ND	7.10	172	78	375	12.7	0.16	0.49		470	1120	67	13.00	<0.02	0.14				2550	2308	750	385	-2.29	SRC
SE-08-13-23-06-W2	18-Mar-75	NIEBERGALL	58.5	ND	7.25	176	72	447	8.1	6.80	0.51		442	1170	134	13.00	<0.05	0.23				2820	2469	735	363	-1.76	SRC
SW-04-21-23-06-W2	29-Jan-70	RD 129 B	116.0	Empress unnamed	7.70	154	78	670		0.20	0.25		440	1140	376	<1							2858	704	361	2.00	PFRA
SW-15-30-23-06-W2	18-Mar-75	ARTYMOWICZ	56.1	Empress unnamed	7.50	192	81	454	8.7	14.20	0.75		475	1300	91	<0.5	<0.05	0.26				2780	2617	815	389	-1.63	SRC
NW-02-15-24-06-W2	18-Mar-75	CARLSON	70.1	ND	7.60	140	51	419	7.1	6.90	0.24		449	617	353	13.00	0.07	0.28				2560	2056	561	368	-1.30	SRC
NE-01-16-24-06-W2	18-Mar-75	VARGA	71.6	ND	7.52	115	49	386	6.3	15.90	0.24		436	574	285	9.30	<0.05	0.29				2350	1877	487	357	-1.04	SRC
NW-14-24-24-06-W2	18-Mar-75	HARDY	55.2	Otthon	7.28	218	92	612	9.3	6.00	0.31		454	1420	342	9.30	<0.05	0.29				3610	3163	922	372	-1.62	SRC
SW-04-26-24-06-W2	18-Mar-75	NAGY	113.7	ND	7.65	56	12	775	5.9	1.50	0.18		551	499	679	9.30	0.05	0.34				3570	2589	192	452	-1.41	SRC
SW-16-29-24-06-W2	18-Mar-75	BUCSIS	73.2	ND	7.35	114	43	383	6.8	4.60	0.37		461	702	159	9.30	<0.05	0.31				2280	1883	460	378	-1.41	SRC
SW-13-31-24-06-W2	7-Nov-88	J.OLSON	75.0	Willowbrook	7.68	200	102	159	8.0	2.20	0.32		562	785	14	0.04	0.06	0.22	115	110	4.7	1720	1833	919	461	-0.89	SRC
SE-04-33-24-06-W2	7-Nov-88	M.BERES	66.1	Willowbrook	7.81	123	62	362	7.4	3.00	0.16		484	848	61	0.04	0.02	0.29	101	95	5.7	1970	1951	561	397	-0.25	SRC
NW- -04-25-06-W2	1966		24.4	ND	7.85	124	89	131	6.0				423	565	15								1353	677	347	0.63	Rutherford, 1967
SE-03-04-25-06-W2	8-Nov-88	E.BERES	47.2	Willowbrook	7.71	197	100	182	8.2	3.50	0.22		567	784	14	0.03	0.03	0.23	117	112	5.0	2110	1856	903	465	0.33	SRC
SW- -20-25-06-W2	1966		36.6	ND	7.72	124	82	145	3.0				495	530	13								1392	648	406	-0.50	Rutherford, 1967
SE-16-32-25-06-W2	8-Nov-88	D.BLAHEY	44.5	Willowbrook	7.76	121	76	213	7.2	1.90	0.24		574	562	22	0.04	0.12	0.16	117	113	4.4	1860	1577	617	471	0.03	SRC
NW-12-33-25-06-W2	5-Jun-75	WILLOWBROOK 001	48.8	Willowbrook	7.11	36	45	175	5.7	4.15	0.15		378	307	21	4.00	0.06	0.11				1070	976	275	310	0.05	SRC
SW-04-05-26-06-W2	7-Nov-88	H.POPENIO	49.7	Willowbrook "A"	7.91	131	78	265	7.6	3.40	0.17		570	682	28	0.04	0.12	0.20	116	112	4.1	2080	1765	648	467	0.70	SRC

Table A-3 Annual withdrawal data (dam^3) for the Yorkton production wells and total annual withdrawals, for the period 1914 - 2004

YEAR	WELL #001	WELL #002	WELL #003	WELL #004	WELL #005	WELL #006/006A	WELL #007	WELL #008	WELL #009	WELL #010	WELL #011	WELL #012	WELL #013	WELL #014	WELL #015	TOTAL	REMARKS
1914																110.5	AVERAGE OF 302.8 M3 SOLD PER DAY
1915																98.4	AVERAGE OF 269.6 M3 SOLD PER DAY
1916																	NO RECORDS
1917																	NO RECORDS
1918																	NO RECORDS
1919																	NO RECORDS
1920																	NO RECORDS
1921																	NO RECORDS
1922																220.9	AVERAGE OF 605.2 M3 SOLD PER DAY
1923																229.6	AVERAGE OF 628.9 M3 SOLD PER DAY
1924																197.2	AVERAGE OF 540.3 M3 SOLD PER DAY
1925																216.6	SOLD
1926																219.2	SOLD
1927	7.6	70.6	143.3													221.5	PUMPED
1928	8.7	76.5	131.4													216.6	SOLD
1929																248.1	SOLD
1930																226.7	SOLD
1931																224.0	SOLD
1932																215.0	SOLD
1933																229.0	SOLD
1934																158.9	SOLD
1935																0.0	NO RECORDS AVAILABLE
1936																157.6	SOLD
1937																0.0	NO RECORDS AVAILABLE
1938																227.9	SOLD
1939																214.1	SOLD
1940																222.4	PUMPED
1941																348.0	LAYNE#2 IN SERVICE:PIPE LOSS 91865.5M3
1942																373.5	PUMPED INTO MAIN: PIPE LOSS 111013.3M3
1943																412.6	PUMPED INTO MAIN: PIPE LOSS 107940.2M3
1944																410.6	PUMPED INTO MAIN: PIPE LOSS 81650.7M3
1945																456.9	PUMPED INTO MAIN: PIPE LOSS 148295.1M3
1946																410.7	PUMPED INTO MAIN
1947																367.0	PUMPED INTO MAIN
1948																516.4	PUMPED INTO MAIN
1949																532.3	PUMPED INTO MAIN
1950																650.9	PUMPED INTO MAIN
1951																752.4	PUMPED INTO MAIN
1952	352.0	352.0	13.8													717.8	PUMPED INTO MAIN
1953																790.4	PUMPED INTO MAIN
1954																658.7	PUMPED INTO MAIN
1955																587.6	PUMPED INTO MAIN
1956	198.7	198.4	8.4	118.1	247.3											770.9	PUMPED INTO MAIN
1957																742.3	PUMPED INTO MAIN
1958																680.6	PUMPED INTO MAIN
1959																695.2	PUMPED INTO MAIN
1960																751.9	PUMPED INTO MAIN
1961																969.0	PUMPED INTO MAIN
1962	263.2	263.2	18.6	47.7	392.9											985.6	PUMPED INTO MAIN
1963																1030.0	PUMPED INTO MAIN
1964																1083.1	PUMPED INTO MAIN
1965																1091.9	PUMPED INTO MAIN

Table A-3 Annual withdrawal data (dam^3) for the Yorkton production wells and total annual withdrawals, for the period 1914 - 2004

YEAR	WELL #001	WELL #002	WELL #003	WELL #004	WELL #005	WELL #006/006A	WELL #007	WELL #008	WELL #009	WELL #010	WELL #011	WELL #012	WELL #013	WELL #014	WELL #015	TOTAL	REMARKS
1966																1238.8	PUMPED FROM WELLS
1967	115.2	149.2	30.2	158.8	445.3	439.8	55.1									1393.6	PUMPED FROM WELLS
1968	143.6	195.0	31.2	123.9	397.3	371.7	103.1									1365.9	PUMPED FROM WELLS
1969	131.4	152.8	39.5	177.1	422.3	456.0	82.6	15.9								1477.7	PUMPED FROM WELLS
1970	101.4	77.3	25.0	136.6	339.7	236.8	37.1	419.7								1373.7	PUMPED FROM WELLS
1971	68.6	19.7	32.6	135.6	451.0	217.2	157.3	315.8								1397.8	PUMPED FROM WELLS
1972	39.6	43.9	8.6	50.4	356.3	156.0	108.7	740.5								1504.1	PUMPED FROM WELLS
1973	24.4	20.9	51.8	47.3	411.3	230.5	89.3	585.5								1461.0	PUMPED FROM WELLS
1974	15.9	16.7	90.4	77.9	298.1	145.4	133.1	834.7								1612.3	PUMPED FROM WELLS
1975	18.6	16.7	76.7	85.9	404.9	107.5	150.1	754.1								1614.5	PUMPED FROM WELLS
1976	175.9	269.6	35.6	78.8	252.7	115.0	144.2	716.9								1788.7	PUMPED FROM WELLS
1977	58.0	57.1	73.3	121.0	332.3	195.4	236.6	777.7								1851.4	PUMPED FROM WELLS
1978	44.6	39.5	103.6	117.7	448.8	181.1	232.9	810.4								1978.6	PUMPED FROM WELLS
1979	89.4	99.3	88.9	181.6	547.3	241.0	378.1	452.9								2078.6	PUMPED FROM WELLS
1980	57.8	60.5	110.3	105.8	346.6	201.2	211.9	836.8	123.8							2054.6	PUMPED FROM WELLS
1981	117.2	11.8	38.5	129.3	90.0	152.8	263.7	90.3	826.6	220.4						1940.6	PUMPED FROM WELLS
1982	76.6	90.3	55.1	161.8	88.1	189.4	353.6	0.0	775.9	235.0						2025.9	PUMPED FROM WELLS
1983	66.0	53.4	33.1	204.8	263.1	89.6	377.1	185.6	445.6	0.0	348.6					2066.8	PUMPED FROM WELLS
1984	24.3	82.3	1.4	124.7	0.0	111.8	201.4	0.0	806.1	139.8	666.5		91.9			2250.2	PUMPED FROM WELLS
1985	72.0	2.6	14.5	147.8	0.0	96.5	128.0	123.8	642.4	46.6	800.7		156.9			2231.9	PUMPED FROM WELLS
1986	5.3	107.9	9.5	61.8	61.5	65.3	157.5	173.1	550.9	139.2	808.7		0.0			2140.8	PUMPED FROM WELLS
1987	27.1	3.5	5.0	14.3	139.0	71.1	146.6	113.5	883.2	53.3	757.4		0.0			2214.1	PUMPED FROM WELLS
1988	0.0	120.7	0.0	143.1	65.3	84.7	196.0	139.6	916.5	5.3	227.0	507.0	0.0			2405.1	PUMPED FROM WELLS
1989	0.0	95.6	0.0	124.3	134.9	30.9	184.4	322.2	675.2	0.0	0.0	766.9	0.0			2334.5	PUMPED FROM WELLS
1990	0.0	96.5	9.4	93.9	0.0	135.3	136.6	213.4	793.6	0.0	0.0	813.2	0.3			2292.2	PUMPED FROM WELLS
1991	0.0	72.3	0.0	98.9	0.0	146.0	119.0	178.4	850.8	0.0	0.0	716.1	0.0			2181.6	PUMPED FROM WELLS
1992	0.0	18.0	0.0	108.3	115.0	1.4	159.8	0.0	1041.7	0.0	167.1	504.6	0.0			2115.9	PUMPED FROM WELLS
1993	15.0	28.0	0.0	142.3	0.0	30.3	239.0	136.7	849.7	0.0	221.1	445.3	0.0			2107.4	PUMPED FROM WELLS
1994	25.9	35.2	0.0	96.2	0.0	216.9	228.0	0.0	895.0	0.0	39.1	646.6	0.0			2183.0	PUMPED FROM WELLS
1995	4.3	8.9	0.0	136.9	0.0	280.9	278.2	0.0	949.5	0.0	119.1	589.2	0.0			2366.9	PUMPED FROM WELLS
1996	0.5	38.9	0.0	92.2	0.0	289.1	343.2	0.0	947.4	0.0	42.9	598.2	0.0			2352.4	PUMPED FROM WELLS
1997	0.0	88.3	0.0	129.2	65.4	226.1	247.4	401.2	486.8	0.0	549.1	195.4	0.0			2388.9	PUMPED FROM WELLS
1998	81.3	1.4	0.0	55.9	249.6	67.7	313.6	411.2	503.7	11.1	235.4	433.8	0.0			2364.6	PUMPED FROM WELLS
1999	46.7	101.8	0.0	110.7	240.7	75.8	282.9	390.7	232.5	42.7	238.5	624.0	0.0			2387.0	PUMPED FROM WELLS
2000	2.0	72.0	0.0	93.3	149.7	155.8	268.8	484.1	440.7	0.4	604.4	183.3	0.0			2454.5	PUMPED FROM WELLS
2001	73.3	0.0	0.0	85.0	75.7	188.2	248.7	795.5	214.0	0.0	292.6	532.4	0.0			2505.3	PUMPED FROM WELLS
2002	27.7	28.9	0.0	75.9	270.8	4.7	240.7	580.0	347.8	0.0	401.2	435.8	0.0			2413.6	PUMPED FROM WELLS
2003	81.0	0.0	0.0	68.9	121.6	131.1	220.2	505.2	379.8	0.0	274.7	602.9	0.0	170.1	105.4	2660.8	PUMPED FROM WELLS
2004	0.0	30.2	0.0	40.4	110.3	11.7	122.8	122.9	463.9	0.0	509.0	19.4	309.6	2.8	481.3	2194.1	PUMPED FROM WELLS

Table A-4 Calculated AVI values

NAME	QTRI	LSD	QTRS	SEC	TWP	RG	MER	DEPTH_M	Depth to Top of aquifer	AQ	Aquifer	Depth 0 - 5 m A	Depth 5 -10 B	Depth > 10 C	Vertical reistance c (years)	AVI Log10
J. NAGY	SW	9		1	23	2	2	41.1	24.0	Tb	Bredenbury Aqu.	5	5.0	14.0	3977.7	3.60
SALTCOATS	SE	1		13	23	2	2	115.8	42.7	Tb	Bredenbury Aqu.	5	5.0	32.7	9089.6	3.96
RALPH EVERT	NE	8		24	23	2	2	72.2	6.0	Tb	Bredenbury Aqu.	5	1.0	0.0	41.1	1.61
L. CAMERON	NE	4		25	23	2	2	56.4	34.0	Tb	Bredenbury Aqu.	5	5.0	24.0	6711.3	3.83
WALTER BRIGIDER	NW	8		25	23	2	2	62.5	38.5	Tb	Bredenbury Aqu.	5	5.0	28.5	7941.5	3.90
G. NAGY	SE	9		35	23	2	2	68.6	24.0	Tb	Bredenbury Aqu.	5	5.0	14.0	3977.7	3.60
YORKTON 530	SW	3		1	24	2	2	91.4	9.1	Tb	Bredenbury Aqu.	5	4.1	0.0	126.0	2.10
PETER JONETT		14		2	24	2	2	26.5	20.5	Tb	Bredenbury Aqu.	5	5.0	10.5	3021.0	3.48
L. IRVINE	NW	15		3	24	2	2	59.4	15.0	Tb	Bredenbury Aqu.	5	5.0	5.0	1517.5	3.18
NICK WINTONYK	SE	9		5	24	2	2	67.1	59.0	Qe	Empress Aqu.	5	5.0	49.0	13545.3	4.13
REG PENNER	SW	1		7	24	2	2	79.2	58.0	Qe	Empress Aqu.	5	5.0	48.0	13272.0	4.12
CLIFFORD BARTEL	SE	3		10	24	2	2	32.0	22.5	Tb	Bredenbury Aqu.	5	5.0	12.5	3567.7	3.55
LORNE PORTER	NE	14		10	24	2	2	53.3	8.5	Tb	Bredenbury Aqu.	5	3.5	0.0	109.6	2.04
ELMER KNOLD	SE	16		13	24	2	2	73.2	53.0	Qe	Empress Aqu.	5	5.0	43.0	11905.2	4.08
MARVIN NABOZNIAK	NW	4		15	24	2	2	50.3	17.0	Tb	Bredenbury Aqu.	5	5.0	7.0	2064.2	3.31
HARRY KARDYNAL	SW	1		23	24	2	2	53.0	45.5	Qe	Empress Aqu.	5	5.0	35.5	9855.0	3.99
DAVID DOMAN	NE	9		24	24	2	2	94.5	66.0	Qe	Empress Aqu.	5	5.0	56.0	15458.9	4.19
H. AICHELLE	NW	8		34	24	2	2	68.6	45.0	Qe	Empress Aqu.	5	5.0	35.0	9718.3	3.99
A. MILLER	NE	4		35	24	2	2	73.2	64.0	Qe	Empress Aqu.	5	5.0	54.0	14912.1	4.17
J R JOWSEY	SE	16		2	25	2	2	56.4	15.5	Tb	Bredenbury Aqu.	5	5.0	5.5	1654.2	3.22
VARGO	NW	2		4	25	2	2	43.0	35.0	Tb	Bredenbury Aqu.	5	5.0	25.0	6984.7	3.84
BHL 01-71	NE	16		7	25	2	2	21.6	0.1	Qit	Sturdee Aqu.	0.1	0.0	0.0	0.3	-0.56
BHL 01-72TH	NE	16		8	25	2	2	45.1	2.4	Tb	Bredenbury Aqu.	2.4	0.0	0.0	6.6	0.82
BHL 01-73TH	NW	15		8	25	2	2	47.6	2.4	Qit	Sturdee Aqu.	2.4	0.0	0.0	6.6	0.82
BHL 01-74TH	SW	12		9	25	2	2	42.1	10.7	Tb	Bredenbury Aqu.	5	5.0	0.7	342.0	2.53
BHL 01-77A	NW	13		9	25	2	2	45.7	0.1	Tb	Bredenbury Aqu.	0.1	0.0	0.0	0.3	-0.56
BHL 01-77B	NW	13		9	25	2	2	22.6	0.1	Tb	Bredenbury Aqu.	0.1	0.0	0.0	0.3	-0.56
BHL 01-77C	NW	13		9	25	2	2	11.0	0.1	Tb	Bredenbury Aqu.	0.1	0.0	0.0	0.3	-0.56
L. LAUBE	SE	1		10	25	2	2	42.7	16.0	Tb	Bredenbury Aqu.	5	5.0	6.0	1790.8	3.25
BHL 02-130A	SE	1		11	25	2	2	54.9	4.9	Tb	Bredenbury Aqu.	4.9	0.0	0.0	13.4	1.13
DR JOHN W JOWSEY	SE	8		12	25	2	2	64.0	12.0	Tb	Bredenbury Aqu.	5	5.0	2.0	697.4	2.84
W. BOBYK	SE	3		14	25	2	2	38.1	32.0	Tb	Bredenbury Aqu.	5	5.0	22.0	6164.6	3.79
NUSSBAUMER DAVID	SW	4		15	25	2	2	23.8	12.2	Tb	Bredenbury Aqu.	5	5.0	2.2	752.1	2.88
BHL 01-75TH	NW	4		16	25	2	2	42.1	5.5	Tb	Bredenbury Aqu.	5	0.5	0.0	27.4	1.44
BHL 01-76TH	SE	1		16	25	2	2	48.2	12.8	Tb	Bredenbury Aqu.	5	5.0	2.8	916.1	2.96
BHL 01-69TH	NE	16		18	25	2	2	29.9	1.5	Qit	Sturdee Aqu.	1.5	0.0	0.0	4.1	0.61
BHL 01-70TH	SE	9		18	25	2	2	29.9	2.1	Qit	Sturdee Aqu.	2.1	0.0	0.0	5.8	0.76
BHL 01-68TH	NE	8		19	25	2	2	36.0	1.5	Qit	Sturdee Aqu.	1.5	0.0	0.0	4.1	0.61
LUTZ HARVEY	SW	1		19	25	2	2	13.1	5.5	Qit	Sturdee Aqu.	5	0.5	0.0	27.4	1.44
BHL 00-43TH	NE	16		23	25	2	2	63.7	16.2	Tb	Bredenbury Aqu.	5	5.0	6.2	1845.5	3.27
A. BACKLUR	SW	11		24	25	2	2	64.0	19.0	Tb	Bredenbury Aqu.	5	5.0	9.0	2610.9	3.42
R GOULDEN	SE	1		25	25	2	2	39.6	26.0	Tb	Bredenbury Aqu.	5	5.0	16.0	4524.4	3.66
PIONTEK CHESTER	SW	2		34	25	2	2	24.4	6.7	Tb	Bredenbury Aqu.	5	1.7	0.0	60.3	1.78

Table A-4 Calculated AVI values

NAME	QTRI	LSD	QTR	SEC	TWP	RG	MER	DEPTH_M	Depth to Top of aquifer	AQ	Aquifer	Depth 0 - 5 m A	Depth 5 -10 B	Depth > 10 C	Vertical reistance c (years)	AVI Log10
I. MACDONALD	NE	1		35	25	2	2	53.3	5.0	Tb	Bredenbury Aqu.	5	0.0	0.0	13.7	1.14
BHL 00-37TH	SE	4		36	25	2	2	9.8	5.5	Qit	Bredenbury Aqu.	5	0.5	0.0	27.4	1.44
BHL 00-44A	SW	1		36	25	2	2	59.4	13.4	Tb	Bredenbury Aqu.	5	5.0	3.4	1080.1	3.03
BHL 00-44B	SW	1		36	25	2	2	20.7	13.4	Tb	Bredenbury Aqu.	5	5.0	3.4	1080.1	3.03
WM BUCHAN	NE	8		36	25	2	2	47.2	28.0	Tb	Bredenbury Aqu.	5	5.0	18.0	5071.2	3.71
YORKTON MASTER FOOD	NE	12		12	26	2	2	37.8	34.0	Tb	Bredenbury Aqu.	5	5.0	24.0	6711.3	3.83
CALLIN PATRICK		0	NE	2	23	3	2	22.9	10.5	Tb	Bredenbury Aqu.	5	5.0	0.5	287.4	2.46
H. MIDDLETON	NW	15		13	23	3	2	36.0	24.0	Tb	Bredenbury Aqu.	5	5.0	14.0	3977.7	3.60
NORMAN ALLIN	SW	3		13	23	3	2	36.6	16.0	Tb	Bredenbury Aqu.	5	5.0	6.0	1790.8	3.25
LEECH LAKE	NE	10		32	23	3	2	43.3	5.8	Qe	Leech Lake Aqu.	5	0.8	0.0	35.6	1.55
YORKTON 529	SE	1		1	24	3	2	121.9	48.8	Qe	Empress Aqu.	5	5.0	38.8	10757.1	4.03
Yorkton TH 46-08	SE	3		3	25	3	2	10.7	2.1	Qit	Intertill Aqu.	2.1	0.0	0.0	5.8	0.76
Yorkton TH 65-03	NW	15		7	25	3	2	33.2	12.2	Qit		5	5.0	2.2	752.1	2.88
VARGO ELSIE		0	SW	11	25	3	2	32.0	20.1	Qit	Sturdee Aqu.	5	5.0	10.1	2911.6	3.46
BHL 01-78	NW	8		12	25	3	2	22.0	2.1	Qit	Sturdee Aqu.	2.1	0.0	0.0	5.8	0.76
BHL 00-33TH	NW	13		13	25	3	2	29.9	10.1	Qit	Sturdee Aqu.	5	5.0	0.1	178.0	2.25
BHL 00-35TH	NE	16		13	25	3	2	42.7	0.1	Qit	Sturdee Aqu.	0.1	0.0	0.0	0.3	-0.56
BHL 01-66TH	SW	12		13	25	3	2	36.0	6.7	Qit	Sturdee Aqu.	5	1.7	0.0	60.3	1.78
BHL 01-67TH	NE	8		13	25	3	2	36.0	0.1	Qit	Sturdee Aqu.	0.1	0.0	0.0	0.3	-0.56
BHL 00-14TH	NW	14		22	25	3	2	34.4	6.1	Qit	Sturdee Aqu.	5	1.1	0.0	43.8	1.64
BHL 00-18TH	NW	13		22	25	3	2	24.1	15.2	Qit	Sturdee Aqu.	5	5.0	5.2	1572.2	3.20
BHL 00-19TH	NW	13		23	25	3	2	42.4	0.9	Qit	Sturdee Aqu.	0.9	0.0	0.0	2.5	0.39
BHL 00-28TH	NW	14		23	25	3	2	45.7	34.4	Qit	Sturdee Aqu.	5	5.0	24.4	6820.7	3.83
BHL 01-57TH	NW	13		23	25	3	2	23.8	0.1	Qit	Sturdee Aqu.	0.1	0.0	0.0	0.3	-0.56
BHL 01-58	NE	13		23	25	3	2	15.2	0.1	Qit	Sturdee Aqu.	0.1	0.0	0.0	0.3	-0.56
BHL 01-59TH	NE	13		23	25	3	2	24.1	0.1	Qit	Sturdee Aqu.	0.1	0.0	0.0	0.3	-0.56
BHL 00-31TH	NE	13		24	25	3	2	24.4	0.1	Qit	Sturdee Aqu.	0.1	0.0	0.0	0.3	-0.56
BHL 00-32TH	NE	14		24	25	3	2	18.0	0.1	Qit	Sturdee Aqu.	0.1	0.0	0.0	0.3	-0.56
BHL 00-34	SE	3		24	25	3	2	34.4	0.9	Qit	Sturdee Aqu.	0.9	0.0	0.0	2.5	0.39
BHL 01-64A	SW	5		24	25	3	2	32.3	0.1	Qit	Sturdee Aqu.	0.1	0.0	0.0	0.3	-0.56
BHL 01-64B	SW	5		24	25	3	2	16.8	0.1	Qit	Sturdee Aqu.	0.1	0.0	0.0	0.3	-0.56
BHL 01-64C	SW	5		24	25	3	2	12.5	0.1	Qit	Sturdee Aqu.	0.1	0.0	0.0	0.3	-0.56
BHL 01-65	NW	12		25	25	3	2	21.3	0.1	Qit	Sturdee Aqu.	0.1	0.0	0.0	0.3	-0.56
BHL 00-29	SW	1		26	25	3	2	30.2	0.1	Qit	Sturdee Aqu.	0.1	0.0	0.0	0.3	-0.56
BHL 01-53TH	NW	13		26	25	3	2	29.9	16.5	Qit	Sturdee Aqu.	5	5.0	6.5	1927.5	3.29
BHL 00-20	NE	8		27	25	3	2	30.2	0.6	Qit	Sturdee Aqu.	0.6	0.0	0.0	1.6	0.22
BHL 01-115PW15	NW	15		27	25	3	2	36.0	2.7	Qit	Sturdee Aqu.	2.7	0.0	0.0	7.4	0.87
BHL 01-50TH	NW	13		27	25	3	2	29.9	4.3	Qit	Sturdee Aqu.	4.3	0.0	0.0	11.8	1.07
BHL 01-51	NW	13		27	25	3	2	9.1	4.3	Qit	Sturdee Aqu.	4.3	0.0	0.0	11.8	1.07
BHL 01-54TH	NE	9		27	25	3	2	29.9	22.9	Qit	Sturdee Aqu.	5	5.0	12.9	3677.0	3.57
BHL 01-60	NE	13		28	25	3	2	12.8	3.1	Qit	Logan South Aqu.	3.1	0.0	0.0	8.5	0.93
BHL 01-60	NE	13		28	25	3	2	12.8	3.1	Qit	Sturdee Aqu.	3.1	0.0	0.0	8.5	0.93
Yorkton TH 66-09	NW	13		29	25	3	2	12.2	4.9	Tb	Logan South Aqu.	4.9	0.0	0.0	13.4	1.13

Table A-4 Calculated AVI values

NAME	QTRL	LSD	QTRS	SEC	TWP	RG	MER	DEPTH_M	Depth to Top of aquifer	AQ	Aquifer	Depth 0 - 5 m A	Depth 5 -10 B	Depth > 10 C	Vertical reistance c (years)	AVI Log10
Art Fiege	NW	14		30	25	3	2	45.7	36.0	Qit		5	5.0	26.0	7258.1	3.86
BHL 01-110A	NE	12		31	25	3	2	39.0	3.1	Qit	Logan Valley Aqu.	3.1	0.0	0.0	8.5	0.93
BHL 01-110B	NE	12		31	25	3	2	25.6	2.9	Qit	Logan Valley Aqu.	2.9	0.0	0.0	7.9	0.90
BHL 01-111A	NE	12		31	25	3	2	37.8	2.7	Qit	Logan Valley Aqu.	2.7	0.0	0.0	7.4	0.87
BHL 01-111B	NE	12		31	25	3	2	21.3	2.7	Qit	Logan Valley Aqu.	2.7	0.0	0.0	7.4	0.87
YORK 95-01	SW	11		31	25	3	2	24.4	2.4	Qit	Logan Valley Aqu.	2.4	0.0	0.0	6.6	0.82
YORK 95-02	SW	11		31	25	3	2	24.4	3.7	Tb	Logan South Aqu.	3.7	0.0	0.0	10.1	1.01
YORK 95-03	NW	3		31	25	3	2	146.3	55.5	Tb	Logan South Aqu.	5	5.0	45.5	12588.6	4.10
Yorkton MW 95-04A, 95-04B,	S	14		31	25	3	2	20.4	6.4	Qit	Logan Valley Aqu.	5	1.4	0.0	52.1	1.72
Yorkton MW 96-01	SW	11		31	25	3	2	15.2	3.7	Tb	Logan South Aqu.	3.7	0.0	0.0	10.1	1.01
Yorkton MW 96-02	SW	11		31	25	3	2	11.9	2.4	Qit	Logan Valley Aqu.	2.4	0.0	0.0	6.6	0.82
Yorkton MW 96-03	SW	14		31	25	3	2	9.1	1.2	Qit	Logan Valley Aqu.	1.2	0.0	0.0	3.3	0.52
Yorkton TH 01-89 GAMMA	SW	14		31	25	3	2	29.3	1.5	Qit	Logan Valley Aqu.	1.5	0.0	0.0	4.1	0.61
Yorkton TH 65-06A	NE	11		31	25	3	2	9.1	1.2	Qit	Logan Valley Aqu.	1.2	0.0	0.0	3.3	0.52
Yorkton TH 65-07	SE	14		31	25	3	2	10.7	1.2	Qit	Logan Valley Aqu.	1.2	0.0	0.0	3.3	0.52
Yorkton TH 65-08	NE	11		31	25	3	2	10.4	1.5	Qit	Logan Valley Aqu.	1.5	0.0	0.0	4.1	0.61
Yorkton TH 76-31	NE	11		31	25	3	2	12.2	1.0	Qit	Logan Valley Aqu.	1.0	0.0	0.0	2.7	0.44
Yorkton TH 76-34	NW	13		31	25	3	2	12.5	2.0	Tb	Logan North Aqu.	2.0	0.0	0.0	5.5	0.74
Yorkton TH 76-37	NW	15		31	25	3	2	18.6	10.4	Qit	Logan Valley Aqu.	5	5.0	0.4	260.0	2.42
Yorkton TH 79-22	SE	14		31	25	3	2	29.6	0.3	Qit	Logan Valley Aqu.	0.3	0.0	0.0	0.8	-0.09
Yorkton TH 79-23	SE	13		31	25	3	2	34.4	1.0	Qit	Logan Valley Aqu.	1.0	0.0	0.0	2.7	0.44
Yorkton TH 79-39	SW	14		31	25	3	2	18.9	2.0	Qit	Logan Valley Aqu.	2.0	0.0	0.0	5.5	0.74
Yorkton TH 79-40	NW	11		31	25	3	2	19.8	1.2	Qit	Logan Valley Aqu.	1.2	0.0	0.0	3.3	0.52
Yorkton TH 79-41	SW	14		31	25	3	2	21.9	1.2	Qit	Logan Valley Aqu.	1.2	0.0	0.0	3.3	0.52
Yorkton TH 79-42	NW	11		31	25	3	2	21.9	1.2	Qit	Logan Valley Aqu.	1.2	0.0	0.0	3.3	0.52
Yorkton TH 79-43	NE	11		31	25	3	2	12.2	1.0	Qit	Logan Valley Aqu.	1.0	0.0	0.0	2.7	0.44
Yorkton TH 79-44	NE	11		31	25	3	2	12.8	2.0	Qit	Logan Valley Aqu.	2.0	0.0	0.0	5.5	0.74
Yorkton TH 79-45	NW	10		31	25	3	2	12.5	2.0	Tb	Logan South Aqu.	2.0	0.0	0.0	5.5	0.74
Yorkton TH 79-46	NW	11		31	25	3	2	14.0	2.1	Qit	Logan Valley Aqu.	2.1	0.0	0.0	5.8	0.76
Yorkton TH 79-47	SE	12		31	25	3	2	40.5	2.7	Qit	Logan Valley Aqu.	2.7	0.0	0.0	7.4	0.87
Yorkton TH 79-48	SW	14		31	25	3	2	37.5	4.0	Qit	Logan Valley Aqu.	4.0	0.0	0.0	11.0	1.04
Yorkton TH 79-49	SE	14		31	25	3	2	28.0	2.4	Qit	Logan Valley Aqu.	2.4	0.0	0.0	6.6	0.82
Yorkton TH 80-10	SW	14		31	25	3	2	46.9	7.3	Qit	Logan Valley Aqu.	5	2.3	0.0	76.7	1.88
Yorkton TH 80-11	SW	14		31	25	3	2	45.1	7.0	Qit	Logan Valley Aqu.	5	2.0	0.0	68.5	1.84
Yorkton TH 80-12	SW	14		31	25	3	2	48.5	10.1	Qit	Logan Valley Aqu.	5	5.0	0.1	178.0	2.25
Yorkton TH 93-03, MW93-04,	SW	12		31	25	3	2	48.8	3.1	Qit	Logan Valley Aqu.	3.1	0.0	0.0	8.5	0.93
Yorkton Well 011	SW	14		31	25	3	2	39.6	1.0	Qit	Logan Valley Aqu.	1.0	0.0	0.0	2.7	0.44
Yorkton TH 76-35	NW	14		31	25	3	2	12.5	2.1	Qit		2.1	0.0	0.0	5.8	0.76
BHL 01-61	SE	9		32	25	3	2	15.2	7.0	Qit	Sturdee Aqu.	5	2.0	0.0	68.5	1.84
Yorkton TH 75-59	SE	1		32	25	3	2	30.5	7.0	Tb	Logan South Aqu.	5	2.0	0.0	68.5	1.84
BHL 01-56TH	NE	8		33	25	3	2	29.9	7.0	Qit	Sturdee Aqu.	5.0	2.0	0.0	68.5	1.84
BHL 01-62	NE	8		33	25	3	2	16.2	5.2	Qit	Sturdee Aqu.	5	0.2	0.0	19.2	1.28
Yorkton TH 75-54	SE	1		33	25	3	2	24.4	3.0	Qit	Sturdee Aqu.	3.0	0.0	0.0	8.2	0.91

Table A-4 Calculated AVI values

NAME	QTRLSD	LSD	QTRSEC	SEC	TWP	RG	MER	DEPTH_M	Depth to Top of aquifer	AQ	Aquifer	Depth 0 - 5 m A	Depth 5 -10 B	Depth > 10 C	Vertical reistance c (years)	AVI Log10
BHL 00-13TH	SW	13		34	25	3	2	21.0	2.4	Qit	Sturdee Aqu.	2.4	0.0	0.0	6.6	0.82
BHL 00-38TW	SE	2		34	25	3	2	36.3	2.4	Qit	Sturdee Aqu.	2.4	0.0	0.0	6.6	0.82
BHL 01-52A	SW	1		34	25	3	2	28.7	18.0	Qit	Sturdee Aqu.	5	5.0	8.0	2337.6	3.37
BHL 01-52B	SW	1		34	25	3	2	8.2	0.6	Qit	Sturdee Aqu.	0.6	0.0	0.0	1.6	0.22
BHL 01-85A	NE	8		34	25	3	2	14.6	0.1	Qit	Sturdee Aqu.	0.1	0.0	0.0	0.3	-0.56
BHL 01-85B	NE	8		34	25	3	2	9.8	0.1	Qit	Sturdee Aqu.	0.1	0.0	0.0	0.3	-0.56
T & C ACRES	NW	5		34	25	3	2	20.4	10.4	Qit	Sturdee Aqu.	5	5.0	0.4	260.0	2.42
Yorkton TH 75-42	SW	1		34	25	3	2	16.9	2.7	Qit	Sturdee Aqu.	2.7	0.0	0.0	7.4	0.87
Yorkton TH 75-43	SE	1		34	25	3	2	15.4	2.0	Qit	Sturdee Aqu.	2.0	0.0	0.0	5.5	0.74
Yorkton TH 75-44	SE	1		34	25	3	2	9.8	3.0	Qit	Sturdee Aqu.	3.0	0.0	0.0	8.2	0.91
Yorkton TH 75-52	SE	2		34	25	3	2	42.7	2.4	Qit	Sturdee Aqu.	2.4	0.0	0.0	6.6	0.82
Yorkton TH 75-53	SE	2		34	25	3	2	39.6	3.0	Qit	Sturdee Aqu.	3.0	0.0	0.0	8.2	0.91
Yorkton TH 76-23	SW	2		34	25	3	2	31.1	4.3	Qit	Sturdee Aqu.	4.3	0.0	0.0	11.8	1.07
Yorkton TH 76-24	SW	2		34	25	3	2	36.9	2.4	Qit	Sturdee Aqu.	2.4	0.0	0.0	6.6	0.82
Yorkton TH 76-29	SE	2		34	25	3	2	31.7	2.4	Qit	Sturdee Aqu.	2.4	0.0	0.0	6.6	0.82
Yorkton TH 76-30	SE	2		34	25	3	2	25.0	2.4	Qit	Sturdee Aqu.	2.4	0.0	0.0	6.6	0.82
Yorkton TH 79-50	SW	15		34	25	3	2	31.4	4.0	Qit	Sturdee Aqu.	4.0	0.0	0.0	11.0	1.04
Yorkton TH 79-51	SW	15		34	25	3	2	18.3	5.5	Qit	Sturdee Aqu.	5	0.5	0.0	27.4	1.44
Yorkton TH 79-52	SE	15		34	25	3	2	31.4	4.0	Qit	Sturdee Aqu.	4.0	0.0	0.0	11.0	1.04
Yorkton TH 79-53	SE	15		34	25	3	2	18.3	5.2	Qit	Sturdee Aqu.	5	0.2	0.0	19.2	1.28
Yorkton TH 79-54	SE	15		34	25	3	2	37.5	4.6	Qit	Sturdee Aqu.	4.6	0.0	0.0	12.6	1.10
Yorkton TH 79-55	NE	2		34	25	3	2	21.6	1.2	Qit	Sturdee Aqu.	1.2	0.0	0.0	3.3	0.52
Yorkton TH 79-56	SE	15		34	25	3	2	31.4	1.2	Qit	Sturdee Aqu.	1.2	0.0	0.0	3.3	0.52
Yorkton TH 79-58	NW	2		34	25	3	2	25.0	1.2	Qit	Sturdee Aqu.	1.2	0.0	0.0	3.3	0.52
Yorkton TH 79-59	NW	2		34	25	3	2	32.9	1.5	Qit	Sturdee Aqu.	1.5	0.0	0.0	4.1	0.61
Yorkton TH 79-60	NE	2		34	25	3	2	31.1	1.2	Qit	Sturdee Aqu.	1.2	0.0	0.0	3.3	0.52
Yorkton TH 79-61	NE	2		34	25	3	2	31.4	1.2	Qit	Sturdee Aqu.	1.2	0.0	0.0	3.3	0.52
Yorkton TH 79-62	NE	2		34	25	3	2	24.4	1.2	Qit	Sturdee Aqu.	1.2	0.0	0.0	3.3	0.52
Yorkton TH 79-63	NE	2		34	25	3	2	34.4	1.2	Qit	Sturdee Aqu.	1.2	0.0	0.0	3.3	0.52
Yorkton TH 79-64	SE	10		34	25	3	2	38.4	3.4	Qit	Sturdee Aqu.	3.4	0.0	0.0	9.3	0.97
Yorkton TH 79-65	SE	10		34	25	3	2	38.7	1.2	Qit	Sturdee Aqu.	1.2	0.0	0.0	3.3	0.52
Yorkton TH 79-66	SE	10		34	25	3	2	31.4	1.2	Qit	Sturdee Aqu.	1.2	0.0	0.0	3.3	0.52
Yorkton TH 79-67	SE	9		34	25	3	2	27.7	2.4	Qit	Sturdee Aqu.	2.4	0.0	0.0	6.6	0.82
Yorkton TH 79-68	NE	16		34	25	3	2	32.6	1.2	Qit	Sturdee Aqu.	1.2	0.0	0.0	3.3	0.52
Yorkton TH 79-69	NW	1		34	25	3	2	31.4	1.8	Qit	Sturdee Aqu.	1.8	0.0	0.0	4.9	0.69
Yorkton TH 79-70	SW	2		34	25	3	2	18.3	1.5	Qit	Sturdee Aqu.	1.5	0.0	0.0	4.1	0.61
BHL 01-55TH	NW	5		35	25	3	2	29.9	0.1	Qit	Sturdee Aqu.	0.1	0.0	0.0	0.3	-0.56
BHL 01-63	SW	12		36	25	3	2	24.1	0.1	Qit	Sturdee Aqu.	0.1	0.0	0.0	0.3	-0.56
BHL 00-24TH	NW	13		2	26	3	2	30.2	0.1	Qit	Sturdee Aqu.	0.1	0.0	0.0	0.3	-0.56
BHL 01-86TH	NW	5		2	26	3	2	29.6	0.1	Qit	Sturdee Aqu.	0.1	0.0	0.0	0.3	-0.56
BHL 00-22TH	NE	15		3	26	3	2	18.0	0.1	Qit	Sturdee Aqu.	0.1	0.0	0.0	0.3	-0.56
BHL 00-23TH	NE	16		3	26	3	2	33.5	0.1	Qit	Sturdee Aqu.	0.1	0.0	0.0	0.3	-0.56
BHL 00-36	NW	15		3	26	3	2	10.7	0.9	Qit	Sturdee Aqu.	0.9	0.0	0.0	2.5	0.39

Table A-4 Calculated AVI values

NAME	QTRI	LSD	QTRS	SEC	TWP	RG	MER	DEPTH_M	Depth to Top of aquifer	AQ	Aquifer	Depth 0 - 5 m A	Depth 5 -10 B	Depth > 10 C	Vertical reistance c (years)	AVI Log10
BHL 00-39TH	SW	1		3	26	3	2	29.9	0.6	Qit	Sturdee Aqu.	0.6	0.0	0.0	1.6	0.22
BHL 00-40A	SW	1		3	26	3	2	19.5	3.1	Qit	Sturdee Aqu.	3.1	0.0	0.0	8.5	0.93
BHL 00-40B	SW	1		3	26	3	2	13.1	3.1	Qit	Sturdee Aqu.	3.1	0.0	0.0	8.5	0.93
BHL 00-40TH	SW	1		3	26	3	2	23.8	2.7	Qit	Sturdee Aqu.	2.7	0.0	0.0	7.4	0.87
BHL 00-41TH	SW	1		3	26	3	2	22.3	3.4	Qit	Sturdee Aqu.	3.4	0.0	0.0	9.3	0.97
BHL 00-42TH	SE	2		3	26	3	2	21.3	6.5	Qit	Sturdee Aqu.	5	1.5	0.0	54.8	1.74
BHL 00-15TH	SE	9		4	26	3	2	36.3	0.8	Qit	Sturdee Aqu.	0.8	0.0	0.0	2.2	0.34
BHL 00-16TH	NE	16		4	26	3	2	48.5	36.3	Qit	Sturdee Aqu.	5	5.0	26.3	7340.1	3.87
BHL 00-17	NE	14		4	26	3	2	75.9	59.4	Qe		5	5.0	49.4	13654.7	4.14
BHL 00-46TH	SW	12		5	26	3	2	26.2	3.4	Qit	Logan Valley Aqu.	3.4	0.0	0.0	9.3	0.97
BHL 00-47TH	SW	12		5	26	3	2	41.2	3.1	Qit	Logan Valley Aqu.	3.1	0.0	0.0	8.5	0.93
BHL 00-48TH	SE	14		5	26	3	2	36.6	4.3	Qit	Logan Valley Aqu.	4.3	0.0	0.0	11.8	1.07
BHL 00-49	NE	14		5	26	3	2	54.9	3.1	Qit	Logan Valley Aqu.	3.1	0.0	0.0	8.5	0.93
BHL 01-114PW14	NE	14		5	26	3	2	50.0	3.1	Qit	Logan Valley Aqu.	3.1	0.0	0.0	8.5	0.93
YORK 96-04 (SRC TH 96-01)	NW	15		5	26	3	2	57.9	5.2	Qit	Logan Valley Aqu.	5	0.2	0.0	19.2	1.28
YORK 96-05 (SRC TH 96-02)	SE	8		6	26	3	2	52.4	6.4	Qit	Logan Valley Aqu.	5	1.4	0.0	52.1	1.72
BHL 01-116	NE	8		8	26	3	2	11.9	5.5	Qit	Logan Valley Aqu.	5	0.5	0.0	27.4	1.44
BHL 00-21	NW	15		9	26	3	2	30.2	4.6	Qit	Logan Valley Aqu.	4.6	0.0	0.0	12.6	1.10
BHL 02-126TH	SW	10		9	26	3	2	18.0	3.1	Qit	Logan Valley Aqu.	3.1	0.0	0.0	8.5	0.93
BHL 02-125	NW	10		9	26	3	2	48.8	6.7	Qit		5	1.7	0.0	60.3	1.78
Yorkton TH 76-22	SE	3		10	26	3	2	15.5	2.1	Qit	Sturdee Aqu.	2.1	0.0	0.0	5.8	0.76
BHL 01-80TH	SE	3		11	26	3	2	25.9	4.3	Qit	Sturdee Aqu.	4.3	0.0	0.0	11.8	1.07
BHL 01-81	SE	3		11	26	3	2	12.8	4.3	Qit	Sturdee Aqu.	4.3	0.0	0.0	11.8	1.07
BHL 01-82	NE	14		11	26	3	2	16.2	12.5	Qit	Sturdee Aqu.	5	5.0	2.5	834.1	2.92
BHL 01-87TH	SW	12		11	26	3	2	29.9	0.1	Qit	Sturdee Aqu.	0.1	0.0	0.0	0.3	-0.56
BHL 00-25	NE	13		15	26	3	2	55.8	12.5	Qit	Logan Valley Aqu.	5	5.0	2.5	834.1	2.92
BHL 00-26TH	SW	4		22	26	3	2	33.5	25.6	Qit	Logan Valley Aqu.	5	5.0	15.6	4415.1	3.64
CRATER LAKE	NE	1		2	23	4	2	122.5	24.4	Qe	Leech Lake Aqu.	5	5.0	14.4	4087.1	3.61
CRATER LAKE	NE	8		2	23	4	2	189.0	79.2	Tb	Leech Lake Aqu.	5	5.0	69.2	19067.2	4.28
CRATER LAKE	NE	8		2	23	4	2	91.4	25.6	Tb	Leech Lake Aqu.	5	5.0	15.6	4415.1	3.64
CRATER LAKE	NW	9		2	23	4	2	122.5	29.9	Qe	Leech Lake Aqu.	5	5.0	19.9	5590.6	3.75
CRATER LAKE	SW	9		2	23	4	2	122.5	28.7	Qe	Leech Lake Aqu.	5	5.0	18.7	5262.5	3.72
PADAR WILLIAM		0	NW	3	23	4	2	48.8	39.0	Qe	Leech Lake Aqu.	5	5.0	29.0	8078.1	3.91
GEORGE GULASH	SW	3		5	23	4	2	63.4	47.0	Qe	Leech Lake Aqu.	5	5.0	37.0	10265.0	4.01
N BURANT	NE	14		5	23	4	2	68.6	48.0	Qe	Leech Lake Aqu.	5	5.0	38.0	10538.4	4.02
P YANISH	SE	16		7	23	4	2	41.1	22.5	Qe	Leech Lake Aqu.	5	5.0	12.5	3567.7	3.55
HALAREWICH MIKE J	NE	9		9	23	4	2	73.2	30.8	Qe	Leech Lake Aqu.	5	5.0	20.8	5836.6	3.77
P. SLAFEREK	NE	8		11	23	4	2	59.4	46.0	Qe	Leech Lake Aqu.	5	5.0	36.0	9991.7	4.00
BHL 01-105	NE	1		13	23	4	2	7.3	3.8	Qit		3.8	0.0	0.0	10.4	1.02
MICHAEL FARMS LTD		1		14	23	4	2	45.7	36.9	Qe	Leech Lake Aqu.	5	5.0	26.9	7504.1	3.88
D. ROEBUCK	NW	16		15	23	4	2	59.4	53.0	Qe	Leech Lake Aqu.	5	5.0	43.0	11905.2	4.08
Yorkton TH 75-41 PIEZ	NW	13		16	23	4	2	67.4	37.0	Qit	Leech Lake Aqu.	5	5.0	27.0	7531.4	3.88
JOHN WENET	NE	16		18	23	4	2	53.9	48.0	Tb	Otthon Aqu.	5	5.0	38.0	10538.4	4.02

Table A-4 Calculated AVI values

NAME	QTRI	LSD	QTRS	SEC	TWP	RG	MER	DEPTH_M	Depth to Top of aquifer	AQ	Aquifer	Depth 0 - 5 m A	Depth 5 -10 B	Depth > 10 C	Vertical reistance c (years)	AVI Log10
BECK FRED		16		21	23	4	2	48.8	37.8	Qe	Leech Lake Aqu.	5	5.0	27.8	7750.1	3.89
BURANT MRS THERESA	NE	14		21	23	4	2	54.9	32.9	Qit	Leech Lake Aqu.	5	5.0	22.9	6410.6	3.81
A. KRAJEWSKI	SW	1		22	23	4	2	50.3	45.0	Qe	Leech Lake Aqu.	5	5.0	35.0	9718.3	3.99
Yorkton TH 75-40	NW	13		22	23	4	2	42.7	20.4	Qe	Leech Lake Aqu.	5	5.0	10.4	2993.6	3.48
D. CHESNEY	SW	15		26	23	4	2	18.3	5.0	Tb	Bredenbury Aqu.	5	0.0	0.0	13.7	1.14
D. LANE	NE	4		29	23	4	2	45.7	33.0	Tb	Otthon Aqu.	5	5.0	23.0	6438.0	3.81
CHAS WENET	SW	2		30	23	4	2	32.3	26.0	Tb	Otthon Aqu.	5	5.0	16.0	4524.4	3.66
Yorkton TH 75-39	SE	2		32	23	4	2	48.8	38.0	Qit	Leech Lake Aqu.	5	5.0	28.0	7804.8	3.89
LEECH LAKE	NW	9		1	24	4	2	61.6	21.9	Qe	Leech Lake Aqu.	5	5.0	11.9	3403.7	3.53
YORKTON 502	SW	4		1	24	4	2	42.7	6.7	Tb	Bredenbury Aqu.	5	1.7	0.0	60.3	1.78
CRESCENT LAKE	SW	7		3	24	4	2	55.5	32.3	Qit	Leech Lake Aqu.	5	5.0	22.3	6246.6	3.80
YORKTON 505	SE	4		9	24	4	2	54.9	24.4	Qit	Leech Lake Aqu.	5	5.0	14.4	4087.1	3.61
Yorkton TH 75-16	SE	4		9	24	4	2	39.6	26.5	Qit	Leech Lake Aqu.	5	5.0	16.5	4661.1	3.67
PROTSKO JOHN		0	NE	16	24	4	2	54.9	35.4	Qit	Leech Lake Aqu.	5	5.0	25.4	7094.0	3.85
Yorkton TH 79-31	NE	14		20	24	4	2	24.4	10.0	Qit	Leech Lake Aqu.	5	5.0	0.0	150.7	2.18
Yorkton TH 75-15	SE	4		20	24	4	2	37.8	11.0	Qit	Leech Lake Aqu.	5	5.0	1.0	424.0	2.63
Yorkton TH 75-26	SE	4		20	24	4	2	3.8	1.0	Qit	Leech Lake Aqu.	1.0	0.0	0.0	2.7	0.44
Yorkton TH 79-30	NW	13		20	24	4	2	27.4	8.5	Qit	Leech Lake Aqu.	5	3.5	0.0	109.6	2.04
Yorkton TH 75-14	SW	1		21	24	4	2	28.0	17.4	Qit	Leech Lake Aqu.	5	5.0	7.4	2173.6	3.34
Yorkton TH 66-13	NW	13		25	24	4	2	26.2	13.4	Qit	Leech Lake Aqu.	5	5.0	3.4	1080.1	3.03
SULLYS CAGE LAYERS 1980	E	16		26	24	4	2	32.0	13.7	Qit	Leech Lake Aqu.	5	5.0	3.7	1162.1	3.07
Yorkton TH 2001-02	NW	14		26	24	4	2	36.0	15.5	Qit	Leech Lake Aqu.	5	5.0	5.5	1654.2	3.22
J. MCGINNES	NE	16		27	24	4	2	20.7	16.0	Qit	Leech Lake Aqu.	5	5.0	6.0	1790.8	3.25
Yorkton TH 75-21C	NW	15		27	24	4	2	4.6	1.0	Qit	Leech Lake Aqu.	1.0	0.0	0.0	2.7	0.44
Yorkton TH 75-22	NW	15		27	24	4	2	4.6	1.0	Qit	Leech Lake Aqu.	1.0	0.0	0.0	2.7	0.44
Yorkton TH 2000-01	SW	7		28	24	4	2	27.4	8.5	Qit	Leech Lake Aqu.	5	3.5	0.0	109.6	2.04
Yorkton TH 67-02	NW	8		28	24	4	2	34.1	5.2	Qit	Leech Lake Aqu.	5	0.2	0.0	19.2	1.28
Yorkton TH 75-18	SW	4		28	24	4	2	6.7	5.3	Qit	Leech Lake Aqu.	5	0.3	0.0	21.9	1.34
Yorkton TH 79-35	NE	16		28	24	4	2	28.0	10.0	Qit	Leech Lake Aqu.	5	5.0	0.0	150.7	2.18
Yorkton TH 79-36	SW	10		28	24	4	2	32.9	7.6	Qit	Leech Lake Aqu.	5	2.6	0.0	84.9	1.93
Yorkton TH 79-37	NE	2		28	24	4	2	25.3	4.0	Qit	Leech Lake Aqu.	4.0	0.0	0.0	11.0	1.04
Yorkton TH 79-38	SE	9		28	24	4	2	20.4	13.4	Qit	Leech Lake Aqu.	5	5.0	3.4	1080.1	3.03
Yorkton TH 67-01	SE	1		29	24	4	2	28.0	8.0	Qit	Leech Lake Aqu.	5	3.0	0.0	95.9	1.98
Yorkton TH 79-25	SW	4		32	24	4	2	27.7	4.9	Qit	Leech Lake Aqu.	4.9	0.0	0.0	13.4	1.13
Yorkton TH 79-26	SE	4		32	24	4	2	25.0	10.0	Qit	Leech Lake Aqu.	5	5.0	0.0	150.7	2.18
Yorkton TH 79-27	SE	3		32	24	4	2	25.0	7.3	Qit	Leech Lake Aqu.	5	2.3	0.0	76.7	1.88
Yorkton TH 79-28	SW	1		32	24	4	2	25.0	4.9	Qit	Leech Lake Aqu.	4.9	0.0	0.0	13.4	1.13
MW #4	NE	16		33	24	4	2	25.0	9.0	Qit	Leech Lake Aqu.	5	4.0	0.0	123.3	2.09
TW 80-12	NW	14		33	24	4	2	21.2	3.7	Qit	Leech Lake Aqu.	3.7	0.0	0.0	10.1	1.01
Yorkton TH 75-06	NE	16		33	24	4	2	27.4	6.1	Qit	Leech Lake Aqu.	5	1.1	0.0	43.8	1.64
Yorkton TH 79-01	NE	8		33	24	4	2	25.0	3.4	Qit	Leech Lake Aqu.	3.4	0.0	0.0	9.3	0.97
Yorkton TH 79-02	NE	8		33	24	4	2	25.0	4.9	Qit	Leech Lake Aqu.	5	0.0	0.0	13.7	1.14
Yorkton TH 79-03	NE	8		33	24	4	2	31.4	6.1	Qit	Leech Lake Aqu.	5	1.1	0.0	43.8	1.64

Table A-4 Calculated AVI values

NAME	QTRLSD	LSD	QTRSEC	SEC	TWP	RG	MER	DEPTH_M	Depth to Top of aquifer	AQ	Aquifer	Depth 0 - 5 m A	Depth 5 -10 B	Depth > 10 C	Vertical reistance c (years)	AVI Log10
Yorkton TH 79-04	NE	7		33	24	4	2	23.2	4.9	Qit	Leech Lake Aqu.	4.9	0.0	0.0	13.4	1.13
Yorkton TH 79-05	SW	2		33	24	4	2	25.0	12.5	Qit	Leech Lake Aqu.	5	5.0	2.5	834.1	2.92
Yorkton TH 79-06	SW	3		33	24	4	2	25.0	8.0	Qit	Leech Lake Aqu.	5	3.0	0.0	95.9	1.98
Yorkton TH 79-07	NW	7		33	24	4	2	25.0	7.0	Qit	Leech Lake Aqu.	5	2.0	0.0	68.5	1.84
Yorkton TH 79-08	NW	15		33	24	4	2	19.5	4.0	Qit	Leech Lake Aqu.	4.0	0.0	0.0	11.0	1.04
Yorkton TH 79-09	NW	14		33	24	4	2	22.6	4.6	Qit	Leech Lake Aqu.	4.6	0.0	0.0	12.6	1.10
Yorkton TH 80-01	NW	14		33	24	4	2	14.0	5.2	Qit	Leech Lake Aqu.	5	0.2	0.0	19.2	1.28
Yorkton TH 80-02	NW	14		33	24	4	2	17.4	4.9	Qit	Leech Lake Aqu.	4.9	0.0	0.0	13.4	1.13
Yorkton TH 80-03	NW	14		33	24	4	2	18.3	4.9	Qit	Leech Lake Aqu.	4.9	0.0	0.0	13.4	1.13
Yorkton TH 99-03	SW	1		33	24	4	2	24.4	5.8	Qit	Leech Lake Aqu.	5	0.8	0.0	35.6	1.55
Yorkton TH 99-04	NW	14		33	24	4	2	24.4	5.5	Qit	Leech Lake Aqu.	5	0.5	0.0	27.4	1.44
Henry Wolochuk	SE	1		34	24	4	2	35.4	16.8	Qit	Leech Lake Aqu.	5	5.0	6.8	2009.5	3.30
MW #1	SW	6		34	24	4	2	23.2	14.9	Qit	Leech Lake Aqu.	5	5.0	4.9	1490.2	3.17
MW #2	NW	3		34	24	4	2	22.2	15.5	Qit	Leech Lake Aqu.	5	5.0	5.5	1654.2	3.22
MW #5	SE	5		34	24	4	2	23.5	16.2	Qit	Leech Lake Aqu.	5	5.0	6.2	1845.5	3.27
YorktonTH 75-01		0	NW	34	24	4	2	39.6	17.1	Qit	Leech Lake Aqu.	5	5.0	7.1	2091.5	3.32
Raymond Buckle (feedlot)	SE	5		34	24	4	2	23.2	17.4	Qit	Leech Lake Aqu.	5	5.0	7.4	2173.6	3.34
Yorkton TH 2000-03	NW	16		34	24	4	2	45.7	26.2	Qit	Leech Lake Aqu.	5	5.0	16.2	4579.1	3.66
Yorkton TH 2000-05	SE	11		34	24	4	2	27.1	14.6	Qit	Leech Lake Aqu.	5	5.0	4.6	1408.1	3.15
Yorkton TH 2001-01	SW	2		34	24	4	2	69.2	18.9	Qit	Leech Lake Aqu.	5	5.0	8.9	2583.6	3.41
Yorkton TH 2001-03	SW	16		34	24	4	2	47.2	18.9	Qit	Leech Lake Aqu.	5	5.0	8.9	2583.6	3.41
Yorkton TH 67-03	SW	2		34	24	4	2	49.7	19.0	Qit	Leech Lake Aqu.	5	5.0	9.0	2610.9	3.42
Yorkton TH 75-09	SE	16		34	24	4	2	39.6	14.9	Qit	Leech Lake Aqu.	5	5.0	4.9	1490.2	3.17
Yorkton TH 75-10	NW	15		34	24	4	2	29.7	19.0	Qit	Leech Lake Aqu.	5	5.0	9.0	2610.9	3.42
Yorkton TH 75-11	SE	16		34	24	4	2	39.6	14.0	Qit	Leech Lake Aqu.	5	5.0	4.0	1244.1	3.09
Yorkton TH 76-51	NW	5		34	24	4	2	36.6	6.4	Qit	Leech Lake Aqu.	5	1.4	0.0	52.1	1.72
Yorkton TH 76-52	SE	5		34	24	4	2	30.8	18.0	Qit	Leech Lake Aqu.	5	5.0	8.0	2337.6	3.37
Yorkton TH 76-53	NE	5		34	24	4	2	36.6	5.8	Qit	Leech Lake Aqu.	5	0.8	0.0	35.6	1.55
Yorkton TH 79-32	SW	4		34	24	4	2	24.4	11.3	Qit	Leech Lake Aqu.	5	5.0	1.3	506.1	2.70
Yorkton TH 99-01	SE	9		34	24	4	2	42.7	14.6	Qit	Leech Lake Aqu.	5	5.0	4.6	1408.1	3.15
Yorkton Well 009	SE	16		34	24	4	2	34.1	15.0	Qit	Leech Lake Aqu.	5	5.0	5.0	1517.5	3.18
LANG DOUGLAS	SE	16		35	24	4	2	32.0	11.0	Qit	Leech Lake Aqu.	5	5.0	1.0	424.0	2.63
Yorkton TH 2000-04	NE	14		35	24	4	2	31.1	12.8	Qit	Leech Lake Aqu.	5	5.0	2.8	916.1	2.96
Yorkton TH 66-15	NW	13		35	24	4	2	35.1	15.8	Qit	Leech Lake Aqu.	5	5.0	5.8	1736.2	3.24
Yorkton TH 75-02	SW	13		35	24	4	2	21.3	15.5	Qit	Leech Lake Aqu.	5	5.0	5.5	1654.2	3.22
Yorkton TH 75-03	SW	13		35	24	4	2	39.6	16.2	Qit	Leech Lake Aqu.	5	5.0	6.2	1845.5	3.27
Yorkton TH 75-04	SW	12		35	24	4	2	32.9	16.0	Qit	Leech Lake Aqu.	5	5.0	6.0	1790.8	3.25
Yorkton TH 75-08	NE	14		35	24	4	2	29.3	11.0	Qit	Leech Lake Aqu.	5	5.0	1.0	424.0	2.63
Yorkton TH 66-14	NW	13		36	24	4	2	25.0	7.3	Qit	Leech Lake Aqu.	5	2.3	0.0	76.7	1.88
D. Buckle	SE	4		1	25	4	2	32.0	16.0	Qit	Leech Lake Aqu.	5	5.0	6.0	1790.8	3.25
GEMBEY DARCY		0	NW	1	25	4	2	30.5	10.4	Qe	Empress Aqu.	5	5.0	0.4	260.0	2.42
Arnold Kruk	NW	8		2	25	4	2	26.5	7.9	Qit	Leech Lake Aqu.	5	2.9	0.0	93.2	1.97
MW #3	NE	5		2	25	4	2	36.6	28.7	Qit	Leech Lake Aqu.	5	5.0	18.7	5262.5	3.72

Table A-4 Calculated AVI values

NAME	QTRL	LSD	QTRS	SEC	TWP	RG	MER	DEPTH_M	Depth to Top of aquifer	AQ	Aquifer	Depth 0 - 5 m A	Depth 5 -10 B	Depth > 10 C	Vertical reistance c (years)	AVI Log10
P. KONKIN	NE	16		2	25	4	2	50.3	40.0	Qe	Empress Aqu.	5	5.0	30.0	8351.5	3.92
Sam Buckle	NE	5		2	25	4	2	41.1	21.8	Qit	Leech Lake Aqu.	5	5.0	11.8	3376.3	3.53
YORK LAKE	NE	8		2	25	4	2	37.2	4.6	Qit	Leech Lake Aqu.	4.6	0.0	0.0	12.6	1.10
YORKTON 506	SW	4		2	25	4	2	54.6	24.4	Qit	Leech Lake Aqu.	5	5.0	14.4	4087.1	3.61
Yorkton TH 75-05	NW	4		2	25	4	2	45.7	12.5	Qit	Leech Lake Aqu.	5	5.0	2.5	834.1	2.92
Yorkton TH 75-13	SE	1		2	25	4	2	26.2	11.0	Qit	Leech Lake Aqu.	5	5.0	1.0	424.0	2.63
Yorkton TH 76-50	NE	5		2	25	4	2	68.0	31.0	Qit	Leech Lake Aqu.	5	5.0	21.0	5891.3	3.77
T. REID	NW	13		3	25	4	2	28.7	12.0	Qit	Leech Lake Aqu.	5	5.0	2.0	697.4	2.84
Yorkton TH 2001-04	NE	1		3	25	4	2	48.2	22.6	Qit	Leech Lake Aqu.	5	5.0	12.6	3595.0	3.56
Yorkton TH 66-17	SE	1		3	25	4	2	35.1	18.9	Qit	Leech Lake Aqu.	5	5.0	8.9	2583.6	3.41
Yorkton TH 66-18	SE	1		3	25	4	2	33.5	18.6	Qit	Leech Lake Aqu.	5	5.0	8.6	2501.6	3.40
Yorkton Well 008	SE	1		3	25	4	2	35.1	21.9	Qit	Leech Lake Aqu.	5	5.0	11.9	3403.7	3.53
Ian White	NE	16		4	25	4	2	27.4	16.2	Qit	Leech Lake Aqu.	5	5.0	6.2	1845.5	3.27
P.J. KONKIN	NE	16		4	25	4	2	27.4	16.0	Qit	Leech Lake Aqu.	5	5.0	6.0	1790.8	3.25
Yorkton TH 66-16	SE	1		4	25	4	2	39.6	5.8	Qit	Leech Lake Aqu.	5	0.8	0.0	35.6	1.55
Yorkton TH 99-02	SE	9		4	25	4	2	39.6	7.0	Qit	Leech Lake Aqu.	5	2.0	0.0	68.5	1.84
YORKTON 504	SW	4		5	25	4	2	42.7	13.7	Tb	Otthon Aqu.	5	5.0	3.7	1162.1	3.07
Yorkton TH 79-29	SW	4		5	25	4	2	18.3	9.4	Tb	Otthon Aqu.	5	4.4	0.0	134.2	2.13
Yorkton TH 2000-02	SE	2		6	25	4	2	25.9	7.6	Tb	Otthon Aqu.	5	2.6	0.0	84.9	1.93
KEN NOVAK	NW	5		7	25	4	2	27.4	17.5	Tb	Otthon Aqu.	5	5.0	7.5	2200.9	3.34
CUNNINGHAM BOB		0	SE	9	25	4	2	24.4	12.5	Qit	Leech Lake Aqu.	5	5.0	2.5	834.1	2.92
J. Wolfe	SE	8		9	25	4	2	30.5	24.4	Qit	Leech Lake Aqu.	5	5.0	14.4	4087.1	3.61
Yorkton TH 75-07	SW	4		10	25	4	2	30.5	21.6	Qit	Leech Lake Aqu.	5	5.0	11.6	3321.7	3.52
Joseph Stachura	SE	1		11	25	4	2	53.0	20.7	Qe	Empress Aqu.	5	5.0	10.7	3075.6	3.49
YORKTON 531	NW	12		12	25	4	2	182.9	43.0	Qe	Empress Aqu.	5	5.0	33.0	9171.6	3.96
KREPAKEVICH DUANE	SW	9		15	25	4	2	45.7	24.4	Qe	Empress Aqu.	5	5.0	14.4	4087.1	3.61
VANDERBURG ED		0		15	25	4	2	51.8	46.3	Qe	Empress Aqu.	5	5.0	36.3	10073.7	4.00
YORKTON 511	NW	13		15	25	4	2	73.2	55.8	Qe	Empress Aqu.	5	5.0	45.8	12670.6	4.10
Yorkton TH 65-01	SW	15		15	25	4	2	66.4	57.9	Qit	Collacott Aqu.	5	5.0	47.9	13244.6	4.12
YORKTON 514	NW	12		18	25	4	2	36.6	16.8	Tb	Otthon Aqu.	5	5.0	6.8	2009.5	3.30
Yorkton TH 65-05	NE	1		19	25	4	2	70.1	39.3	Qe	Empress Aqu.	5	5.0	29.3	8160.1	3.91
T. TOBIN	NE	16		20	25	4	2	56.4	46.0	Qe	Empress Aqu.	5	5.0	36.0	9991.7	4.00
YORKTON WEIGH SCALE 001	NE	16		20	25	4	2	70.1	66.0	Qe	Empress Aqu.	5	5.0	56.0	15458.9	4.19
E. SALVASON	NE	14		21	25	4	2	57.9	51.0	Qe	Empress Aqu.	5	5.0	41.0	11358.5	4.06
YORKTON 503	SW	2		21	25	4	2	67.1	39.3	Qe	Empress Aqu.	5	5.0	29.3	8160.1	3.91
KOZUSKA HAZEL	NW	14		22	25	4	2	39.6	30.5	Tb	Logan South Aqu.	5	5.0	20.5	5754.6	3.76
Yorkton TH 76-27	NW	13		22	25	4	2	45.7	34.7	Tb	Logan South Aqu.	5	5.0	24.7	6902.7	3.84
R. MATISKO	SW	4		23	25	4	2	30.5	24.0	Tb	Logan South Aqu.	5	5.0	14.0	3977.7	3.60
Russell Tataryn	NW	13		23	25	4	2	27.4	12.8	Qe	Logan South Aqu.	5	5.0	2.8	916.1	2.96
TATARYN CAROL	NW	13		23	25	4	2	27.4	10.7	Tb	Logan South Aqu.	5	5.0	0.7	342.0	2.53
Yorkton TH 76-17	NW	16		23	25	4	2	18.3	6.0	Tb	Logan South Aqu.	5	1.0	0.0	41.1	1.61
Yorkton TH 76-13	NW	13		25	25	4	2	18.9	5.0	Tb	Logan South Aqu.	5	0.0	0.0	13.7	1.14
Yorkton TH 76-12	SE	13		25	25	4	2	18.6	9.1	Tb	Logan South Aqu.	5	4.1	0.0	126.0	2.10

Table A-4 Calculated AVI values

NAME	QTRL	LSD	QTRS	SEC	TWP	RG	MER	DEPTH_M	Depth to Top of aquifer	AQ	Aquifer	Depth 0 - 5 m A	Depth 5 -10 B	Depth > 10 C	Vertical reistance c (years)	AVI Log10
Yorkton TH 60-01	NW	12		26	25	4	2	48.8	3.0	Qit	Logan Valley Aqu.	3.0	0.0	0.0	8.2	0.91
Yorkton TH 60-04	SW	14		26	25	4	2	45.7	13.0	Qit	Logan Valley Aqu.	5	5.0	3.0	970.8	2.99
TW 001/60	NW	12		26	25	4	2	33.5	12.8	Qit	Logan Valley Aqu.	5	5.0	2.8	916.1	2.96
TW 002/61	NW	12		26	25	4	2	22.0	11.0	Qit	Logan Valley Aqu.	5	5.0	1.0	424.0	2.63
Yorkton TH 61-01	NW	12		26	25	4	2	35.1	12.2	Qit	Logan Valley Aqu.	5	5.0	2.2	752.1	2.88
Yorkton TH 76-19	NE	9		26	25	4	2	31.1	11.9	Tb	Logan South Aqu.	5	5.0	1.9	670.1	2.83
Yorkton TH 76-38	SE	16		26	25	4	2	18.6	3.4	Tb	Logan South Aqu.	3.4	0.0	0.0	9.3	0.97
Yorkton TH 76-39	NW	16		26	25	4	2	18.6	3.7	Tb	Logan South Aqu.	3.7	0.0	0.0	10.1	1.01
Yorkton TH 30-11	NW	16		27	25	4	2	29.0	1.5	Tb	Logan North Aqu.	1.5	0.0	0.0	4.1	0.61
Yorkton TH 39-03	SW	7		27	25	4	2	15.2	3.7	Qit	Logan Valley Aqu.	3.7	0.0	0.0	10.1	1.01
Yorkton TH 60-02	NE	9		27	25	4	2	24.1	14.0	Qit	Logan Valley Aqu.	5	5.0	4.0	1244.1	3.09
Yorkton TH 60-03	SW	7		27	25	4	2	24.4	8.8	Qit	Logan Valley Aqu.	5	3.8	0.0	117.8	2.07
Yorkton TH 66-08	NW	1		27	25	4	2	16.8	2.4	Qit	Logan Valley Aqu.	2.4	0.0	0.0	6.6	0.82
Yorkton TH 66-10	NE	9		27	25	4	2	48.8	13.4	Qit	Leech Lake Aqu.	5	5.0	3.4	1080.1	3.03
Yorkton TH 66-11	SW	7		27	25	4	2	35.4	26.5	Qit	Logan Valley Aqu.	5	5.0	16.5	4661.1	3.67
Yorkton TH 76-20	NE	9		27	25	4	2	43.0	15.2	Qit	Logan Valley Aqu.	5	5.0	5.2	1572.2	3.20
BHL 02-128	NE	13		28	25	4	2	31.1	21.0	Qe	Empress Aqu.	5	5.0	11.0	3157.6	3.50
TW 008/81	NW	13		28	25	4	2	90.8	42.7	Qe	Empress Aqu.	5	5.0	32.7	9089.6	3.96
Walter Rhinas	NE	14		28	25	4	2	18.3	10.7	Qit	Empress Aqu.	5	5.0	0.7	342.0	2.53
Yorkton TH 79-33	NW	13		28	25	4	2	50.9	42.1	Qe	Empress Aqu.	5	5.0	32.1	8925.5	3.95
Yorkton TH 81-01	NW	13		28	25	4	2	81.4	40.8	Qe	Empress Aqu.	5	5.0	30.8	8570.2	3.93
Yorkton TH 81-02	NW	13		28	25	4	2	45.7	36.3	Qe	Empress Aqu.	5	5.0	26.3	7340.1	3.87
Yorkton TH 81-03	NW	13		28	25	4	2	48.8	40.8	Qe	Empress Aqu.	5	5.0	30.8	8570.2	3.93
Yorkton TH 81-04	NW	13		28	25	4	2	76.2	44.5	Qe	Empress Aqu.	5	5.0	34.5	9581.6	3.98
Yorkton TH 81-05	NW	13		28	25	4	2	87.2	39.6	Qe	Empress Aqu.	5	5.0	29.6	8242.1	3.92
Yorkton TH 81-06	NW	13		28	25	4	2	90.8	42.7	Qe	Empress Aqu.	5	5.0	32.7	9089.6	3.96
Yorkton TH 81-07	NW	13		28	25	4	2	53.6	43.6	Qe	Empress Aqu.	5	5.0	33.6	9335.6	3.97
Yorkton Well 005	SW	13		28	25	4	2	31.1	25.6	Qe	Empress Aqu.	5	5.0	15.6	4415.1	3.64
Yorkton Well 013	NW	13		28	25	4	2	90.8	45.0	Qe	Empress Aqu.	5	5.0	35.0	9718.3	3.99
Ed Pindus	NE	16		29	25	4	2	25.3	12.8	Qe	Empress Aqu.	5	5.0	2.8	916.1	2.96
Yorkton TH 79-34	SW	1		29	25	4	2	37.5	19.8	Qe	Empress Aqu.	5	5.0	9.8	2829.6	3.45
Yorkton TH 65-11	NW	5		30	25	4	2	33.2	30.1	Qe	Empress Aqu.	5	5.0	20.1	5645.2	3.75
BHL 02-148TH	SE	8		31	25	4	2	42.7	36.6	Qe	Empress Aqu.	5	5.0	26.6	7422.1	3.87
Yorkton TH 65-10	SW	12		31	25	4	2	36.0	20.7	Qit	Collacott Aqu.	5	5.0	10.7	3075.6	3.49
Yorkton TH 65-22	NW	13		31	25	4	2	34.1	11.0	Qit	Collacott Aqu.	5	5.0	1.0	424.0	2.63
Yorkton TH 65-23	SW	5		31	25	4	2	37.2	11.9	Qit	Collacott Aqu.	5	5.0	1.9	670.1	2.83
Yorkton TH 65-10B	SW	12		31	25	4	2	25.2	22.6	Qit	Collacott Aqu.	5	5.0	12.6	3595.0	3.56
Yorkton TH 75-10	NW	5		31	25	4	2	35.7	21.9	Qit	Collacott Aqu.	5	5.0	11.9	3403.7	3.53
BHL 00-30	SE	8		32	25	4	2	36.0	2.4	Qit	Collacott Aqu.	2.4	0.0	0.0	6.6	0.82
BHL 00-30	SE	8		32	25	4	2	36.0	2.4	Qit	Empress Aqu.	2.4	0.0	0.0	6.6	0.82
BHL 00-45PW (WELL6A)	NE	8		32	25	4	2	42.1	24.4	Qe	Collacott Aqu.	5	5.0	14.4	4087.1	3.61
BHL 00-45PW (WELL6A)	NE	8		32	25	4	2	42.1	24.4	Qe	Empress Aqu.	5	5.0	14.4	4087.1	3.61
BHL 02-147TH	NW	13		32	25	4	2	42.7	29.0	Qe	Collacott Aqu.	5	5.0	19.0	5344.5	3.73

Table A-4 Calculated AVI values

NAME	QTRL	LSD	QTRS	SEC	TWP	RG	MER	DEPTH_M	Depth to Top of aquifer	AQ	Aquifer	Depth 0 - 5 m A	Depth 5 -10 B	Depth > 10 C	Vertical reistance c (years)	AVI Log10
BHL 02-147TH	NW	13		32	25	4	2	42.7	29.0	Qe	Empress Aqu.	5	5.0	19.0	5344.5	3.73
YORKTON	NE	8		32	25	4	2	48.8	31.7	Qe	Collacott Aqu.	5	5.0	21.7	6082.6	3.78
YORKTON	NE	8		32	25	4	2	48.8	31.7	Qe	Empress Aqu.	5	5.0	21.7	6082.6	3.78
Yorkton TH 60-05	SE	8		32	25	4	2	39.0	31.1	Qe	Empress Aqu.	5	5.0	21.1	5918.6	3.77
Yorkton TH 60-06	SE	8		32	25	4	2	42.7	31.7	Qe	Empress Aqu.	5	5.0	21.7	6082.6	3.78
Yorkton Well 006	NE	8		32	25	4	2	40.2	31.1	Qit	Collacott Aqu.	5	5.0	21.1	5918.6	3.77
Yorkton Well 006	NE	8		32	25	4	2	40.2	31.1	Qit	Empress Aqu.	5	5.0	21.1	5918.6	3.77
Alex Paley	NE	12		33	25	4	2	40.2	31.7	Qe	Collacott Aqu.	5	5.0	21.7	6082.6	3.78
Alex Paley	NE	12		33	25	4	2	40.2	31.7	Qe	Empress Aqu.	5	5.0	21.7	6082.6	3.78
Andy Wosyliu	SE	13		33	25	4	2	22.9	4.6	Qe	Collacott Aqu.	4.6	0.0	0.0	12.6	1.10
Andy Wosyliu	SE	13		33	25	4	2	22.9	4.6	Qe	Empress Aqu.	4.6	0.0	0.0	12.6	1.10
David Janzen	SE	14		33	25	4	2	44.2	19.8	Qe	Collacott Aqu.	5	5.0	9.8	2829.6	3.45
David Janzen	SE	14		33	25	4	2	44.2	19.8	Qe	Empress Aqu.	5	5.0	9.8	2829.6	3.45
DEER PARK GOLF COURSE		0	NE	33	25	4	2	42.7	31.4	Qe	Collacott Aqu.	5	5.0	21.4	6000.6	3.78
DEER PARK GOLF COURSE		0	NE	33	25	4	2	42.7	31.4	Qe	Empress Aqu.	5	5.0	21.4	6000.6	3.78
E. BROWN	NW	13		33	25	4	2	42.7	20.0	Qit	Collacott Aqu.	5	5.0	10.0	2884.3	3.46
E. BROWN	NW	13		33	25	4	2	42.7	20.0	Qit	Empress Aqu.	5	5.0	10.0	2884.3	3.46
Irvin Smith	SW	13		33	25	4	2	27.4	9.1	Qe	Collacott Aqu.	5	4.1	0.0	126.0	2.10
Irvin Smith	SW	13		33	25	4	2	27.4	9.1	Qe	Empress Aqu.	5	4.1	0.0	126.0	2.10
Joe Prokopetz	NW	13		33	25	4	2	27.4	10.4	Qe	Collacott Aqu.	5	5.0	0.4	260.0	2.42
Joe Prokopetz	NW	13		33	25	4	2	27.4	10.4	Qe	Empress Aqu.	5	5.0	0.4	260.0	2.42
K. HODY	SW	12		33	25	4	2	41.1	6.0	Qit	Collacott Aqu.	5	1.0	0.0	41.1	1.61
K. HODY	SW	12		33	25	4	2	41.1	6.0	Qit	Empress Aqu.	5	1.0	0.0	41.1	1.61
Ray Danylko	SE	12		33	25	4	2	41.1	4.9	Qe	Collacott Aqu.	4.9	0.0	0.0	13.4	1.13
Ray Danylko	SE	12		33	25	4	2	41.1	4.9	Qe	Empress Aqu.	4.9	0.0	0.0	13.4	1.13
Yorkton TH 45-09	NW	14		33	25	4	2	35.7	28.0	Qe	Collacott Aqu.	5	5.0	18.0	5071.2	3.71
Yorkton TH 45-09	NW	14		33	25	4	2	35.7	28.0	Qe	Empress Aqu.	5	5.0	18.0	5071.2	3.71
Yorkton TH 62-04	SW	16		33	25	4	2	42.1	7.3	Qit	Collacott Aqu.	5	2.3	0.0	76.7	1.88
Yorkton TH 76-26	SE	4		33	25	4	2	43.3	14.0	Qe	Empress Aqu.	5	5.0	4.0	1244.1	3.09
Yorkton TH 76-45	SW	4		33	25	4	2	6.4	5.2	Qe	Empress Aqu.	5	0.2	0.0	19.2	1.28
Yorkton TH 79-10	SE	2		33	25	4	2	18.6	5.2	Qit	Collacott Aqu.	5	0.2	0.0	19.2	1.28
Yorkton TH 79-12	SE	4		33	25	4	2	69.2	43.0	Qe	Empress Aqu.	5	5.0	33.0	9171.6	3.96
Yorkton TH 79-14	SE	4		33	25	4	2	56.1	22.0	Qe	Empress Aqu.	5	5.0	12.0	3431.0	3.54
Yorkton TH 30-06	NE	16		34	25	4	2	18.9	10.0	Qit	Collacott Aqu.	5	5.0	0.0	150.7	2.18
Yorkton TH 30-02	NW	16		35	25	4	2	9.8	3.0	Tb	Logan North Aqu.	3.0	0.0	0.0	8.2	0.91
Yorkton TH 30-01	NW	14		35	25	4	2	21.3	15.5	Qit	Collacott Aqu.	5	5.0	5.5	1654.2	3.22
Yorkton TH 30-05	SW	14		35	25	4	2	21.0	9.8	Qit	Collacott Aqu.	5	4.8	0.0	145.2	2.16
Yorkton TH 30-21	NW	3		35	25	4	2	12.2	2.7	Qit	Logan Valley Aqu.	5	0.0	0.0	13.7	1.14
Yorkton TH 30-22	SW	8		35	25	4	2	16.8	2.1	Qit	Logan Valley Aqu.	5	0.0	0.0	13.7	1.14
Yorkton TH 30-23	NE	1		35	25	4	2	14.8	3.0	Tb	Logan South Aqu.	3.0	0.0	0.0	8.2	0.91
Yorkton TH 30-24	SW	8		35	25	4	2	15.9	2.4	Qit	Logan Valley Aqu.	2.4	0.0	0.0	6.6	0.82
Yorkton TH 39-04	NW	2		35	25	4	2	17.1	11.9	Qit	Logan Valley Aqu.	5	5.0	1.9	670.1	2.83
Yorkton TH 39-07	NE	3		35	25	4	2	16.9	11.3	Qit	Logan Valley Aqu.	5	5.0	1.3	506.1	2.70

Table A-4 Calculated AVI values

NAME	QTRL	LSD	QTRS	SEC	TWP	RG	MER	DEPTH_M	Depth to Top of aquifer	AQ	Aquifer	Depth 0 - 5 m A	Depth 5 -10 B	Depth > 10 C	Vertical reistance c (years)	AVI Log10
Yorkton TH 39-08	NE	3		35	25	4	2	15.1	3.4	Qit	Logan Valley Aqu.	3.4	0.0	0.0	9.3	0.97
Yorkton TH 39-09	NE	3		35	25	4	2	10.1	3.4	Qit	Logan Valley Aqu.	3.4	0.0	0.0	9.3	0.97
Yorkton TH 39-10	SE	6		35	25	4	2	16.5	4.6	Qit	Logan Valley Aqu.	4.6	0.0	0.0	12.6	1.10
Yorkton TH 39-12	NE	3		35	25	4	2	15.2	7.9	Qit	Logan Valley Aqu.	5	2.9	0.0	93.2	1.97
Yorkton TH 39-14	NW	2		35	25	4	2	16.3	9.1	Qit	Logan Valley Aqu.	5	4.1	0.0	126.0	2.10
Yorkton TH 46-05	NW	9		35	25	4	2	19.8	14.0	Tb	Logan North Aqu.	5	5.0	4.0	1244.1	3.09
Yorkton TH 57-01	SW	2		35	25	4	2	18.6	5.5	Qit	Logan Valley Aqu.	5	0.5	0.0	27.4	1.44
Yorkton TH 57-02	SW	2		35	25	4	2	15.2	3.0	Qit	Logan Valley Aqu.	3.0	0.0	0.0	8.2	0.91
Yorkton TH 65-02	SW	15		35	25	4	2	65.8	57.9	Qit	Collacott Aqu.	5	5.0	47.9	13244.6	4.12
Yorkton TH 75-27	SE	4		35	25	4	2	18.9	4.9	Qit	Logan Valley Aqu.	4.9	0.0	0.0	13.4	1.13
Yorkton TH 75-28	SE	3		35	25	4	2	20.8	4.6	Qit	Logan Valley Aqu.	4.6	0.0	0.0	12.6	1.10
Yorkton TH 75-29	SW	2		35	25	4	2	18.9	4.6	Qit	Logan Valley Aqu.	4.6	0.0	0.0	12.6	1.10
Yorkton TH 75-30	SW	2		35	25	4	2	18.9	4.6	Qit	Logan Valley Aqu.	4.6	0.0	0.0	12.6	1.10
Yorkton TH 75-31	NW	2		35	25	4	2	18.3	4.3	Qit	Logan Valley Aqu.	4.3	0.0	0.0	11.8	1.07
Yorkton TH 75-32	NE	2		35	25	4	2	18.9	4.3	Qit	Logan Valley Aqu.	4.3	0.0	0.0	11.8	1.07
Yorkton TH 75-33	NW	2		35	25	4	2	18.9	4.3	Qit	Logan Valley Aqu.	4.3	0.0	0.0	11.8	1.07
Yorkton TH 75-34	NW	2		35	25	4	2	15.9	4.3	Qit	Logan Valley Aqu.	4.3	0.0	0.0	11.8	1.07
Yorkton TH 75-35	NW	2		35	25	4	2	18.3	4.3	Qit	Logan Valley Aqu.	4.3	0.0	0.0	11.8	1.07
Yorkton TH 75-36	SE	7		35	25	4	2	18.9	5.5	Qit	Logan Valley Aqu.	5.0	0.5	0.0	27.4	1.44
Yorkton TH 76-01	NE	5		35	25	4	2	24.7	13.4	Tb	Logan North Aqu.	5	5.0	3.4	1080.1	3.03
Yorkton TH 76-02	SE	4		35	25	4	2	24.7	12.0	Tb	Logan North Aqu.	5	5.0	2.0	697.4	2.84
Yorkton TH 76-05	SW	8		35	25	4	2	33.8	5.2	Qit	Logan Valley Aqu.	5	0.2	0.0	19.2	1.28
Yorkton TH 76-06	SE	1		35	25	4	2	18.6	3.0	Tb	Logan South Aqu.	5	0.0	0.0	13.7	1.14
Yorkton TH 76-07	NW	8		35	25	4	2	30.8	16.2	Tb	Logan North Aqu.	5	5.0	6.2	1845.5	3.27
Yorkton TH 76-08	SE	8		35	25	4	2	25.0	5.2	Qit	Logan Valley Aqu.	5	0.2	0.0	19.2	1.28
Yorkton TH 76-11	NE	2		35	25	4	2	25.9	2.7	Qit	Logan Valley Aqu.	2.7	0.0	0.0	7.4	0.87
Yorkton TH 79-11	SE	8		35	25	4	2	27.1	4.6	Qit	Logan Valley Aqu.	5	0.0	0.0	13.7	1.14
Yorkton TH 79-15	SW	8		35	25	4	2	31.4	4.9	Qit	Logan Valley Aqu.	4.9	0.0	0.0	13.4	1.13
Yorkton TH 79-16	SE	8		35	25	4	2	24.4	4.0	Qit	Logan Valley Aqu.	4.0	0.0	0.0	11.0	1.04
Yorkton TH 79-17	SE	8		35	25	4	2	21.3	4.6	Qit	Logan Valley Aqu.	4.6	0.0	0.0	12.6	1.10
Yorkton TH 79-18	SW	8		35	25	4	2	22.3	7.9	Qit	Logan Valley Aqu.	5	2.9	0.0	93.2	1.97
Yorkton TH 79-19		0	SE	35	25	4	2	27.4	6.1	Qit	Logan Valley Aqu.	5	1.1	0.0	43.8	1.64
Yorkton TH 79-21	SW	8		35	25	4	2	27.4	5.5	Qit	Logan Valley Aqu.	5	0.5	0.0	27.4	1.44
Yorkton Well 001	SW	2		35	25	4	2	17.0	4.6	Qit	Logan Valley Aqu.	4.6	0.0	0.0	12.6	1.10
Yorkton Well 002	NW	1		35	25	4	2	13.0	3.0	Qit	Logan Valley Aqu.	3.0	0.0	0.0	8.2	0.91
BHL 01-109TH	SE	9		36	25	4	2	29.9	2.1	Qit	Logan Valley Aqu.	2.1	0.0	0.0	5.8	0.76
BHL 01-112TH	SW	9		36	25	4	2	13.7	3.1	Qit	Logan Valley Aqu.	3.1	0.0	0.0	8.5	0.93
BHL 01-113A	NW	8		36	25	4	2	27.4	3.1	Qit	Logan Valley Aqu.	3.1	0.0	0.0	8.5	0.93
BHL 01-113B	NW	8		36	25	4	2	12.5	3.1	Qit	Logan Valley Aqu.	3.1	0.0	0.0	8.5	0.93
BHL 01-90A	NW	6		36	25	4	2	24.1	2.7	Qit	Logan Valley Aqu.	2.7	0.0	0.0	7.4	0.87
BHL 01-90B	NW	6		36	25	4	2	9.1	2.7	Qit	Logan Valley Aqu.	2.7	0.0	0.0	7.4	0.87
BHL 01-91TH	NE	16		36	25	4	2	38.1	2.7	Tb	Logan North Aqu.	2.7	0.0	0.0	7.4	0.87
BHL 01-92A	NE	6		36	25	4	2	33.1	2.6	Qit	Logan Valley Aqu.	2.6	0.0	0.0	7.1	0.85

Table A-4 Calculated AVI values

NAME	QTRL	LSD	QTRS	SEC	TWP	RG	MER	DEPTH_M	Depth to Top of aquifer	AQ	Aquifer	Depth 0 - 5 m A	Depth 5 -10 B	Depth > 10 C	Vertical reistance c (years)	AVI Log10
BHL 01-92B	NE	6		36	25	4	2	16.2	2.6	Qit	Logan Valley Aqu.	2.6	0.0	0.0	7.1	0.85
BHL 01-92C	NE	6		36	25	4	2	9.8	2.9	Qit	Logan Valley Aqu.	2.9	0.0	0.0	7.9	0.90
BHL 01-93	NW	7		36	25	4	2	10.7	4.3	Qit	Logan Valley Aqu.	4.3	0.0	0.0	11.8	1.07
BHL 01-94	NE	6		36	25	4	2	12.5	2.7	Qit	Logan Valley Aqu.	2.7	0.0	0.0	7.4	0.87
BHL 01-95TH	NW	6		36	25	4	2	18.6	4.3	Qit	Logan Valley Aqu.	4.3	0.0	0.0	11.8	1.07
BHL 01-96TH	NE	5		36	25	4	2	15.2	0.9	Qit	Logan Valley Aqu.	0.9	0.0	0.0	2.5	0.39
BHL 01-97A	NW	6		36	25	4	2	30.2	4.6	Qit	Logan Valley Aqu.	4.6	0.0	0.0	12.6	1.10
BHL 01-97B	NW	6		36	25	4	2	13.7	4.3	Qit	Logan Valley Aqu.	4.3	0.0	0.0	11.8	1.07
BHL 01-97C	NW	6		36	25	4	2	5.8	4.3	Qit	Logan Valley Aqu.	4.3	0.0	0.0	11.8	1.07
BHL 01-98	NE	5		36	25	4	2	31.4	4.0	Qit	Logan Valley Aqu.	4.0	0.0	0.0	11.0	1.04
Yorkton TH 76-09	NE	5		36	25	4	2	30.8	11.6	Qit	Logan Valley Aqu.	5	5.0	1.6	588.1	2.77
Yorkton TH 76-10	SW	3		36	25	4	2	18.6	2.1	Tb	Logan South Aqu.	2.1	0.0	0.0	5.8	0.76
Yorkton TH 76-14	SW	11		36	25	4	2	18.6	3.4	Qit	Logan Valley Aqu.	3.4	0.0	0.0	9.3	0.97
Yorkton TH 76-15	SE	12		36	25	4	2	18.6	4.0	Tb	Logan North Aqu.	4.0	0.0	0.0	11.0	1.04
Yorkton TH 76-16	NE	6		36	25	4	2	12.5	2.1	Qit	Logan Valley Aqu.	2.1	0.0	0.0	5.8	0.76
Yorkton TH 76-25	SE	3		36	25	4	2	12.5	3.0	Tb	Logan South Aqu.	3.0	0.0	0.0	8.2	0.91
Yorkton TH 76-32	SW	11		36	25	4	2	12.8	3.4	Qit	Logan Valley Aqu.	3.4	0.0	0.0	9.3	0.97
Yorkton TH 76-33	SW	11		36	25	4	2	12.2	3.4	Qit	Logan Valley Aqu.	3.4	0.0	0.0	9.3	0.97
Yorkton TH 79-20	NW	5		36	25	4	2	24.4	4.0	Qit	Logan Valley Aqu.	4.0	0.0	0.0	11.0	1.04
Yorkton TH 80-07	SE	16		36	25	4	2	18.3	6.7	Tb	Logan North Aqu.	5	1.7	0.0	60.3	1.78
Yorkton TH 80-08	SE	9		36	25	4	2	12.2	4.0	Qit	Logan Valley Aqu.	4.0	0.0	0.0	11.0	1.04
Yorkton TH 80-09	NE	8		36	25	4	2	12.2	4.9	Qit	Logan Valley Aqu.	4.9	0.0	0.0	13.4	1.13
Yorkton TH 80-13	SW	12		36	25	4	2	36.6	1.8	Qit	Logan Valley Aqu.	1.8	0.0	0.0	4.9	0.69
Yorkton TH 80-14	SE	11		36	25	4	2	18.3	6.1	Qit	Logan Valley Aqu.	5	1.1	0.0	43.8	1.64
Yorkton TH 80-15	NE	11		36	25	4	2	13.7	3.7	Tb	Logan North Aqu.	5	0.0	0.0	13.7	1.14
YORKTON 509	SE	2		1	26	4	2	36.6	3.7	Tb	Logan North Aqu.	3.7	0.0	0.0	10.1	1.01
Yorkton TH 66-01	NW	16		1	26	4	2	12.2	1.2	Tb	Logan North Aqu.	1.2	0.0	0.0	3.3	0.52
Yorkton TH 66-02	NW	16		1	26	4	2	12.2	1.2	Tb	Logan North Aqu.	1.2	0.0	0.0	3.3	0.52
Yorkton TH 66-03	NW	16		1	26	4	2	12.2	1.2	Tb	Logan North Aqu.	1.2	0.0	0.0	3.3	0.52
Yorkton TH 66-04	NE	15		1	26	4	2	12.2	1.8	Tb	Logan North Aqu.	1.8	0.0	0.0	4.9	0.69
Yorkton TH 66-06	NW	16		1	26	4	2	15.2	3.7	Tb	Logan North Aqu.	3.7	0.0	0.0	10.1	1.01
Yorkton TH 66-07	SE	16		1	26	4	2	12.2	3.7	Tb	Logan North Aqu.	3.7	0.0	0.0	10.1	1.01
Yorkton TH 30-03	NE	4		2	26	4	2	22.3	7.3	Qit	Collacott Aqu.	5	2.3	0.0	76.7	1.88
Yorkton TH 30-20	SW	15		2	26	4	2	16.5	6.7	Tb	Logan North Aqu.	5	1.7	0.0	60.3	1.78
BHL 02-153TH	SW	4		3	26	4	2	36.6	10.4	Tb	Collacott Aqu.	5	5.0	0.4	260.0	2.42
YORKTON 513	SW	4		3	26	4	2	42.4	7.6	Tb	Collacott Aqu.	5	2.6	0.0	84.9	1.93
Yorkton TH 50-07	NE	6		3	26	4	2	8.8	3.7	Qit	Collacott Aqu.	3.7	0.0	0.0	10.1	1.01
Yorkton TH 60-08	SW	3		3	26	4	2	51.8	4.6	Qit	Collacott Aqu.	4.6	0.0	0.0	12.6	1.10
Yorkton TH 62-01	NW	15		3	26	4	2	36.6	14.6	Qit	Collacott Aqu.	5	5.0	4.6	1408.1	3.15
Yorkton TH 76-28	SW	4		3	26	4	2	36.9	13.7	Tb	Collacott Aqu.	5	5.0	3.7	1162.1	3.07
Yorkton TH 76-42	SW	4		3	26	4	2	6.4	5.2		Collacott Aqu.	5	0.2	0.0	19.2	1.28
Yorkton TH 76-48	NW	5		3	26	4	2	12.5	6.4	Tb	Collacott Aqu.	5	1.4	0.0	52.1	1.72
Yorkton TH 76-49	NW	12		3	26	4	2	12.5	5.2	Tb	Collacott Aqu.	5	0.2	0.0	19.2	1.28

Table A-4 Calculated AVI values

NAME	QTRL	LSD	QTRS	SEC	TWP	RG	MER	DEPTH_M	Depth to Top of aquifer	AQ	Aquifer	Depth 0 - 5 m A	Depth 5 -10 B	Depth > 10 C	Vertical reistance c (years)	AVI Log10
Yorkton Well 004	SW	4		3	26	4	2	17.7	10.7	Tb	Collacott Aqu.	5	5.0	0.7	342.0	2.53
B. SERNOWSKI	SW	1		4	26	4	2	41.1	20.0	Tb	Collacott Aqu.	5	5.0	10.0	2884.3	3.46
BHL 01-122	SE	9		4	26	4	2	44.5	4.0	Tb	Collacott Aqu.	4.0	0.0	0.0	11.0	1.04
BHL 02-129	NE	4		4	26	4	2	19.8	11.0	Qit	Collacott Aqu.	5	5.0	1.0	424.0	2.63
BHL 02-129	NE	4		4	26	4	2	19.8	11.0	Qit	Empress Aqu.	5	5.0	1.0	424.0	2.63
Frank Vidomski	NE	1		4	26	4	2	19.2	12.2	Tb	Collacott Aqu.	5	5.0	2.2	752.1	2.88
John Mysko	NE	8		4	26	4	2	42.7	27.4	Tb	Collacott Aqu.	5	5.0	17.4	4907.2	3.69
SERAY GEORGE		0	SW	4	26	4	2	41.1	38.1	Qit	Collacott Aqu.	5	5.0	28.1	7832.1	3.89
SERAY GEORGE		0	SW	4	26	4	2	41.1	38.1	Qit	Empress Aqu.	5	5.0	28.1	7832.1	3.89
Smith Steel		0	SW	4	26	4	2	27.4	21.3	Qit	Collacott Aqu.	5	5.0	11.3	3239.7	3.51
Smith Steel		0	SW	4	26	4	2	27.4	21.3	Qit	Empress Aqu.	5	5.0	11.3	3239.7	3.51
Yorkton TH 60-09	SW	3		4	26	4	2	19.8	4.6	Qit	Collacott Aqu.	4.6	0.0	0.0	12.6	1.10
Yorkton TH 60-09	SW	3		4	26	4	2	19.8	4.6	Qit	Empress Aqu.	4.6	0.0	0.0	12.6	1.10
Yorkton TH 76-46	SW	3		4	26	4	2	6.4	2.4	Qit	Collacott Aqu.	2.4	0.0	0.0	6.6	0.82
Yorkton TH 76-46	SW	3		4	26	4	2	6.4	2.4	Qit	Empress Aqu.	2.4	0.0	0.0	6.6	0.82
Yorkton Well 007	SE	3		4	26	4	2	22.6	4.5	Qit	Collacott Aqu.	4.5	0.0	0.0	12.3	1.09
Yorkton Well 007	SE	3		4	26	4	2	22.6	4.5	Qit	Empress Aqu.	4.5	0.0	0.0	12.3	1.09
BHL 01-121TH	NE	16		5	26	4	2	24.1	13.1	Tb	Orcadia Aqu.	5	5.0	3.1	998.1	3.00
Yorkton TH 60-07	SE	8		5	26	4	2	20.1	6.1	Qit	Collacott Aqu.	5	1.1	0.0	43.8	1.64
BHL 02-151TH	NW	13		6	26	4	2	24.1	11.0	Tb	Orcadia Aqu.	5	5.0	1.0	424.0	2.63
Yorkton TH 65-09	NW	1		6	26	4	2	36.6	22.6	Qe	Collacott Aqu.	5	5.0	12.6	3595.0	3.56
Yorkton TH 65-09	NW	1		6	26	4	2	36.6	22.6	Qe	Empress Aqu.	5	5.0	12.6	3595.0	3.56
LARGE HARLEY J		0	SE	7	26	4	2	32.0	23.8	Tb	Orcadia Aqu.	5	5.0	13.8	3923.1	3.59
TRAST PERRY		0	SW	7	26	4	2	33.5	24.4	Tb	Orcadia Aqu.	5	5.0	14.4	4087.1	3.61
Yorkton TH 65-19	NW	13		7	26	4	2	37.5	6.7	Tb	Orcadia Aqu.	5	1.7	0.0	60.3	1.78
Yorkton TH 65-13	NW	13		8	26	4	2	29.3	6.1	Tb	Orcadia Aqu.	5	1.1	0.0	43.8	1.64
Yorkton TH 65-13A	NW	13		8	26	4	2	30.5	6.1	Tb	Orcadia Aqu.	5	1.1	0.0	43.8	1.64
Yorkton TH 65-13B	NW	13		8	26	4	2	31.1	6.1	Tb	Orcadia Aqu.	5	1.1	0.0	43.8	1.64
BHL 01-119TH	SE	9		9	26	4	2	24.1	3.1	Tb	Orcadia Aqu.	3.1	0.0	0.0	8.5	0.93
BHL 01-120TH	NE	1		9	26	4	2	30.2	3.1	Tb	Collacott Aqu.	3.1	0.0	0.0	8.5	0.93
BHL 01-123	NE	1		9	26	4	2	28.4	3.1	Tb	Orcadia Aqu.	3.1	0.0	0.0	8.5	0.93
N. MICHALCHUK	SE	3		9	26	4	2	41.1	4.0	Qe	Collacott Aqu.	4.0	0.0	0.0	11.0	1.04
N. MICHALCHUK	SE	3		9	26	4	2	41.1	4.0	Qe	Empress Aqu.	4.0	0.0	0.0	11.0	1.04
BHL 02-145TH	NE	10		10	26	4	2	24.4	14.0	Tb	Orcadia Aqu.	5	5.0	4.0	1244.1	3.09
BHL 02-149TH	SE	9		10	26	4	2	21.3	7.0	Tb	Logan North Aqu.	5	2.0	0.0	68.5	1.84
Yorkton TH 62-03	SW	2		10	26	4	2	9.1	3.4	Qit	Collacott Aqu.	3.4	0.0	0.0	9.3	0.97
BHL 02-144TH	SW	6		11	26	4	2	18.3	4.3	Tb	Logan North Aqu.	4.3	0.0	0.0	11.8	1.07
Yorkton TH 30-07	NW	2		11	26	4	2	18.9	10.4	Tb	Logan North Aqu.	5	5.0	0.4	260.0	2.42
BHL 02-131TH	NE	9		12	26	4	2	18.3	4.0	Tb	Logan North Aqu.	4.0	0.0	0.0	11.0	1.04
BHL 02-143TH	NW	15		12	26	4	2	21.3	12.8	Tb	Logan North Aqu.	5	5.0	2.8	916.1	2.96
EAGLE NO.125 YORKTON	NE	4		12	26	4	2	182.9	3.0	Tb	Logan North Aqu.	5	0.0	0.0	13.7	1.14
W. WILKINSON	NW	16		12	26	4	2	10.7	5.0	Tb	Logan North Aqu.	5	0.0	0.0	13.7	1.14
Yorkton TH 66-05	NE	2		12	26	4	2	10.7	2.1	Tb	Logan North Aqu.	2.1	0.0	0.0	5.8	0.76

Table A-4 Calculated AVI values

NAME	QTRL	LSD	QTRS	SEC	TWP	RG	MER	DEPTH_M	Depth to Top of aquifer	AQ	Aquifer	Depth 0 - 5 m A	Depth 5 -10 B	Depth > 10 C	Vertical reistance c (years)	AVI Log10
Yorkton TH 60-10	SW	3		13	26	4	2	39.6	4.6	Qit		4.6	0.0	0.0	12.6	1.10
BHL 01-118TH	NW	4		15	26	4	2	18.0	1.2	Tb	Orcadia Aqu.	1.2	0.0	0.0	3.3	0.52
T. GROOTHOFF	NW	1		15	26	4	2	24.4	16.0	Tb	Orcadia Aqu.	5	5.0	6.0	1790.8	3.25
BHL 02-146TH	NE	16		16	26	4	2	21.3	1.2	Tb	Orcadia Aqu.	1.2	0.0	0.0	3.3	0.52
Yorkton TH 65-17	NW	4		20	26	4	2	25.0	9.8	Tb	Orcadia Aqu.	5	4.8	0.0	145.2	2.16
BURKELL CRAIG		0	SE	21	26	4	2	30.5	8.5	Tb	Orcadia Aqu.	5	3.5	0.0	109.6	2.04
C. PATTERSON	SE	4		27	26	4	2	16.2	13.0	Tb	Orcadia Aqu.	5	5.0	3.0	970.8	2.99
FRANK VAUGHAN	SW	5		31	26	4	2	25.0	17.5	Tb	Orcadia Aqu.	5	5.0	7.5	2200.9	3.34
ZAYSHLEY RANDY		0	NW	31	26	4	2	30.5	19.8	Tb	Orcadia Aqu.	5	5.0	9.8	2829.6	3.45
JACK WILKINSON	NW	15		32	26	4	2	17.1	3.0	Tb	Orcadia Aqu.	3.0	0.0	0.0	8.2	0.91
D. BLOMNART	NW	13		33	26	4	2	18.3	5.0	Tb	Orcadia Aqu.	5	0.0	0.0	13.7	1.14
MITRENGA EDWIN	SW	1		5	23	5	2	64.0	22.6	Tb	Otthon Aqu.	5	5.0	12.6	3595.0	3.56
HUGO MITRENGA	SW	1		6	23	5	2	45.7	36.0	Tb	Otthon Aqu.	5	5.0	26.0	7258.1	3.86
JOHN RAM	SE	16		6	23	5	2	52.4	43.5	Tb	Otthon Aqu.	5	5.0	33.5	9308.3	3.97
W MOLNAR	NE	8		7	23	5	2	35.7	30.0	Tb	Otthon Aqu.	5	5.0	20.0	5617.9	3.75
EUGENE WALCHUK	NE	8		10	23	5	2	53.0	40.5	Tb	Otthon Aqu.	5	5.0	30.5	8488.2	3.93
HENRY OSICKI	SE	16		15	23	5	2	31.7	27.5	Tb	Otthon Aqu.	5	5.0	17.5	4934.5	3.69
L GADICA	SW	4		17	23	5	2	42.7	36.0	Tb	Otthon Aqu.	5	5.0	26.0	7258.1	3.86
DARCY BUCSIS 1/88	NW	13		18	23	5	2	59.4	34.0	Tb	Otthon Aqu.	5	5.0	24.0	6711.3	3.83
E. MOLNAR	NE	2		18	23	5	2	62.8	45.0	Tb	Otthon Aqu.	5	5.0	35.0	9718.3	3.99
HEIN ART	NW	12		18	23	5	2	64.0	44.5	Tb	Otthon Aqu.	5	5.0	34.5	9581.6	3.98
YORKTON 520	SW	4		18	23	5	2	73.2	41.1	Qe	Empress Aqu.	5	5.0	31.1	8652.2	3.94
W. WOLCHUK	NW	4		20	23	5	2	61.0	26.0	Tb	Otthon Aqu.	5	5.0	16.0	4524.4	3.66
E. OLIJNYK	NE	9		21	23	5	2	45.7	24.0	Tb	Otthon Aqu.	5	5.0	14.0	3977.7	3.60
JOHN OSICKI	NW	13		24	23	5	2	48.8	27.5	Tb	Otthon Aqu.	5	5.0	17.5	4934.5	3.69
PETER S SEMCHUK	SE	8		24	23	5	2	53.3	35.5	Tb	Otthon Aqu.	5	5.0	25.5	7121.4	3.85
BERNARD WOZNIAK	NW	13		25	23	5	2	50.6	37.5	Tb	Otthon Aqu.	5	5.0	27.5	7668.1	3.88
HUDY HENRY		12		26	23	5	2	54.9	22.9	Tb	Otthon Aqu.	5	5.0	12.9	3677.0	3.57
WEISGERBER MARK		0	SW	30	23	5	2	64.0	32.0	Tb	Otthon Aqu.	5	5.0	22.0	6164.6	3.79
COLIN HEAD	NW	15		31	23	5	2	59.4	39.5	Tb	Otthon Aqu.	5	5.0	29.5	8214.8	3.91
Felix Hudy	NW	13		4	24	5	2	59.4	22.0	Tb	Otthon Aqu.	5	5.0	12.0	3431.0	3.54
DON HARRISON	NE	14		8	24	5	2	43.9	24.5	Tb	Otthon Aqu.	5	5.0	14.5	4114.4	3.61
BLAHUT ROBERT		0	NE	9	24	5	2	61.0	26.5	Tb	Otthon Aqu.	5	5.0	16.5	4661.1	3.67
MIKE MOLNAR	SE	13		9	24	5	2	34.7	31.5	Tb	Otthon Aqu.	5	5.0	21.5	6027.9	3.78
YORKTON 516	NW	1		9	24	5	2	67.1	19.8	Tb	Otthon Aqu.	5	5.0	9.8	2829.6	3.45
KORMOS JULIUS	SE	16		10	24	5	2	53.0	18.9	Tb	Otthon Aqu.	5	5.0	8.9	2583.6	3.41
MCKIM	SE	1		12	24	5	2	43.3	4.0	Tb	Otthon Aqu.	4.0	0.0	0.0	11.0	1.04
RAY BUCSIS	NW	5		14	24	5	2	42.7	37.0	Tb	Otthon Aqu.	5	5.0	27.0	7531.4	3.88
KLINGSPON NORMAN	SE	7		20	24	5	2	54.9	22.9	Tb	Otthon Aqu.	5	5.0	12.9	3677.0	3.57
BARSE JOHN		0	SE	21	24	5	2	38.1	19.5	Tb	Otthon Aqu.	5	5.0	9.5	2747.6	3.44
J KORMOS	NE	1		22	24	5	2	13.4	9.0	Tb	Otthon Aqu.	5	4.0	0.0	123.3	2.09
Yorkton TH 75-46	SE	1		23	24	5	2	42.7	4.9	Tb	Otthon Aqu.	4.9	0.0	0.0	13.4	1.13
BRIAN KOZWOLKE	NE	3		26	24	5	2	32.0	4.5	Tb	Otthon Aqu.	5	0.0	0.0	13.7	1.14

Table A-4 Calculated AVI values

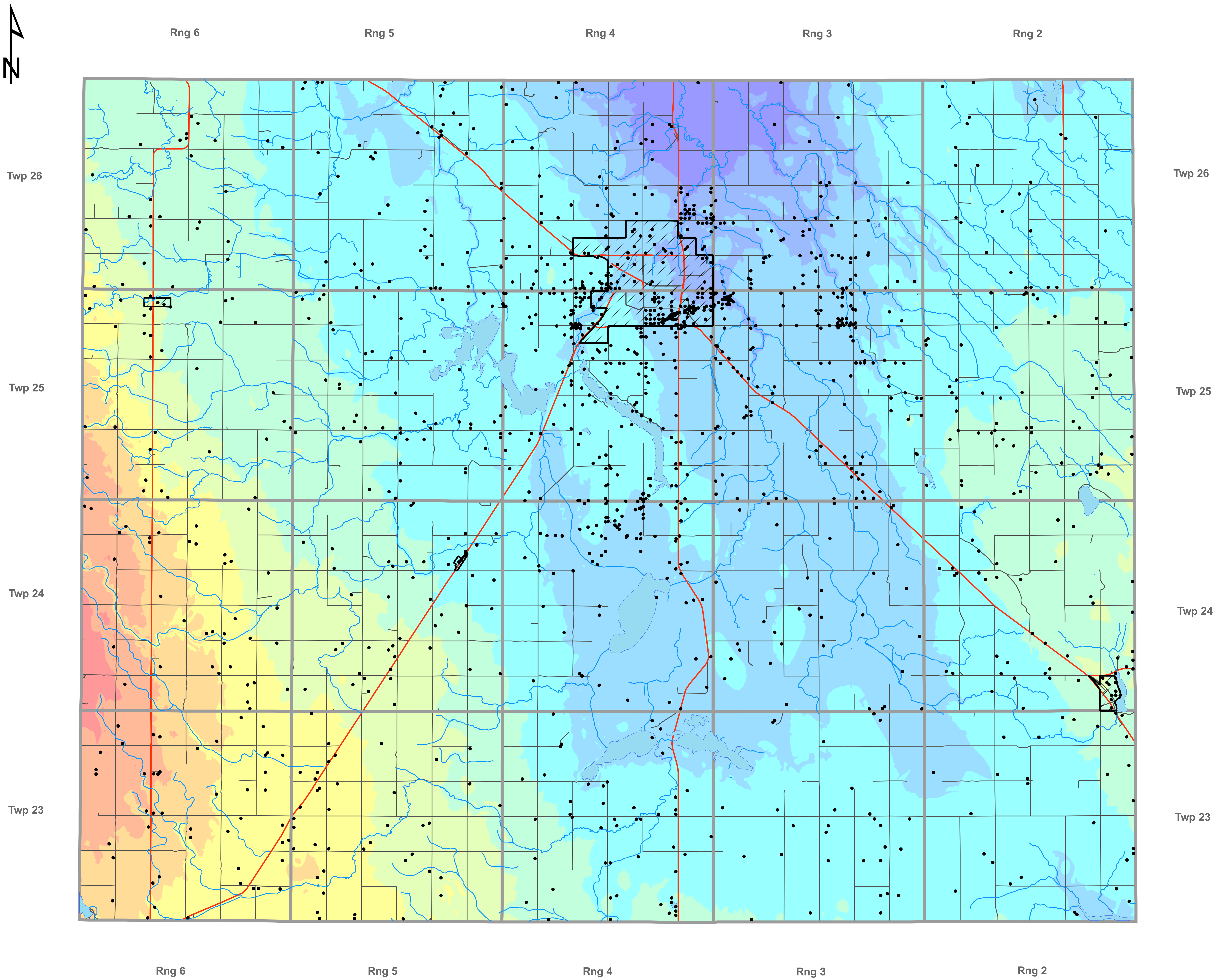
NAME	QTRL	LSD	QTRS	SEC	TWP	RG	MER	DEPTH_M	Depth to Top of aquifer	AQ	Aquifer	Depth 0 - 5 m A	Depth 5 -10 B	Depth > 10 C	Vertical reistance c (years)	AVI Log10
RM OF CANA	NE	8		26	24	5	2	41.1	4.5	Tb	Otthon Aqu.	4.5	0.0	0.0	12.3	1.09
HARDY RONALD	SE	4		29	24	5	2	54.9	43.3	Tb	Otthon Aqu.	5	5.0	33.3	9253.6	3.97
T. VARGA	SW	14		30	24	5	2	45.7	14.0	Tb	Otthon Aqu.	5	5.0	4.0	1244.1	3.09
KUNELLIS HARVEY		14		34	24	5	2	36.6	7.0	Tb	Otthon Aqu.	5	2.0	0.0	68.5	1.84
A NAGY	SW	1		36	24	5	2	27.4	16.5	Tb	Otthon Aqu.	5	5.0	6.5	1927.5	3.29
AICHELE DENNIS	NE	16		2	25	5	2	30.5	6.1	Tb	Otthon Aqu.	5	1.1	0.0	43.8	1.64
ASH S		0	SE	4	25	5	2	36.6	10.1	Tb	Otthon Aqu.	5	5.0	0.1	178.0	2.25
YORKTON 515	SE	1		4	25	5	2	42.7	7.6	Tb	Otthon Aqu.	5	2.6	0.0	84.9	1.93
TOURNEY BRIAN		0		12	25	5	2	27.4	24.4	Tb	Otthon Aqu.	5	5.0	14.4	4087.1	3.61
PROTZ JOHN		0	SE	13	25	5	2	24.4	20.4	Tb	Otthon Aqu.	5	5.0	10.4	2993.6	3.48
BHL 02-156TH	SE	1		21	25	5	2	42.4	32.9	Qe		5	5.0	22.9	6410.6	3.81
Yorkton TH 65-25	SW	12		36	25	5	2	34.1	26.8	Qit	Collacott Aqu.	5	5.0	16.8	4743.1	3.68
Yorkton TH 65-24	SE	1		2	26	5	2	25.0	9.1	Qit	Collacott Aqu.	5	4.1	0.0	126.0	2.10
BHL 02-152TH	SE	9		10	26	5	2	34.1	29.9	Tb		5	5.0	19.9	5590.6	3.75
Yorkton TH 65-26	SE	1		11	26	5	2	34.1	28.3	Qit	Collacott Aqu.	5	5.0	18.3	5153.2	3.71
JOHN YUZIK	SE	1		24	26	5	2	32.0	27.5	Qit		5	5.0	17.5	4934.5	3.69
MOLLY E NORMAN	SE	16		36	26	5	2	27.4	18.0	Tb	Orcadia Aqu.	5	5.0	8.0	2337.6	3.37
JOHN POTYONDI	NE	16		2	23	6	2	58.5	45.0	Tb	Otthon Aqu.	5	5.0	35.0	9718.3	3.99
CITY OF MELVILLE 2	SW	4		3	23	6	2	67.4	38.1	Tb	Otthon Aqu.	5	5.0	28.1	7832.1	3.89
KELLER VAL		5		4	23	6	2	68.6	56.4	Tb	Otthon Aqu.	5	5.0	46.4	12834.6	4.11
NIEBERGALL ERNEST		0	SE	13	23	6	2	67.1	49.4	Qe	Empress Aqu.	5	5.0	39.4	10921.1	4.04
GORDON STEFFEN	SE	12		14	23	6	2	65.5	58.0	Qe	Empress Aqu.	5	5.0	48.0	13272.0	4.12
NIEBERGALL RONALD	NW	15		14	23	6	2	61.0	56.1	Qe	Empress Aqu.	5	5.0	46.1	12752.6	4.11
PFRA RD 129	SW	4		21	23	6	2	115.8	109.0	Qe	Empress Aqu.	5	5.0	99.0	27213.4	4.43
WOTHERSPOON ELMER	NW	4		28	23	6	2	97.5	77.7	Qe	Empress Aqu.	5	5.0	67.7	18657.2	4.27
WOTHERSPOON ELMER A		0	SW	28	23	6	2	106.7	84.4	Qe	Empress Aqu.	5	5.0	74.4	20488.7	4.31
BERNARD ALBERTS	NW	1		29	23	6	2	109.7	75.0	Qe	Empress Aqu.	5	5.0	65.0	17919.1	4.25
MELVILLE	SW	15		30	23	6	2	93.0	81.7	Qe	Empress Aqu.	5	5.0	71.7	19750.6	4.30
WALCHUK WARREN	SW	12		32	23	6	2	85.3	80.8	Qe	Empress Aqu.	5	5.0	70.8	19504.6	4.29
SCHWITZER TRENT	SW	5		33	23	6	2	85.3	75.6	Qe	Empress Aqu.	5	5.0	65.6	18083.1	4.26
MOLNAR EDWARD	C	1		34	23	6	2	64.0	54.9	Qe	Empress Aqu.	5	5.0	44.9	12424.6	4.09
SCHWITZER ALLEN	SE	16		2	24	6	2	79.2	71.3	Qe	Empress Aqu.	5	5.0	61.3	16907.7	4.23
SOMOGYI	SE	16		7	24	6	2	91.4	74.0	Tb	Willowbrook Aqu.	5	5.0	64.0	17645.7	4.25
ALMASI DON		0	SW	9	24	6	2	85.3	62.2	Tb	Willowbrook Aqu.	5	5.0	52.2	14420.1	4.16
ALMASI BOB		0	SW	21	24	6	2	67.7	48.2	Qe		5	5.0	38.2	10593.0	4.03
R ALBERTS	SE	8		30	24	6	2	76.2	61.0	Tb	Willowbrook Aqu.	5	5.0	51.0	14092.1	4.15
OLSON IRVIN		0	NW	31	24	6	2	86.9	64.0	Tb	Willowbrook Aqu.	5	5.0	54.0	14912.1	4.17
BERES MERYLE D	SE	4		33	24	6	2	77.7	61.9	Tb	Willowbrook Aqu.	5	5.0	51.9	14338.1	4.16
BERES EDWARD		0	SW	4	25	6	2	62.5	43.3	Tb	Willowbrook Aqu.	5	5.0	33.3	9253.6	3.97
ALBERTS DOUG	SW	9		5	25	6	2	67.1	53.3	Tb	Willowbrook Aqu.	5	5.0	43.3	11987.2	4.08
RUTH STRANBERG	NW	13		9	25	6	2	28.0	26.5	Tb	Willowbrook Aqu.	5	5.0	16.5	4661.1	3.67
HREBENIK WADE		0	SE	13	25	6	2	61.0	27.4	Qe		5	5.0	17.4	4907.2	3.69
Yorkton TH 49-01	SE	1		13	25	6	2	22.6	19.5	Qit		5	5.0	9.5	2747.6	3.44

Table A-4 Calculated AVI values

NAME	QTRL	LSD	QTRS	SEC	TWP	RG	MER	DEPTH_M	Depth to Top of aquifer	AQ	Aquifer	Depth 0 - 5 m A	Depth 5 -10 B	Depth > 10 C	Vertical reistance c (years)	AVI Log10
JACKSON GORDON	SE	1		18	25	6	2	54.9	49.0	Tb	Willowbrook Aqu.	5	5.0	39.0	10811.7	4.03
JIM GRANQUIST	SW	4		18	25	6	2	45.7	38.5	Tb	Willowbrook Aqu.	5	5.0	28.5	7941.5	3.90
BENKO DENNIS M	NE	9		29	25	6	2	50.3	29.3	Tb	Willowbrook Aqu.	5	5.0	19.3	5426.5	3.73
S. KORVAL	SE	1		29	25	6	2	82.3	51.0	Qe	Willowbrook "A" Aqu.	5	5.0	41.0	11358.5	4.06
RICHARD YAREMKO	NE	5		31	25	6	2	68.6	56.0	Qe	Willowbrook "A" Aqu.	5	5.0	46.0	12725.3	4.10
BLAHEY DONALD	SE	16		32	25	6	2	48.8	34.1	Tb	Willowbrook Aqu.	5	5.0	24.1	6738.7	3.83
COULTER JIM		0	SE	32	25	6	2	48.8	27.4	Tb	Willowbrook Aqu.	5	5.0	17.4	4907.2	3.69
COULTER LARRY	NW	12		32	25	6	2	54.9	42.4	Qe	Willowbrook "A" Aqu.	5	5.0	32.4	9007.6	3.95
YORKTON 522	SW	11		33	25	6	2	61.0	22.3	Tb	Willowbrook Aqu.	5	5.0	12.3	3513.0	3.55
STACHERUK DANNY		13		2	26	6	2	53.3	36.0	Qe	Willowbrook "A" Aqu.	5	5.0	26.0	7258.1	3.86
R. LEMOCHUK	SW	2		4	26	6	2	45.7	38.0	Tb	Willowbrook Aqu.	5	5.0	28.0	7804.8	3.89
POPENIA HARRY		4		5	26	6	2	54.9	40.8	Qe	Willowbrook "A" Aqu.	5	5.0	30.8	8570.2	3.93
HARRY LAZURKO	SW	3		6	26	6	2	59.4	53.5	Qe	Willowbrook "A" Aqu.	5	5.0	43.5	12041.9	4.08
BENNIE NESBITT	NW	12		7	26	6	2	41.1	32.5	Qe	Willowbrook "A" Aqu.	5	5.0	22.5	6301.3	3.80
H. SARADA	NW	14		10	26	6	2	64.0	58.0	Qe	Willowbrook "A" Aqu.	5	5.0	48.0	13272.0	4.12
FRITZ BORYS	SW	13		14	26	6	2	42.7	35.0	Qe	Willowbrook "A" Aqu.	5	5.0	25.0	6984.7	3.84
JOE MICHALISHEN	SW	3		17	26	6	2	50.3	37.0	Qe	Willowbrook "A" Aqu.	5	5.0	27.0	7531.4	3.88
J. MILLER	SW	13		22	26	6	2	42.7	34.0	Qe	Willowbrook "A" Aqu.	5	5.0	24.0	6711.3	3.83
FLETT BOB	NE	8		28	26	6	2	48.8	32.9	Qe	Willowbrook "A" Aqu.	5	5.0	22.9	6410.6	3.81

APPENDIX B: MAPS AND CROSS SECTIONS

MAPS:



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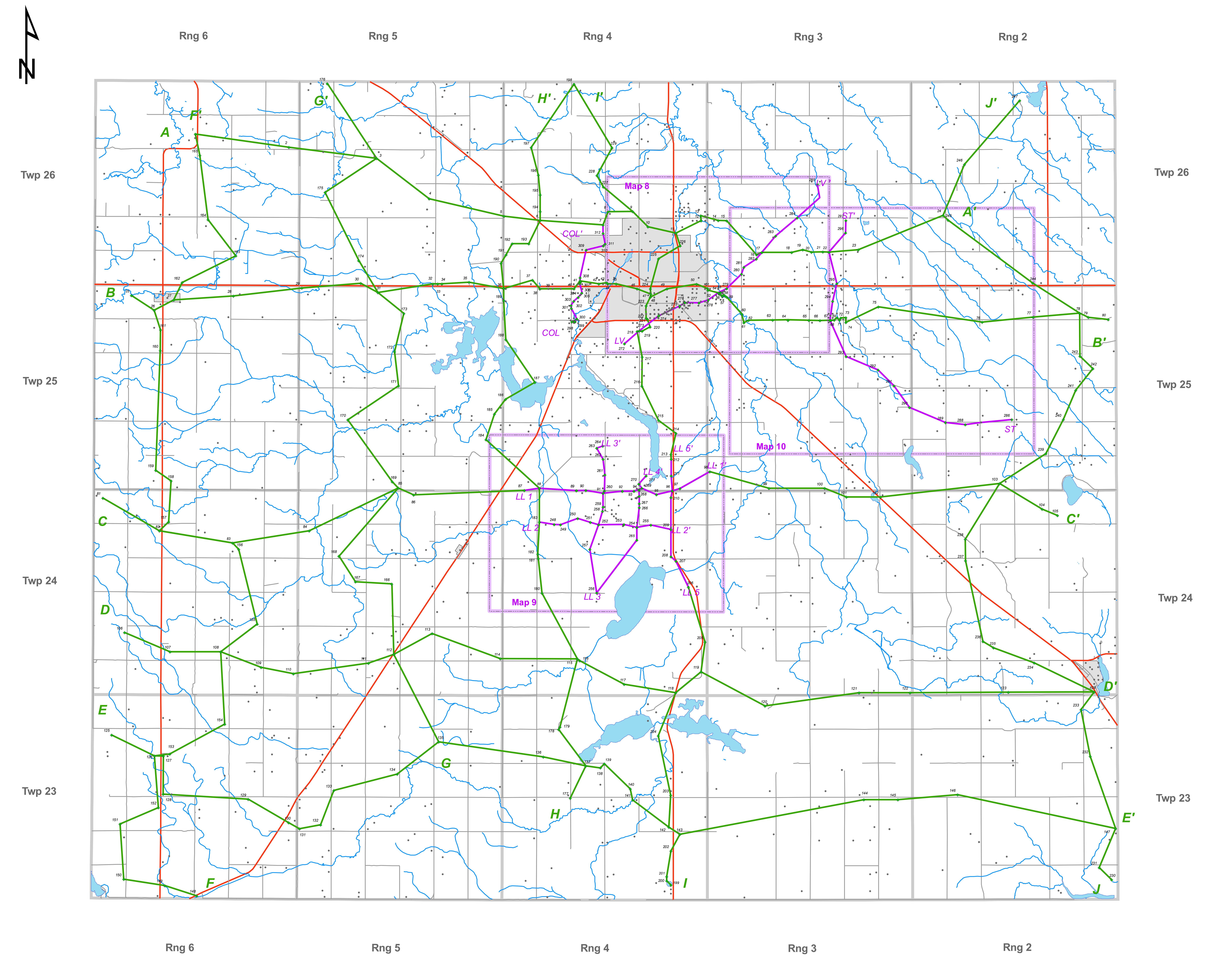
Map 1
Topographical setting of the Yorkton study area

These maps are accompanied by a series of cross sections which depict the subsurface units along the transects shown on the map. The maps and cross sections are representations of the data taken from the testholes and wells indicated on the maps. The boundaries outline areas in which the aquifer or geologic unit is likely to be found. Aquifers and other geologic units mapped do not always occur continuously within the areas shown, and may not be found at a specific site or may occur at elevations other than those indicate. Discontinuous water bearing zones may be found outside the boundaries shown.

Map accompanies report:

Maathuis, H. and Simpson, M. 2006. Groundwater resources in the Yorkton aquifer management plan area, final report. Saskatchewan Research Council, SRC Publication No.10419-1E06



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Map 2
Location of testholes and cross sections in the Yorkton study area

- Road
- Highway
- Testhole location
- Testhole on cross section
- Regional cross sections
- Detailed Areas
- Detailed cross section

0 1 2 4 6 8 10 Km

These maps are accompanied by a series of cross sections which depict the subsurface units along the transects shown on the map. The maps and cross sections are representations of the data taken from the testholes and wells indicated on the maps. The boundaries outline areas in which the aquifer or geologic unit is likely to be found. Aquifers and other geologic units mapped do not always occur continuously within the areas shown, and may not be found at a specific site or may occur at elevations other than those indicate. Discontinuous water bearing zones may be found outside the boundaries shown.

Map accompanies SRC report:

Maathuis, H. and Simpson, M. 2006, Groundwater Resources in the Yorkton aquifer management plan area, final report. Saskatchewan Research Council Report No.10419-1E06

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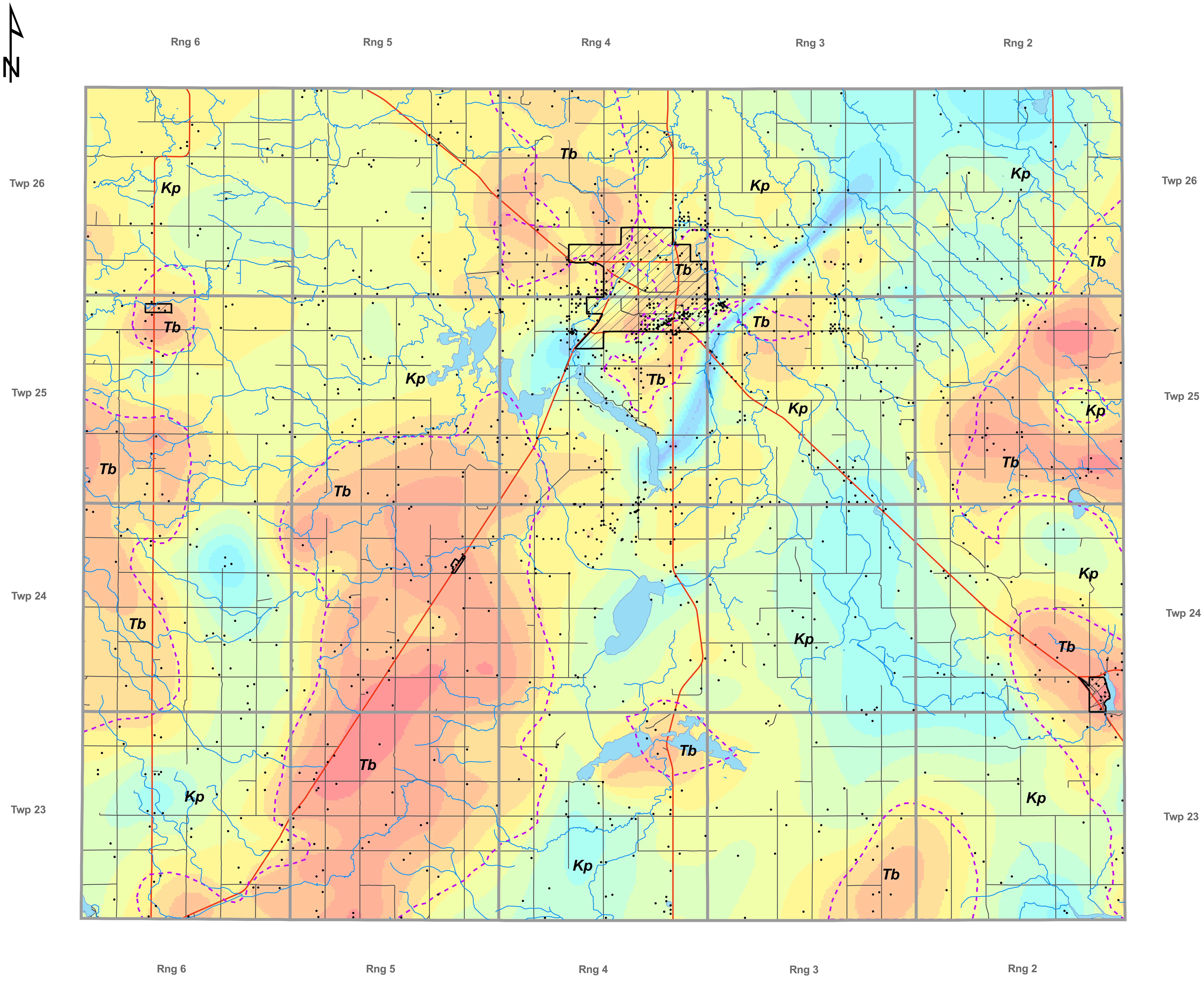
Map 3
Bedrock geology and topography in the Yorkton study area



Testhole location

Geologial contact

Tb - Tertiary, Bredenbury Fm.

Kp - Cretaceous, Pierre Shale

Bedrock topography (masl)

390.1 - 400.0
400.1 - 410.0
410.1 - 420.0
420.1 - 430.0
430.1 - 440.0
440.1 - 450.0
450.1 - 460.0
460.1 - 470.0
470.1 - 480.0
480.1 - 490.0
490.1 - 500.0
500.1 - 510.0
510.1 - 520.0
520.1 - 530.0

Road

Highway

0 1 2 4 6 8 10 Km

These maps are accompanied by a series of cross sections which depict the subsurface units along the transects shown on the map. The maps and cross sections are representations of the data taken from the testholes and wells indicated on the maps. The boundaries outline areas in which the aquifer or geologic unit is likely to be found. Aquifers and other geologic units mapped do not always occur continuously within the areas shown, and may not be found at a specific site or may occur at elevations other than those indicate. Discontinuous water bearing zones may be found outside the boundaries shown.

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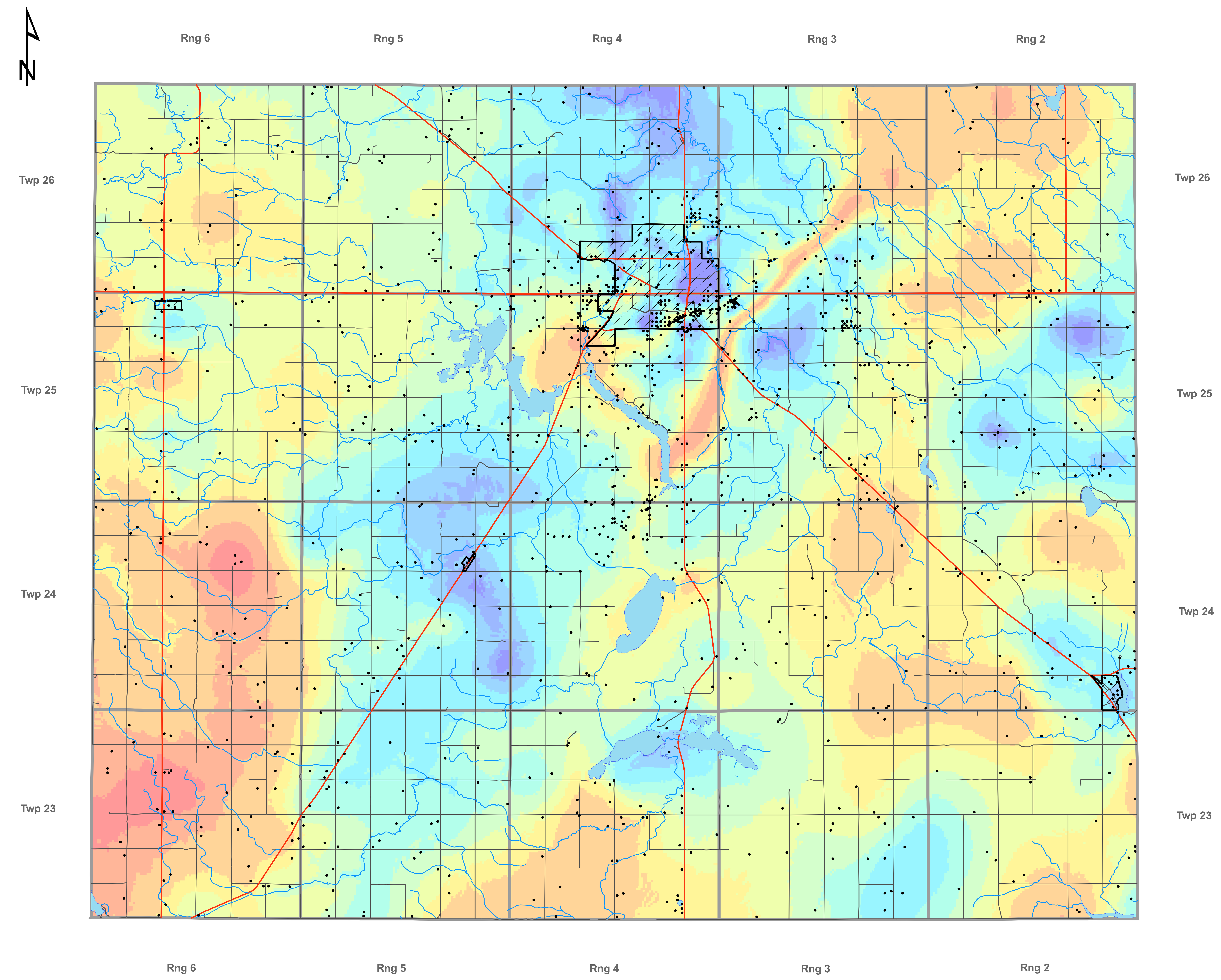
Map 4
Drift thickness in the Yorkton study area



Drift thickness (m)

- 0.0 - 2.0
- 2.1 - 5.0
- 5.1 - 10.0
- 10.1 - 20.0
- 20.1 - 30.0
- 30.1 - 40.0
- 40.1 - 50.0
- 50.1 - 60.0
- 60.1 - 80.0
- 80.1 - 100.0
- 100.1 - 120.0
- Road
- Highway
- Testhole location

0 1 2 4 6 8 10 Km

These maps are accompanied by a series of cross sections which depict the subsurface units along the transects shown on the map. The maps and cross sections are representations of the data taken from the testholes and wells indicated on the maps. The boundaries outline areas in which the aquifer or geologic unit is likely to be found. Aquifers and other geologic units mapped do not always occur continuously within the areas shown, and may not be found at a specific site or may occur at elevations other than those indicate. Discontinuous water bearing zones may be found outside the boundaries shown.

Map accompanies report:

Maathuis, H. and Simpson, M. 2006. Groundwater resources in the Yorkton aquifer management plan area, final report. Saskatchewan Research Council, SRC Publication No.10419-1E06

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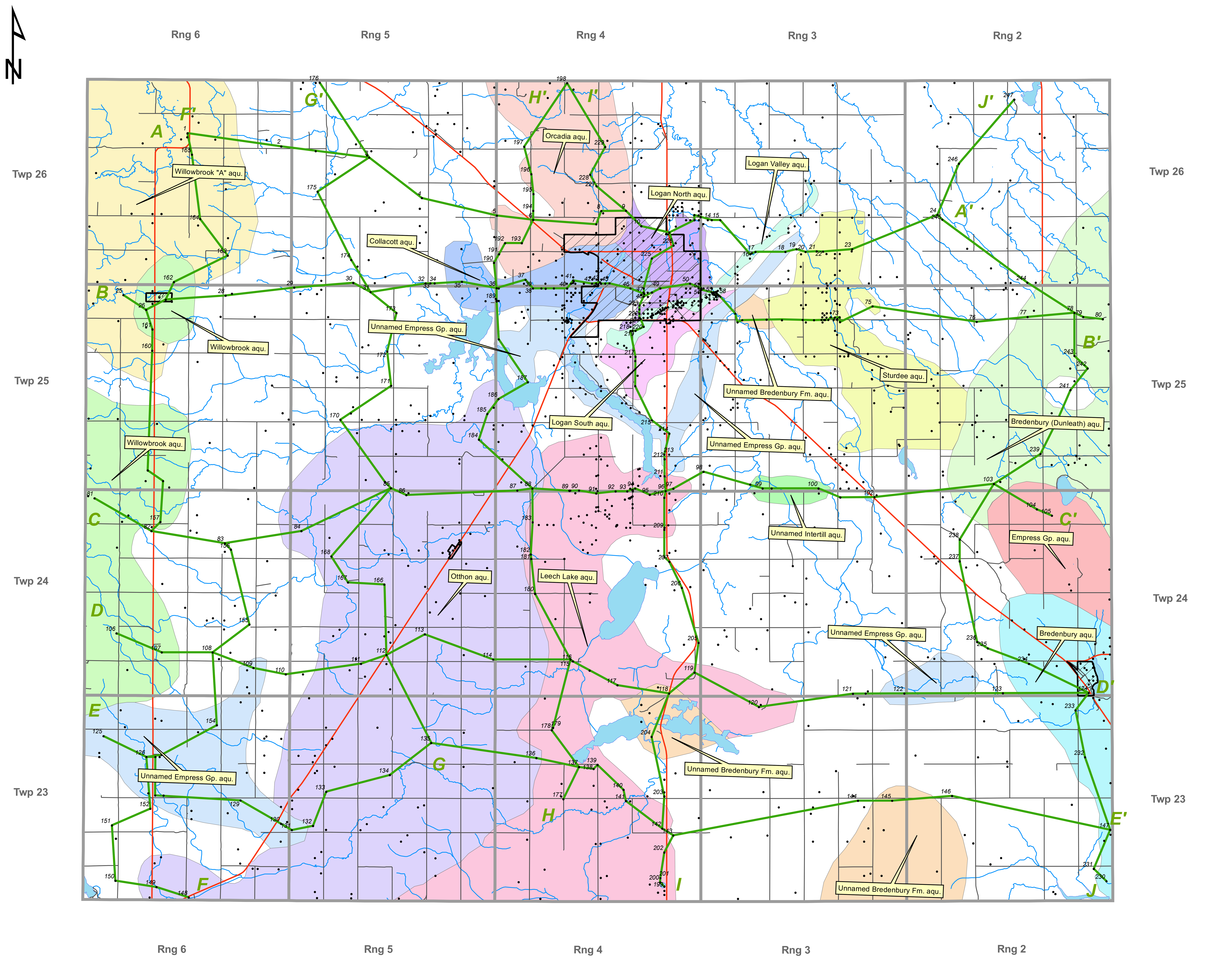
Groundwater Resources in the Yorkton Aquifer Management Plan Area, Final Report

Map 5
Location and extent of major aquifers in the Yorkton study area



Aquifer extents

- Bredenbury (Dunleath) aqu.
- Bredenbury aqu.
- Collacott aqu.
- Empress Gp. aqu.
- Leech Lake aqu.
- Logan North aqu.
- Logan South aqu.
- Logan Valley aqu.
- Orcadia aqu.
- Otthon aqu.
- Sturdee aqu.
- Unnamed Bredenbury Fm. aqu.
- Unnamed Empress Gp. aqu.
- Unnamed Intertill aqu.
- Willowbrook "A" aqu.
- Willowbrook aqu.

Testhole location

Road

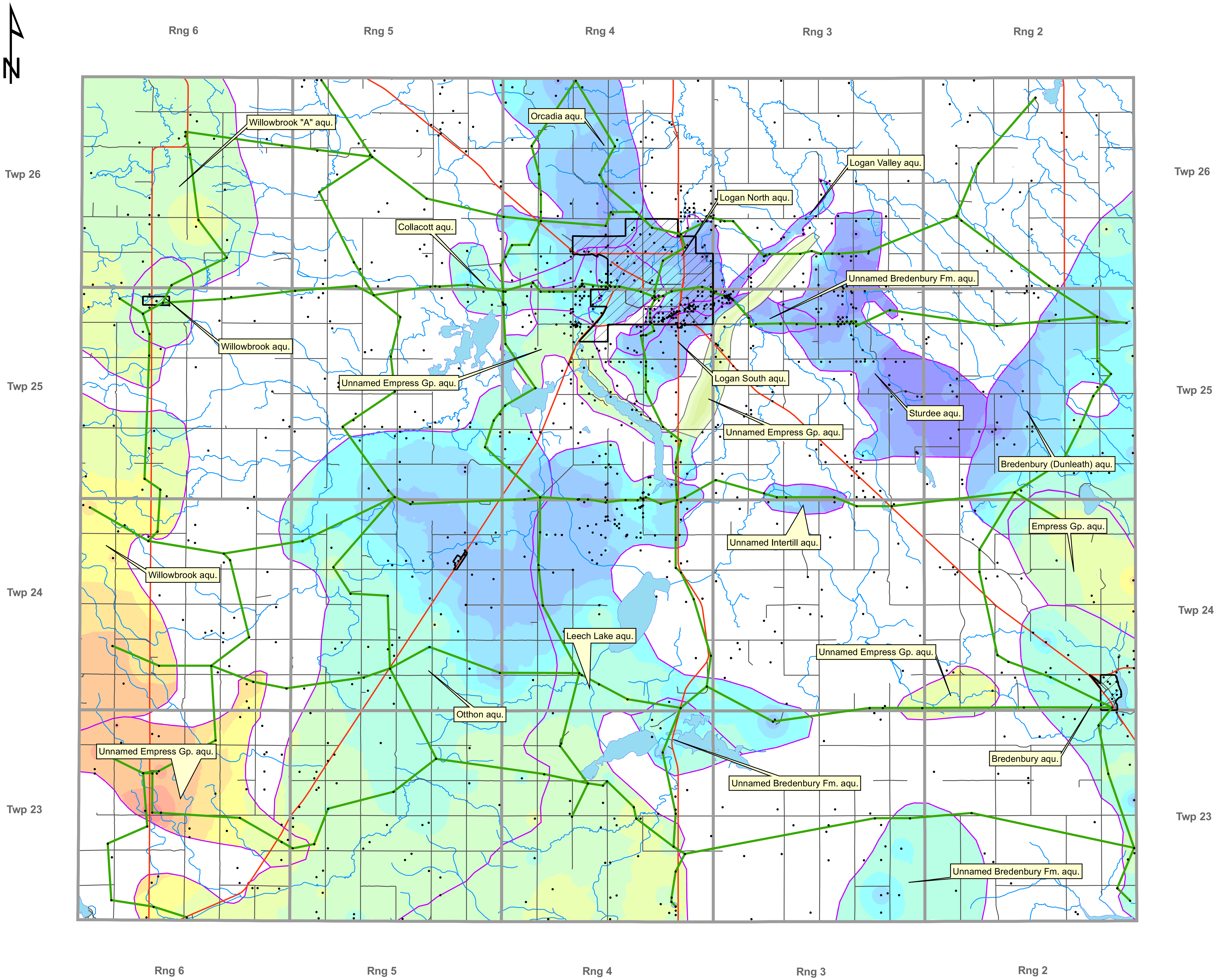
Highway

0 1 2 4 6 8 10 Km

These maps are accompanied by a series of cross sections which depict the subsurface units along the transects shown on the map. The maps and cross sections are representations of the data taken from the testholes and wells indicated on the maps. The boundaries outline areas in which the aquifer or geologic unit is likely to be found. Aquifers and other geologic units mapped do not always occur continuously within the areas shown, and may not be found at a specific site or may occur at elevations other than those indicate. Discontinuous water bearing zones may be found outside the boundaries shown.

Map accompanies report:

Maathuis, H. and Simpson, M. 2006. Groundwater resources in the Yorkton aquifer management plan area, final report. Saskatchewan Research Council, SRC Publication No.10419-1E06



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Map 6
Depth to the top of major aquifers in the Yorkton study area

Depth to aquifer top (m)

- 0.1 - 2.5
- 2.6 - 5
- 5.1 - 10
- 10.1 - 15
- 15.1 - 20
- 20.1 - 30
- 30.1 - 40
- 40.1 - 50
- 50.1 - 60
- 60.1 - 70
- 70.1 - 80
- 80.1 - 90
- 90.1 - 100

Aquifer extents

- <all other values>
- Testhole location
- Road
- Highway

0 1 2 4 6 8 10 Km

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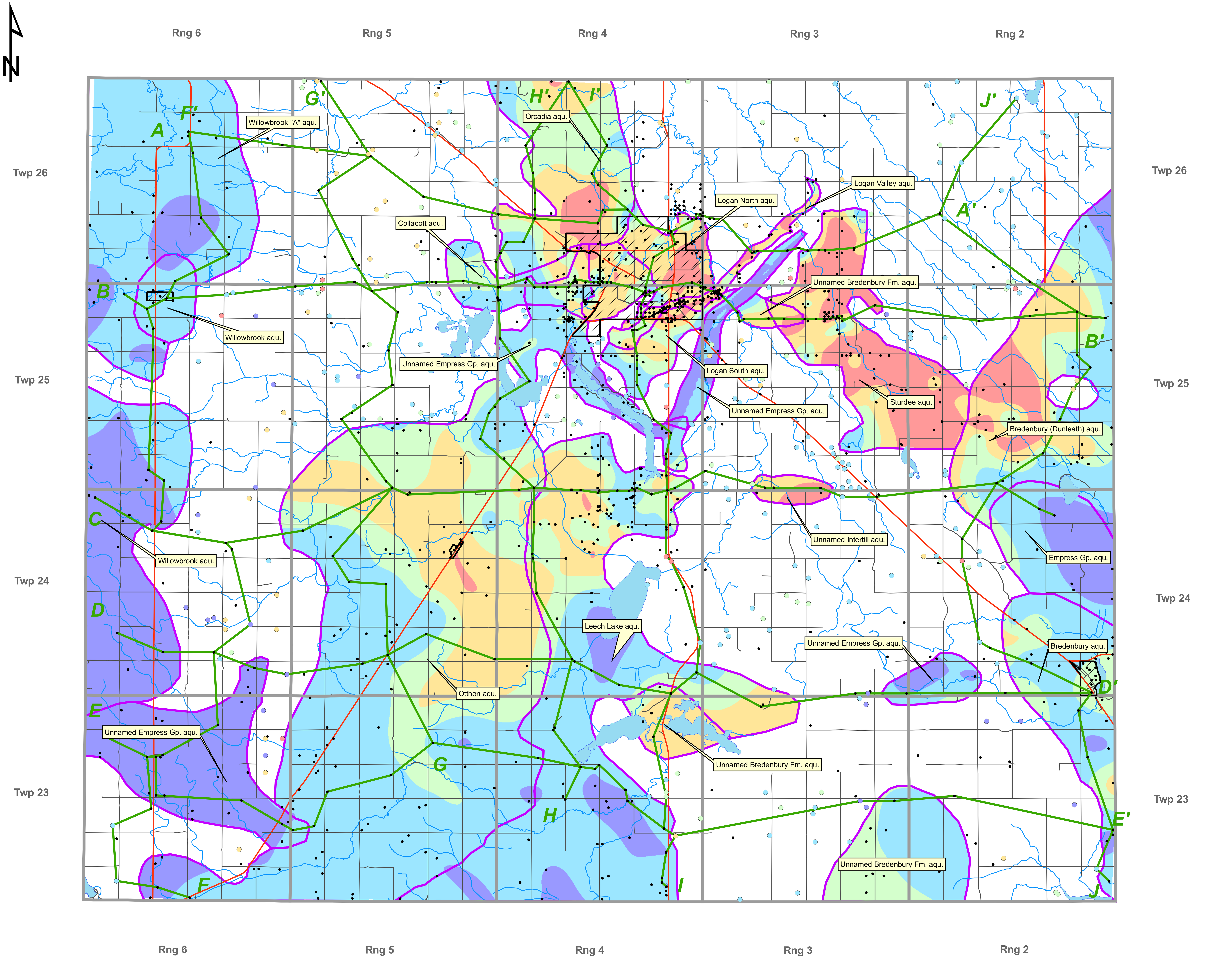

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Map 7
Aquifer vulnerability index for major aquifers in the Yorkton study area

Aquifer Vulnerability Index (AVI)

< 1	Extremely High	
1-2	High	
2-3	Moderate	
3-4	Low	
>4	Extremely Low	

Road

Highway

Testhole location

Aquifer extents

AVI of unclassified SWA "wells"

(AVI based on depth to screen)

<1	Extremely High
1-2	High
2-3	Moderate
3-4	Low
>4	Extremely Low

0 1 2 4 6 8 10 Km

These maps are accompanied by a series of cross sections which depict the subsurface units along the transects shown on the map. The maps and cross sections are representations of the data taken from the testholes and wells indicated on the maps. The boundaries outline areas in which the aquifer or geologic unit is likely to be found. Aquifers and other geologic units mapped do not always occur continuously within the areas shown, and may not be found at a specific site or may occur at elevations other than those indicate. Discontinuous water bearing zones may be found outside the boundaries shown.

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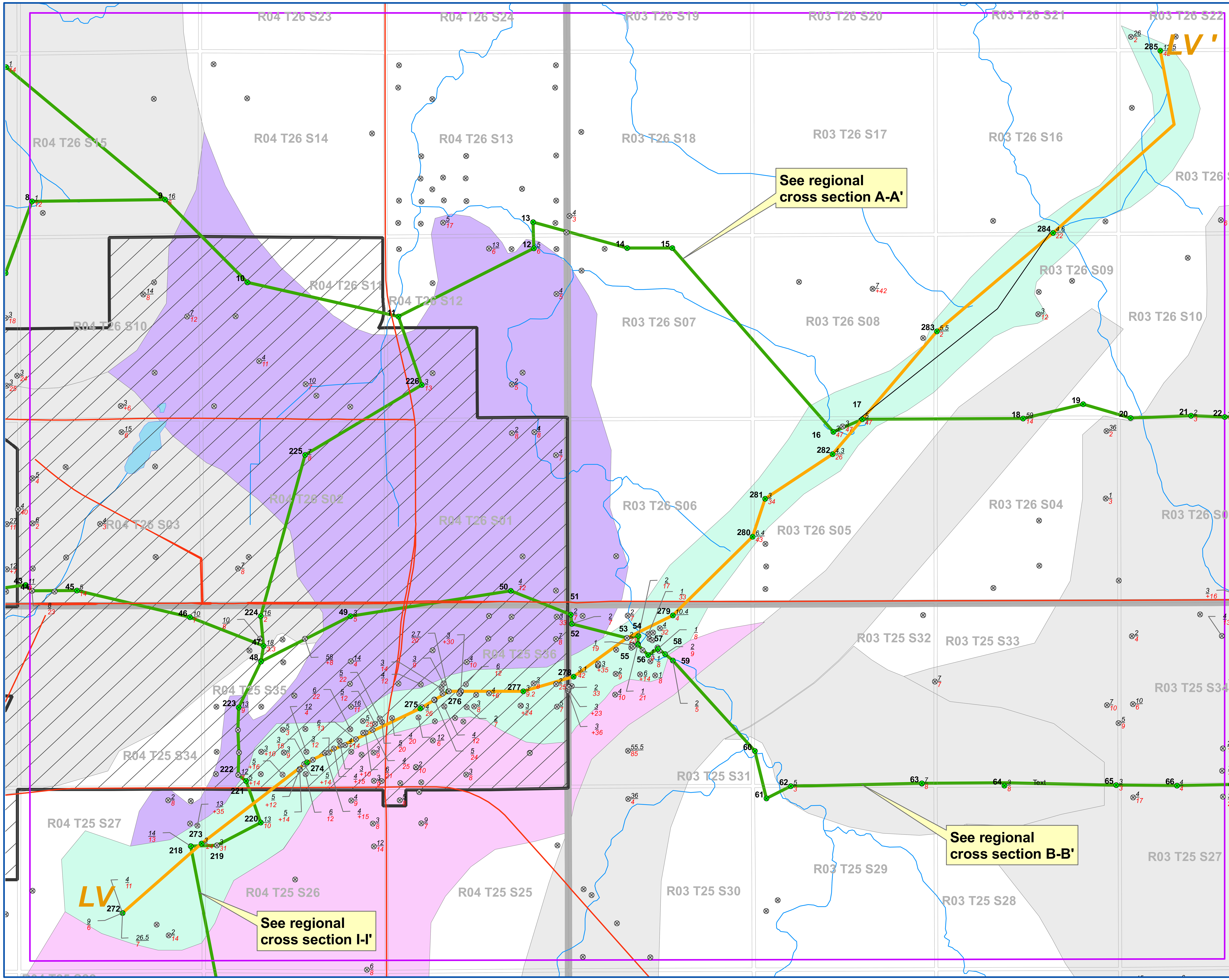

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Map 8
Extent, depth to and thickness of the Logan Aquifer System

- 236 — Testhole location (5 — Depth to Aqu. top m; 9 — Aqu. thickness m)
- Testhole/well on section
- other aquifers
- Logan North aqu.
- Logan South aqu.
- Logan Valley aqu.
- Regional cross section
- Logan Valley Aqu. X-section

N

0 — 1,500 m

These maps are accompanied by a series of cross sections which depict the subsurface units along the transects shown on the map. The maps and cross sections are representations of the data taken from the testholes and wells indicated on the maps. The boundaries outline areas in which the aquifer or geologic unit is likely to be found. Aquifers and other geologic units mapped do not always occur continuously within the areas shown, and may not be found at a specific site or may occur at elevations other than those indicate. Discontinuous water bearing zones may be found outside the boundaries shown.

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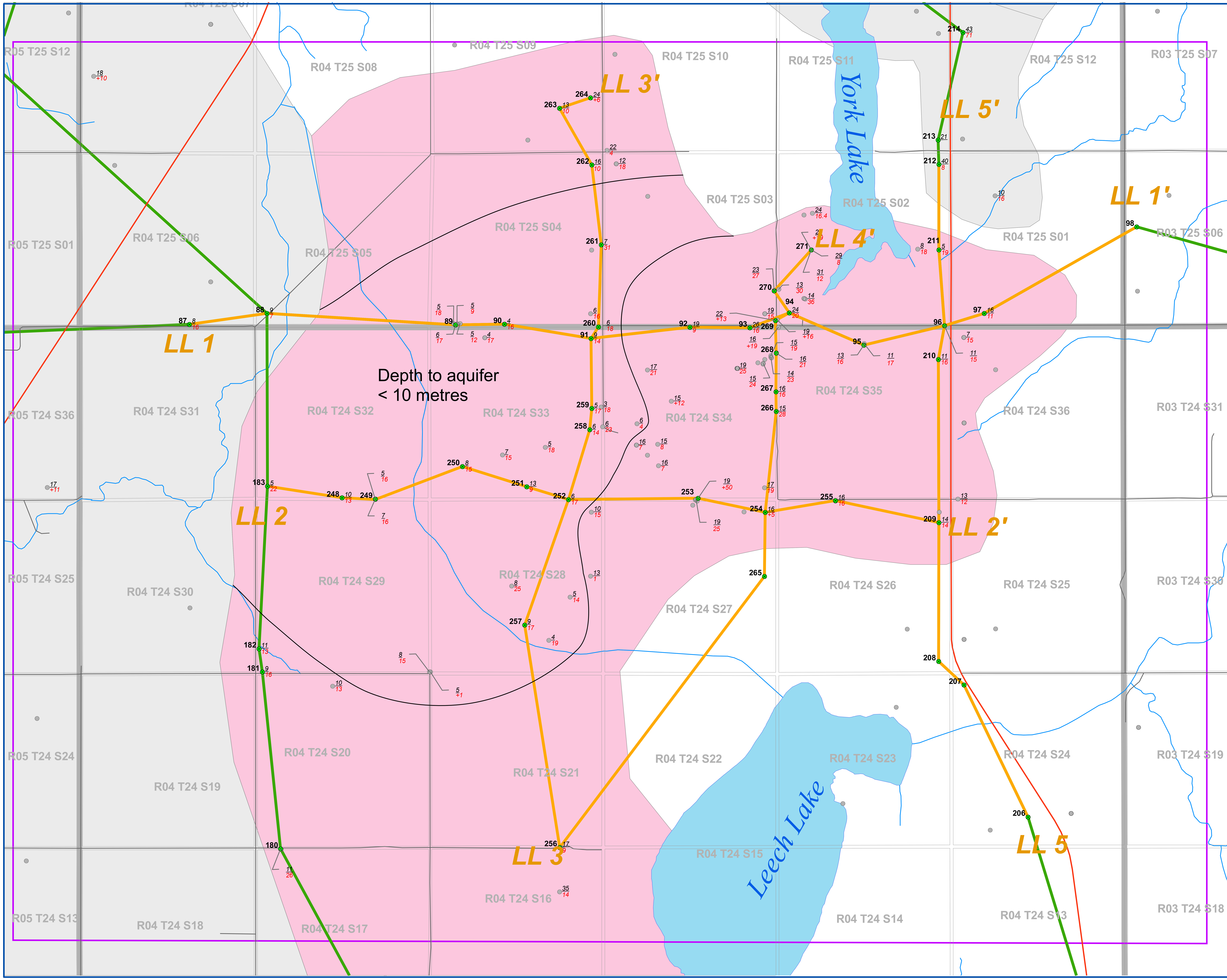

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Map 9
Extent, depth to and thickness of the northern part of the Leech Lake Aquifer

236 — Depth to Aqu. top m (5) / Aqu. thickness m (9)

- Testhole/well on X-section
- Testhole/well location
- Detailed X-section
- Regional X-section
- other aquifers
- Leech Lake aqu.

N

0 — 1,500 m

These maps are accompanied by a series of cross sections which depict the subsurface units along the transects shown on the map. The maps and cross sections are representations of the data taken from the testholes and wells indicated on the maps. The boundaries outline areas in which the aquifer or geologic unit is likely to be found. Aquifers and other geologic units mapped do not always occur continuously within the areas shown, and may not be found at a specific site or may occur at elevations other than those indicate. Discontinuous water bearing zones may be found outside the boundaries shown.

Map accompanies report:

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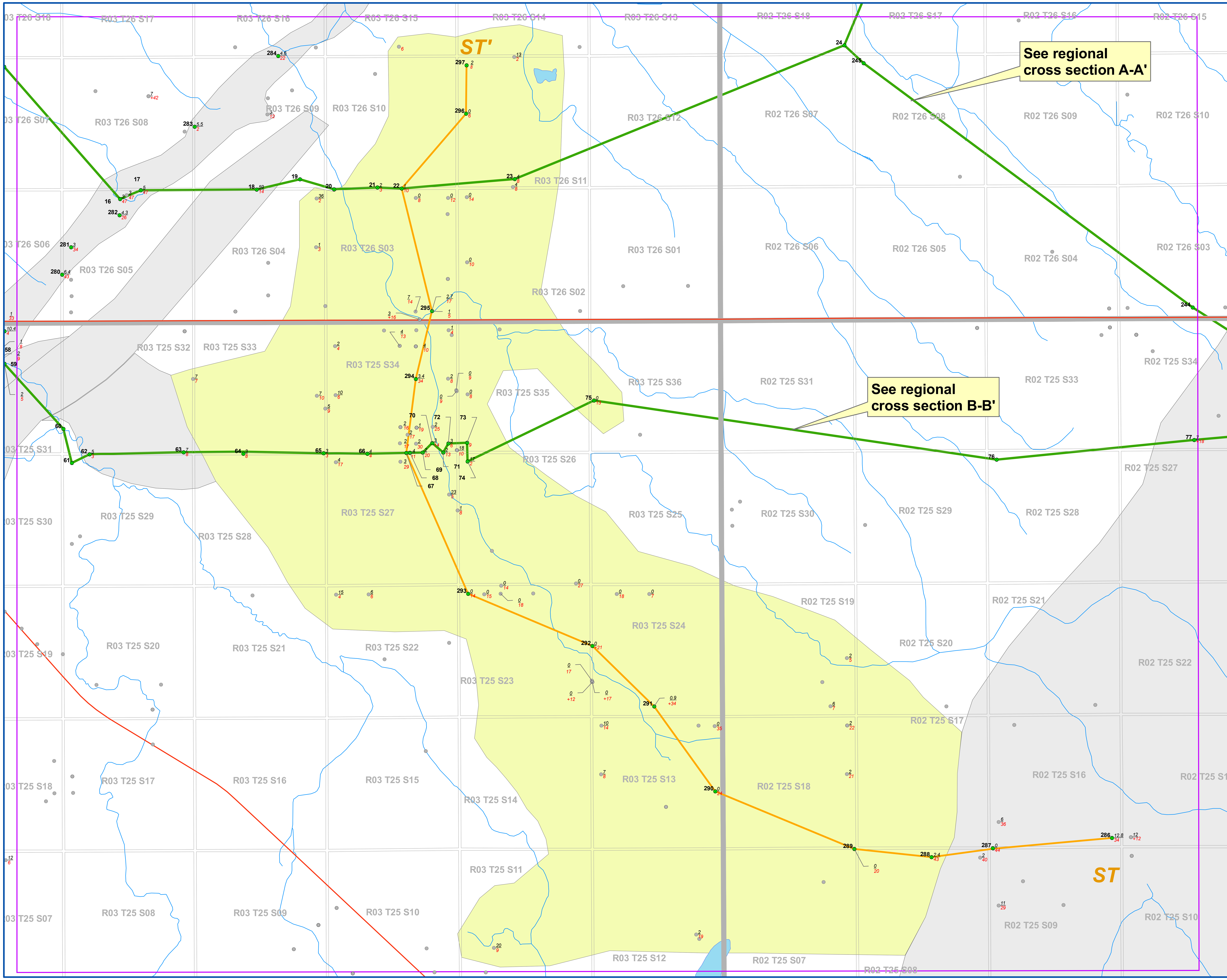
Groundwater Resources in the Yorkton Aquifer Management Plan Area, Final Report

Map 10
Extent, depth to and thickness of the Sturdee aquifer



236
Depth to top (m)
Aquifer thickness (m)
Testhole/well on X-section
Testhole/well location
Regional cross section
Sturdee aquifer cross section
other aquifers
Sturdee aqu.

N

0 1,500 m

These maps are accompanied by a series of cross sections which depict the subsurface units along the transects shown on the map. The maps and cross sections are representations of the data taken from the testholes and wells indicated on the maps. The boundaries outline areas in which the aquifer or geologic unit is likely to be found. Aquifers and other geologic units mapped do not always occur continuously within the areas shown, and may not be found at a specific site or may occur at elevations other than those indicate. Discontinuous water bearing zones may be found outside the boundaries shown.

Map accompanies report:

Maathuis, H. and Simpson, M. 2006. Groundwater resources in the Yorkton aquifer management plan area, final report. Saskatchewan Research Council, SRC Publication No.10419-1E06

Cross Section Index

CROSS SECTION LOG INDEX

Cross Section Number	SRCACQ	Type of log	QTRLSD	LSD	QTRSEC	SEC	TWP	RG	MER	ZONE83	EASTING83	NORTHING83	NAD	SOURCE83
1	12554	SWA farmwell - elog	NE	8		28	26	6	2	13	654819	5682805	83	convert from land loc
2	999331	SWA farmwell - noelog	SE	2		25	26	6	2	13	659337	5682328	83	convert from land loc
3	6706	SWA farmwell - elog			NW	21	26	5	2	13	663565	5681939	83	convert from land loc
4	999332	SWA farmwell - noelog	SW	9		15	26	5	2	13	666166	5680088	83	convert from land loc
5	314	SRC	NW	13		7	26	4	2	13	669778	5679372	83	convert from nad27
6	315	SRC	NW	13		8	26	4	2	13	671527	5679232	83	convert from land loc
7	999333	SWA farmwell - noelog	SE	16		9	26	4	2	13	674557	5679114	83	convert from land loc
8	999299	Consultant	NW	4		15	26	4	2	13	674770	5679761	83	landlocation
9	999334	SWA farmwell - noelog	NW	1		15	26	4	2	13	675956	5679816	83	convert from land loc
10	1000295	SWA farmwell - noelog			NW	11	26	4	2	13	676713	5679103	83	convert from land loc
11	316	SRC	SW	12		12	26	4	2	13	678069	5678843	83	convert from land loc
12	999335	SWA farmwell - noelog	NW	16		12	26	4	2	13	679255	5679491	83	convert from land loc
13	999336	SWA farmwell - noelog	SW	1		13	26	4	2	13	679239	5679723	83	convert from land loc
14	999315	Consultant	NW	14		7	26	3	2	13	680086	5679521	83	landlocation
15	999316	Consultant	NW	15		7	26	3	2	13	680488	5679534	83	landlocation
16	999296	Consultant	NE	14		5	26	3	2	13	681976	5677944	83	landlocation
17	3186	SRC	NW	15		5	26	3	2	13	682231	5678063	83	swa
18	999149	Consultant	NE	14		4	26	3	2	13	683664	5678118	83	swa-gps
19	999337	SWA farmwell - noelog	SW	1		9	26	3	2	13	684194	5678263	83	convert from land loc
20	999038	Consultant	SW	4		10	26	3	2	13	684621	5678155	83	convert from nad27
21	2970	SRC	SE	3		10	26	3	2	13	685158	5678192	83	convert from nad27
22	999156	Consultant	NW	15		3	26	3	2	13	685458	5678191	83	swa-gps
23	999275	Consultant	SE	3		11	26	3	2	13	686855	5678355	83	landlocation
24	259	SRC	SE	1		18	26	2	2	13	690878	5680147	83	convert from land loc
25	9213	SWA farmwell - elog	NW	12		32	25	6	2	13	652017	5674937	83	convert from land loc
26	7912	SWA farmwell - elog			SE	32	25	6	2	13	653140	5674263	83	convert from land loc
27	336	SRC	SW	11		33	25	6	2	13	654054	5674797	83	convert from land loc
28	10503	SWA farmwell - elog	NW	12		35	25	6	2	13	656925	5675083	83	convert from land loc
29	8412	SWA farmwell - elog	NW	13		31	25	5	2	13	660190	5675581	83	convert from land loc
30	999338	SWA farmwell - noelog	SW	1		5	26	5	2	13	663014	5675902	83	convert from land loc
31	10502	SWA farmwell - elog	SW	14		33	25	5	2	13	663861	5675495	83	convert from land loc
32	1000496	SWA farmwell - noelog	SE	1		3	26	5	2	13	666485	5676002	83	convert from land loc
33	325	SRC	SW	4		2	26	5	2	13	666716	5676015	83	convert from land loc
34	6701	SWA farmwell - elog	SE	4		2	26	5	2	13	666916	5676015	83	convert from land loc
35	999005	Consultant	SE	1		2	26	5	2	13	668221	5676136	83	convert from nad27
36	303	SRC	NW	13		31	25	4	2	13	669887	5675890	83	convert from nad27

CROSS SECTION LOG INDEX

Cross Section Number	SRCACQ	Type of log	QTRLSD	LSD	QTRSEC	SEC	TWP	RG	MER	ZONE83	EASTING83	NORTHING83	NAD	SOURCE83
37	313	SRC	NW	1		6	26	4	2	13	671255	5676349	83	convert from nad27
38	999321	Consultant	NW	13		32	25	4	2	13	671633	5675941	83	landlocation
39	1000021	SWA farmwell - noelog	NW	13		32	25	4	2	13	671633	5675941	83	convert from land loc
40	999339	SWA farmwell - noelog	NW	13		33	25	4	2	13	673268	5676000	83	convert from land loc
41	312	SRC	SE	3		4	26	4	2	13	673542	5676391	83	convert from nad27
42	999340	SWA farmwell - noelog	SW	1		4	26	4	2	13	674455	5676275	83	convert from land loc
43	311	SRC	SW	4		3	26	4	2	13	674826	5676342	83	convert from nad27
44	310	SRC	SW	4		3	26	4	2	13	674886	5676290	83	convert from land loc
45	999341	SWA farmwell - noelog	SW	3		3	26	4	2	13	675285	5676305	83	convert from land loc
46	999342	SWA farmwell - noelog	NE	16		34	25	4	2	13	676301	5676101	83	convert from land loc
47	50752	Consultant	NW	11		35	25	4	2	13	676965	5675867	83	convert from nad27
48	307	SRC	NW	11		35	25	4	2	13	676946	5675728	83	convert from land loc
49	999343	SWA farmwell - noelog	NW	16		35	25	4	2	13	677731	5676159	83	convert from land loc
50	308	SRC	SE	2		1	26	4	2	13	679150	5676433	83	convert from land loc
51	999069	Consultant	NW	13		31	25	3	2	13	679692	5676238	83	convert from nad27
52	3040	SRC	NE	13		31	25	3	2	13	679704	5676156	83	swa
53	2966	SRC	SW	14		31	25	3	2	13	680199	5676046	83	convert from land loc
54	999094	Consultant	SW	14		31	25	3	2	13	680302	5676067	83	convert from nad27
55	50755	Consultant	SW	14		31	25	3	2	13	680297	5675989	83	convert from nad27
56	999098	Consultant	NE	11		31	25	3	2	13	680393	5675900	83	convert from nad27
57	999066	Consultant	NE	11		31	25	3	2	13	680479	5675959	83	convert from nad27
58	999344	SWA farmwell - noelog	NE	11		31	25	3	2	13	680544	5675913	83	from map-mas
59	999345	SWA farmwell - noelog	NW	10		31	25	3	2	13	680614	5675859	83	convert from land loc
60	999047	Consultant	NW	4		32	25	3	2	13	681371	5675076	83	convert from nad27
61	999346	SWA farmwell - noelog	NW	13		29	25	3	2	13	681489	5674657	83	convert from land loc
62	268	SRC	NW	13		29	25	3	2	13	681702	5674774	83	convert from nad27
63	999049	Consultant	SE	1		32	25	3	2	13	682868	5674837	83	convert from nad27
64	999171	Consultant	NE	13		28	25	3	2	13	683606	5674841	83	swa-gps
65	999044	Consultant	SE	1		33	25	3	2	13	684601	5674880	83	convert from nad27
66	999167	Consultant	NW	13		27	25	3	2	13	685142	5674893	83	swa-gps
67	999059	Consultant	SW	2		34	25	3	2	13	685623	5674919	83	convert from nad27
68	2968	SRC	SE	2		34	25	3	2	13	685669	5674922	83	convert from nad27
69	2967	SRC	SE	2		34	25	3	2	13	685826	5674932	83	convert from nad27
70	999035	Consultant	SW	1		34	25	3	2	13	685940	5675054	83	landloc
71	999036	Consultant	SE	1		34	25	3	2	13	686082	5674940	83	convert from nad27
72	999037	Consultant	SE	1		34	25	3	2	13	686140	5675054	83	landloc

CROSS SECTION LOG INDEX

Cross Section Number	SRCACQ	Type of log	QTRLSD	LSD	QTRSEC	SEC	TWP	RG	MER	ZONE83	EASTING83	NORTHING83	NAD	SOURCE83
73	2969	SRC	SW	4		35	25	3	2	13	686371	5675070	83	convert from land loc
74	999258	Consultant	NW	13		26	25	3	2	13	686387	5674839	83	landlocation
75	999174	Consultant	SW	12		36	25	3	2	13	687924	5675645	83	swa-gps
76	10459	SWA farmwell - elog	NW	13		28	25	2	2	13	692935	5675079	83	convert from land loc
77	21907	SWA farmwell - elog	SW	2		34	25	2	2	13	695370	5675404	83	CENTX
78	999347	SWA farmwell - noelog	NE	1		35	25	2	2	13	697602	5675678	83	convert from land loc
79	999246	Consultant	SE	4		36	25	2	2	13	698033	5675495	83	landlocation
80	999159	Consultant	SW	1		36	25	2	2	13	698980	5675426	83	swa-gps
81	8639	SWA farmwell - elog			NW	31	24	6	2	13	650982	5665157	83	convert from land loc
82	335	SRC	SE	16		29	24	6	2	13	653762	5663674	83	convert from land loc
83	334	SRC	NW	5		26	24	6	2	13	657296	5663216	83	convert from land loc
84	999348	SWA farmwell - noelog	SW	14		30	24	5	2	13	660951	5663926	83	convert from land loc
85	324	SRC	SE	1		4	25	5	2	13	665165	5666132	83	convert from land loc
86	7807	SWA farmwell - elog		14		34	24	5	2	13	665912	5665827	83	convert from land loc
87	3274	SRC	SE	2		6	25	4	2	13	671216	5666233	83	swa
88	288	SRC	SW	4		5	25	4	2	13	671942	5666360	83	convert from land loc
89	3273	SRC	NW	14		33	24	4	2	13	673720	5666310	83	swa
90	50725	Consultant	NW	15		33	24	4	2	13	674180	5666333	83	convert from nad27
91	999115	Consultant	NE	16		33	24	4	2	13	675001	5666226	83	landloc
92	999013	Consultant	NW	15		34	24	4	2	13	675928	5666362	83	convert from nad27
93	3275	SRC	NW	16		34	24	4	2	13	676491	5666376	83	swa
94	284	SRC	SW	4		2	25	4	2	13	676858	5666527	83	convert from land loc
95	3276	SRC	NE	14		35	24	4	2	13	677569	5666247	83	swa
96	50747	Consultant	SE	1		2	25	4	2	13	678324	5666456	83	convert from nad27
97	50762	Consultant	SE	4		1	25	4	2	13	678693	5666583	83	convert from land loc
98	265	SRC	SW	12		6	25	3	2	13	680102	5667446	83	convert from land loc
99	999697	SWA farmwell - noelog	SW	1		5	25	3	2	13	682971	5666745	83	convert from land loc
100	999693	SWA farmwell - noelog	SE	3		3	25	3	2	13	685644	5666834	83	convert from land loc
101	999349	SWA farmwell - noelog	SW	13		35	24	3	2	13	686698	5666448	83	convert from land loc
102	264	SRC	SW	13		36	24	3	2	13	688338	5666509	83	convert from land loc
103	999350	SWA farmwell - noelog	NW	2		4	25	2	2	13	694041	5667353	83	convert from land loc
104	999351	SWA farmwell - noelog	NW	8		34	24	2	2	13	696132	5666196	83	convert from land loc
105	999352	SWA farmwell - noelog	NE	4		35	24	2	2	13	696873	5665918	83	convert from land loc
106	999353	SWA farmwell - noelog	SE	16		7	24	6	2	13	652259	5658728	83	convert from land loc
107	14815	SWA farmwell - elog			SW	9	24	6	2	13	654465	5657884	83	convert from land loc
108	8552	SWA farmwell - elog			SE	10	24	6	2	13	656903	5657965	83	convert from land loc

CROSS SECTION LOG INDEX

Cross Section Number	SRCACQ	Type of log	QTRLSD	LSD	QTRSEC	SEC	TWP	RG	MER	ZONE83	EASTING83	NORTHING83	NAD	SOURCE83
109	21913	SWA farmwell - elog	SE	16		2	24	6	2	13	658875	5657284	83	CENTX
110	999354	SWA farmwell - noelog	C	9		1	24	6	2	13	660434	5657035	83	convert from land loc
111	50788	Consultant	NW	13		4	24	5	2	13	664027	5657670	83	convert from land loc
112	323	SRC	NW	1		9	24	5	2	13	665227	5658131	83	convert from land loc
113	8414	SWA farmwell - elog	SE	16		10	24	5	2	13	667034	5659194	83	convert from land loc
114	322	SRC	SE	1		12	24	5	2	13	670345	5658101	83	convert from land loc
115	276	SRC	SE	4		9	24	4	2	13	674054	5658227	83	convert from land loc
116	999014	Consultant	SE	4		9	24	4	2	13	674168	5658137	83	convert from nad27
117	275	SRC	SW	7		3	24	4	2	13	676340	5657078	83	convert from land loc
118	273	SRC	SW	4		1	24	4	2	13	678829	5656762	83	convert from land loc
119	274	SRC	NW	9		1	24	4	2	13	680011	5657808	83	convert from land loc
120	262	SRC	NE	10		32	23	3	2	13	683149	5656272	83	convert from land loc
121	999355	SWA farmwell - noelog	SE	3		2	24	3	2	13	687641	5657068	83	convert from land loc
122	263	SRC	SE	1		1	24	3	2	13	690092	5657155	83	convert from land loc
123	258	SRC	SW	1		4	24	2	2	13	694814	5657342	83	convert from land loc
124	257	SRC	SW	3		1	24	2	2	13	698934	5657496	83	convert from land loc
125	333	SRC	SW	15		30	23	6	2	13	651804	5653784	83	convert from land loc
126	332	SRC	NW	1		29	23	6	2	13	653896	5652850	83	convert from land loc
127	21451	SWA farmwell - elog	NW	4		28	23	6	2	13	654331	5652864	83	convert from land loc
128	999358	SWA farmwell - noelog	SW	4		21	23	6	2	13	654384	5651027	83	convert from land loc
129	10561	SWA farmwell - elog	NW	15		14	23	6	2	13	658479	5650927	83	convert from land loc
130	8340	SWA farmwell - elog			SE	13	23	6	2	13	660452	5649872	83	convert from land loc
131	165	SRC	SW	4		18	23	5	2	13	660991	5649591	83	convert from land loc
132	999359	SWA farmwell - noelog	NE	2		18	23	5	2	13	661990	5649825	83	convert from land loc
133	999360	SWA farmwell - noelog	NW	4		20	23	5	2	13	662568	5651490	83	convert from land loc
134	999361	SWA farmwell - noelog	NE	9		21	23	5	2	13	665595	5652390	83	convert from land loc
135	6369	SWA farmwell - elog		12		26	23	5	2	13	667523	5654000	83	convert from land loc
136	999362	SWA farmwell - noelog	NE	4		29	23	4	2	13	672580	5653455	83	convert from land loc
137	7092	SWA farmwell - elog	NE	14		21	23	4	2	13	674635	5653094	83	convert from land loc
138	6683	SWA farmwell - elog		16		21	23	4	2	13	675337	5653025	83	convert from land loc
139	2971	SRC	NW	13		22	23	4	2	13	675523	5653230	83	convert from nad27
140	999363	SWA farmwell - noelog	SW	1		22	23	4	2	13	676814	5652070	83	convert from land loc
141	999364	SWA farmwell - noelog	NW	16		15	23	4	2	13	676939	5651541	83	convert from land loc
142	8350	SWA farmwell - elog		1		14	23	4	2	13	678725	5650287	83	convert from land loc
143	999365	SWA farmwell - noelog	NE	13		12	23	4	2	13	679275	5649970	83	convert from land loc
144	999366	SWA farmwell - noelog	NW	15		14	23	3	2	13	688053	5651942	83	convert from land loc

CROSS SECTION LOG INDEX

Cross Section Number	SRCACQ	Type of log	QTRLSD	LSD	QTRSEC	SEC	TWP	RG	MER	ZONE83	EASTING83	NORTHING83	NAD	SOURCE83
145	999367	SWA farmwell - noelog	NW	15		13	23	3	2	13	689689	5651999	83	convert from land loc
146	999368	SWA farmwell - noelog	SW	3		20	23	2	2	13	692550	5652334	83	convert from land loc
147	2144	SRC	SE	1		13	23	2	2	13	700192	5650974	83	convert from land loc
148	172	SRC	SW	4		3	23	6	2	13	656160	5646197	83	convert from land loc
149	8342	SWA farmwell - elog		5		4	23	6	2	13	654604	5646640	83	convert from land loc
150	12514	SWA farmwell - elog	SE	9		6	23	6	2	13	652626	5646872	83	convert from land loc
151	7805	SWA farmwell - elog	NW	1		18	23	6	2	13	652359	5649517	83	convert from land loc
152	13933	SWA farmwell - elog	NE	9		17	23	6	2	13	654176	5650379	83	convert from land loc
153	6824	SWA farmwell - elog			SW	28	23	6	2	13	654625	5652972	83	convert from land loc
154	9077	SWA farmwell - elog	C	1		34	23	6	2	13	657216	5654490	83	convert from land loc
155	999374	SWA farmwell - noelog	SW	1		14	24	6	2	13	658615	5659362	83	convert from land loc
156	6821	SWA farmwell - elog			SW	26	24	6	2	13	657604	5662920	83	convert from land loc
157	7396	SWA farmwell - elog	SE	4		33	24	6	2	13	654183	5664129	83	convert from land loc
158	12964	SWA farmwell - elog			SW	4	25	6	2	13	654234	5666093	83	convert from land loc
159	6703	SWA farmwell - elog	SW	9		5	25	6	2	13	653482	5666576	83	convert from land loc
160	999373	SWA farmwell - noelog	SE	1		29	25	6	2	13	653499	5672329	83	convert from land loc
161	6678	SWA farmwell - elog	NE	9		29	25	6	2	13	653473	5673334	83	convert from land loc
162	999372	SWA farmwell - noelog	SW	2		4	26	6	2	13	654429	5675643	83	convert from land loc
163	10826	SWA farmwell - elog		13		2	26	6	2	13	656960	5677011	83	convert from land loc
164	999370	SWA farmwell - noelog	NW	14		10	26	6	2	13	655573	5678712	83	convert from land loc
165	999369	SWA farmwell - noelog	SW	13		22	26	6	2	13	655074	5681781	83	convert from land loc
166	21911	SWA farmwell - elog			SE	21	24	5	2	13	665011	5661511	83	CENTX
167	8415	SWA farmwell - elog	SE	7		20	24	5	2	13	663263	5661552	83	convert from land loc
168	14808	SWA farmwell - elog	SE	4		29	24	5	2	13	662426	5662762	83	convert from land loc
169	8550	SWA farmwell - elog			SE	4	25	5	2	13	664858	5666426	83	convert from land loc
170	8186	SWA farmwell - elog	SE	3		17	25	5	2	13	662624	5669325	83	convert from land loc
171	999330	Consultant	SE	1		21	25	5	2	13	665006	5671041	83	landlocation
172	999329	Consultant	SW	1		28	25	5	2	13	664755	5672678	83	landlocation
173	999328	Consultant	NW	4		34	25	5	2	13	665134	5674531	83	landlocation
174	6931	SWA farmwell - elog			NE	5	26	5	2	13	662882	5677000	83	convert from land loc
175	12073	SWA farmwell - elog			NE	18	26	5	2	13	661151	5680215	83	convert from land loc
176	999375	SWA farmwell - noelog	NW	16		31	26	5	2	13	661074	5685442	83	convert from land loc
177	2974	SRC	NW	13		16	23	4	2	13	673947	5651523	83	convert from nad27
178	999040	Consultant	SE	2		32	23	4	2	13	673268	5654805	83	convert from nad27
179	2972	SRC	SE	2		32	23	4	2	13	673330	5654922	83	convert from land loc
180	50749	Consultant	SE	4		20	24	4	2	13	672238	5661322	83	convert from nad27

CROSS SECTION LOG INDEX

Cross Section Number	SRCACQ	Type of log	QTRLSD	LSD	QTRSEC	SEC	TWP	RG	MER	ZONE83	EASTING83	NORTHING83	NAD	SOURCE83
181	50732	Consultant	NW	13		20	24	4	2	13	672011	5662982	83	convert from nad27
182	999088	Consultant	SW	4		34	24	4	2	13	671971	5663200	83	convert from nad27
183	999378	SWA farmwell - noelog	SW	4		32	24	4	2	13	672002	5664733	83	convert from land loc
184	12552	SWA farmwell - elog		0		12	25	5	2	13	669297	5668607	83	convert from land loc
185	8562	SWA farmwell - elog			SE	13	25	5	2	13	669659	5669854	83	convert from land loc
186	292	SRC	NW	12		18	25	4	2	13	670170	5670577	83	convert from land loc
187	999939	SWA farmwell - noelog	NE	1		19	25	4	2	13	671549	5671441	83	convert from land loc
188	1000009	SWA farmwell - noelog	NW	5		30	25	4	2	13	670076	5673446	83	convert from land loc
189	302	SRC	SW	12		31	25	4	2	13	669916	5675304	83	convert from nad27
190	1000495	SWA farmwell - noelog	NE	9		1	26	5	2	13	669726	5677105	83	convert from land loc
191	999325	Consultant	NW	13		6	26	4	2	13	669945	5677521	83	landlocation
192	18495	SWA farmwell - elog			SW	7	26	4	2	13	670224	5678062	83	convert from land loc
193	6806	SWA farmwell - elog			SE	7	26	4	2	13	671027	5678096	83	convert from land loc
194	999004	Consultant	NW	4		17	26	4	2	13	671513	5679665	83	landloc
195	999377	SWA farmwell - noelog	NW	12		17	26	4	2	13	671491	5680464	83	convert from land loc
196	317	SRC	NW	4		20	26	4	2	13	671359	5681414	83	convert from nad27
197	318	SRC	SW	1		30	26	4	2	13	670976	5682713	83	convert from land loc
198	999376	SWA farmwell - noelog	NW	13		33	26	4	2	13	672926	5685833	83	convert from land loc
199	156	SRC	NE	8		2	23	4	2	13	678929	5647509	83	convert from land loc
200	157	SRC	SW	9		2	23	4	2	13	678714	5647710	83	convert from land loc
201	158	SRC	NW	9		2	23	4	2	13	678714	5647910	83	convert from land loc
202	999388	SWA farmwell - noelog	NE	8		11	23	4	2	13	678869	5649147	83	convert from land loc
203	999386	SWA farmwell - noelog	SE	1		23	23	4	2	13	678768	5651827	83	convert from land loc
204	999385	SWA farmwell - noelog	SW	15		26	23	4	2	13	678065	5654661	83	convert from land loc
205	999384	SWA farmwell - noelog	SE	9		12	24	4	2	13	680155	5659246	83	convert from land loc
206	277	SRC	SW	6		24	24	4	2	13	679262	5661856	83	convert from nad27
207	2975	SRC	NW	13		24	24	4	2	13	678620	5663078	83	convert from land loc
208	8049	SWA farmwell - elog	SE	1		26	24	4	2	13	678373	5663293	83	convert from land loc
209	8954	SWA farmwell - elog	E	16		26	24	4	2	13	678332	5664599	83	convert from land loc
210	8437	SWA farmwell - elog	SE	16		35	24	4	2	13	678276	5666136	83	convert from land loc
211	285	SRC	NE	8		2	25	4	2	13	678247	5667169	83	convert from land loc
212	999383	SWA farmwell - noelog	NE	16		2	25	4	2	13	678219	5667972	83	convert from land loc
213	50770	Consultant	SE	1		11	25	4	2	13	678204	5668203	83	convert from land loc
214	289	SRC	NW	12		12	25	4	2	13	678406	5669222	83	convert from land loc
215	290	SRC	SW	2		14	25	4	2	13	677548	5669825	83	convert from land loc
216	999382	SWA farmwell - noelog	SW	4		23	25	4	2	13	676697	5671436	83	convert from land loc

CROSS SECTION LOG INDEX

Cross Section Number	SRCACQ	Type of log	QTRLSD	LSD	QTRSEC	SEC	TWP	RG	MER	ZONE83	EASTING83	NORTHING83	NAD	SOURCE83
217	6699	SWA farmwell - elog	NW	13		23	25	4	2	13	676652	5672842	83	convert from land loc
218	999982	SWA farmwell - noelog	NE	9		27	25	4	2	13	676375	5674063	83	convert from land loc
219	999381	SWA farmwell - noelog	NW	12		26	25	4	2	13	676607	5674077	83	convert from land loc
220	999380	SWA farmwell - noelog	SW	14		26	25	4	2	13	676992	5674292	83	convert from land loc
221	999025	Consultant	SE	4		35	25	4	2	13	676849	5674659	83	convert from nad27
222	1000149	SWA farmwell - noelog	SE	4		35	25	4	2	13	676777	5674711	83	convert from land loc
223	1000153	SWA farmwell - noelog	NE	5		35	25	4	2	13	676761	5675312	83	convert from land loc
224	1000174	SWA farmwell - noelog	NW	14		35	25	4	2	13	676931	5676131	83	convert from land loc
225	1000211	SWA farmwell - noelog	SW	15		2	26	4	2	13	677278	5677581	83	convert from land loc
226	2852	SRC	NE	4		12	26	4	2	13	678297	5678239	83	convert from land loc
227	999320	Consultant	NE	16		16	26	4	2	13	674500	5680950	83	landlocation
228	6807	SWA farmwell - elog			SE	21	26	4	2	13	674176	5681479	83	convert from land loc
229	999379	SWA farmwell - noelog	SE	4		27	26	4	2	13	674859	5682839	83	convert from land loc
230	999406	SWA farmwell - noelog	SW	9		1	23	2	2	13	700088	5648504	83	convert from land loc
231	999405	SWA farmwell - noelog	NE	14		1	23	2	2	13	699465	5649075	83	convert from land loc
232	999404	SWA farmwell - noelog	NE	4		25	23	2	2	13	698857	5654403	83	convert from land loc
233	999403	SWA farmwell - noelog	SE	9		35	23	2	2	13	698330	5656630	83	convert from land loc
234	999402	SWA farmwell - noelog	NW	15		3	24	2	2	13	696009	5658795	83	convert from land loc
235	999401	SWA farmwell - noelog		6		9	24	2	2	13	694020	5659456	83	convert from land loc
236	999400	SWA farmwell - noelog	SW	12		9	24	2	2	13	693503	5659742	83	convert from land loc
237	999399	SWA farmwell - noelog	NW	15		20	24	2	2	13	692533	5663591	83	convert from land loc
238	999398	SWA farmwell - noelog	SW	10		29	24	2	2	13	692491	5664626	83	convert from land loc
239	999397	SWA farmwell - noelog	SE	1		10	25	2	2	13	696219	5668865	83	convert from land loc
240	999396	SWA farmwell - noelog	SE	3		14	25	2	2	13	696989	5670534	83	convert from land loc
241	999395	SWA farmwell - noelog	NW	16		14	25	2	2	13	697542	5671970	83	convert from land loc
242	999394	SWA farmwell - noelog	SW	11		24	25	2	2	13	698331	5673038	83	convert from land loc
243	999252	Consultant	NE	16		23	25	2	2	13	697680	5673609	83	landlocation
244	999393	SWA farmwell - noelog	SW	2		3	26	2	2	13	695298	5677042	83	convert from land loc
245	999391	SWA farmwell - noelog	NW	13		8	26	2	2	13	691124	5679931	83	convert from land loc
246	999390	SWA farmwell - noelog	SW	10		20	26	2	2	13	691820	5682627	83	convert from land loc
247	999389	SWA farmwell - noelog	NE	5		34	26	2	2	13	694369	5685793	83	convert from land loc
248	50729	Consultant	SE	4		32	24	4	2	13	672706	5664647	83	convert from nad27
249	50731	Consultant	SE	3		32	24	4	2	13	673020	5664645	83	convert from nad27
250	999078	Consultant	SW	3		33	24	4	2	13	673830	5664980	83	convert from nad27
251	999891	SWA farmwell - noelog	SW	2		33	24	4	2	13	674441	5664808	83	convert from land loc
252	3272	SRC	SW	1		33	24	4	2	13	674838	5664701	83	swa

CROSS SECTION LOG INDEX

Cross Section Number	SRCACQ	Type of log	QTRLSD	LSD	QTRSEC	SEC	TWP	RG	MER	ZONE83	EASTING83	NORTHING83	NAD	SOURCE83
253	3278	SRC	SW	2		34	24	4	2	13	676057	5664754	83	Provided, source unkno
254	999413	SWA farmwell - noelog	NE	16		27	24	4	2	13	676693	5664641	83	convert from land loc
255	3279	SRC	NW	14		26	24	4	2	13	677352	5664776	83	Provided, source unkno
256	50748	Consultant	SW	1		21	24	4	2	13	674865	5661423	83	convert from nad27
257	3325	SRC	SW	7		28	24	4	2	13	674465	5663507	83	GPS
258	999075	Consultant	NE	8		33	24	4	2	13	675016	5665365	83	convert from nad27
259	999074	Consultant	NE	8		33	24	4	2	13	675028	5665567	83	convert from nad27
260	50741	Consultant	NE	16		33	24	4	2	13	675067	5666337	83	convert from nad27
261	3271	SRC	SE	9		4	25	4	2	13	675067	5667111	83	swa
262	999411	SWA farmwell - noelog	NE	16		4	25	4	2	13	674952	5667860	83	convert from land loc
263	12551	SWA farmwell - elog			SE	9	25	4	2	13	674632	5668383	83	convert from land loc
264	50769	Consultant	SE	8		9	25	4	2	13	674921	5668492	83	convert from land loc
265	279	SRC	SE	9		27	24	4	2	13	676707	5664039	83	convert from land loc
266	3270	SRC	SE	9		34	24	4	2	13	676766	5665595	83	swa
267	50739	Consultant	SW	12		35	24	4	2	13	676758	5665782	83	convert from nad27
268	50738	Consultant	SW	13		35	24	4	2	13	676747	5666145	83	convert from nad27
269	286	SRC	SE	1		3	25	4	2	13	676730	5666452	83	convert from nad27
270	3281	SRC	NE	1		3	25	4	2	13	676710	5666730	83	Provided, source unkno
271	50763	Consultant	NE	5		2	25	4	2	13	677045	5667127	83	convert from land loc
272	298	SRC	SW	7		27	25	4	2	13	675786	5673447	83	convert from land loc
273	3044	SRC	NE	9		25	25	4	2	13	676470	5674088	83	swa
274	3043	SRC		2		35	25	4	2	13	677384	5674844	83	swa
275	999198	Consultant	NE	5		36	25	4	2	13	678378	5675356	83	swa-gps
276	999188	Consultant	NW	6		36	25	4	2	13	678623	5675519	83	swa-gps
277	3042	SRC	SW	9		36	25	4	2	13	679291	5675541	83	swa
278	3041	SRC	SW	12		31	25	3	2	13	679736	5675686	83	swa
279	999766	SWA farmwell - noelog	NW	15		31	25	3	2	13	680600	5676261	83	convert from land loc
280	3187	SRC	SE	8		6	26	3	2	13	681289	5676986	83	swa
281	999255	Consultant	SW	12		5	26	3	2	13	681390	5677327	83	landlocation
282	999256	Consultant	SE	14		5	26	3	2	13	681976	5677744	83	landlocation
283	999206	Consultant	NE	8		8	26	3	2	13	682869	5678869	83	swa-gps
284	999151	Consultant	NW	15		9	26	3	2	13	683875	5679781	83	swa-gps
285	999152	Consultant	NE	13		15	26	3	2	13	684777	5681436	83	swa-gps
286	999273	Consultant	SE	1		16	25	2	2	13	694518	5670444	83	landlocation
288	999270	Consultant	NW	15		8	25	2	2	13	692292	5670131	83	landlocation
289	999179	Consultant	NE	16		7	25	2	2	13	691334	5670202	83	swa-gps

CROSS SECTION LOG INDEX

Cross Section Number	SRCACQ	Type of log	QTRLSD	LSD	QTRSEC	SEC	TWP	RG	MER	ZONE83	EASTING83	NORTHING83	NAD	SOURCE83
290	999265	Consultant	NE	8		13	25	3	2	13	689586	5670858	83	landlocation
291	999155	Consultant	SE	3		24	25	3	2	13	688797	5671882	83	swa-gps
292	999178	Consultant	NW	12		25	25	3	2	13	688007	5672606	83	swa-gps
293	999235	Consultant	NW	13		23	25	3	2	13	686448	5673203	83	landlocation
294	999108	Consultant	SE	10		34	25	3	2	13	685712	5675840	83	landloc
295	999249	Consultant	SW	1		3	26	3	2	13	685882	5676688	83	landlocation
296	999279	Consultant	SW	12		11	26	3	2	13	686225	5679143	83	landlocation
297	999803	SWA farmwell - noelog	NW	13		11	26	3	2	13	686212	5679744	83	convert from land loc
298	300	SRC	SW	13		28	25	4	2	13	673225	5674412	83	convert from nad27
299	50757	Consultant	NW	13		28	25	4	2	13	673367	5674422	83	convert from nad27
300	999081	Consultant	SE	4		33	25	4	2	13	673459	5674560	83	convert from nad27
301	999154	Consultant	SE	8		32	25	4	2	13	673173	5675058	83	swa-gps
302	304	SRC	NE	8		32	25	4	2	13	673160	5675193	83	convert from nad27
303	999409	SWA farmwell - noelog	SW	12		33	25	4	2	13	673280	5675398	83	convert from land loc
304	50775	Consultant	NE	12		33	25	4	2	13	673480	5675598	83	convert from land loc
305	3045	SRC	C	14		33	25	4	2	13	673649	5675808	83	swa
306	999212	Consultant	NE	4		4	26	4	2	13	673536	5676265	83	swa-gps
307	3039	SRC	NE	3		4	26	4	2	13	673575	5676342	83	swa
308	14810	SWA farmwell - elog			SW	4	26	4	2	13	673544	5676540	83	convert from land loc
309	999407	SWA farmwell - noelog	SE	3		9	26	4	2	13	673792	5677885	83	convert from land loc
310	999301	Consultant	NE	1		9	26	4	2	13	674598	5678111	83	landlocation
311	999208	Consultant	NE	1		9	26	4	2	13	674690	5678202	83	swa-gps
312	999300	Consultant	SE	9		9	26	4	2	13	674570	5678713	83	landlocation

Cross Sections

smart science solutions

Cross section A–A'

Testhole/well

Drift, undifferentiated (aquitard)

Intertill Aquifer

Empress Gp Aquifer

Bredenbury Aquifer

Pierre Shale (aquitard)

Accompanies: Maathuis, H. and Simpson, M. 2006, Groundwater Resources in the Yorkton Aquifer Management Plan Area, Final Report. Saskatchewan Research Council report 10419-1E06.

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B
B'
F–F'
G–G'
H–H'
I–I'
J–J'
25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53–59 60 61 62 63 64 65 66 67–74 75 76 77 78 79 80
metres above sea level
530 520 510 500 490 480 470 460 450 440 430 420 410 400
Willowbrook Aquifer
("Bredenbury Fm.")
Willowbrook "A" Aquifer
(Empress Gp.)
Drift, undifferentiated
(aquitard)
Collacott Aquifer
(Intertill)
Empress Aquifer
unnamed aquifer
("Bredenbury Fm.")
Logan North Aquifer
("Bredenbury Fm.")
Logan South Aquifer
("Bredenbury Fm.")
Logan Aquifer
(Intertill)
unnamed
Empress Gp. Aquifer
Sturdee Aquifer
(Intertill)
Bredenbury Aquifer
Pierre Shale
(aquitard)
0 1000m 2000m
smart science solutions
Cross section B–B'
Testhole/well
Drift, undifferentiated (aquitard)
Intertill Aquifer
Empress Gp Aquifer
Bredenbury Aquifer
Pierre Shale (aquitard)
Accompanies: Maathuis, H. and Simpson, M. 2006, Groundwater Resources in the Yorkton Aquifer Management Plan Area, Final Report. Saskatchewan Research Council report 10419–1E06.
g:\current_projects\Yorkton\2005_cross_sections\xsec_B.dwg


C
C'
F–F'
F–F'
G–G'
H–H'
LL3
LL4
I–I'
J–J'
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
LL1 CROSS SECTION
metres above sea level
Drift, undifferentiated
(aquitard)
Willowbrook Aquifer
("Bredenbury Fm.")
Otthon Aquifer
("Bredenbury Fm.")
Leech Lake Aquifer
(Intertill)
Intertill Aquifer
Drift, undifferentiated
(aquitard)
Bredenbury Aquifer
unnamed
Empress Aquifer
Pierre Shale
(aquitard)
Pierre Shale
(aquitard)
0
1000m
2000m
smart science solutions
Cross section C–C'
Testhole/well
Drift, undifferentiated
(aquitard)
Intertill Aquifer
Empress Gp Aquifer
Bredenbury Aquifer
Pierre Shale
(aquitard)
Accompanies: Maathuis, H. and Simpson, M. 2006, Groundwater Resources in the Yorkton Aquifer Management Plan Area, Final Report. Saskatchewan Research Council report 10419-1E06.
g:\current_projects\Yorkton\2005_cross_sections\xsec_C.dwg


D
D'
106
107
F–F'
108
109
110
111
G–G'
112
113
114
H–H'
115
116
117
118
I–I'
119
I–I'
120
121
122
123
J–J'
124
metres above sea level
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
Drift, undifferentiated
(aquitard)
Willowbrook Aquifer
("Bredenbury Fm.")
Empress Aquifer
Othon Aquifer
("Bredenbury Fm.")
Pierre Shale
(aquitard)
Leech Lake Aquifer
(Intertill)
Bredenbury Fm.
Leech Lake Aquifer
(Intertill)
Pierre Shale
(aquitard)
Drift, undifferentiated
(aquitard)
Unnamed
Empress Aquifer
Bredenbury Aquifer
0
1000m
2000m
smart science solutions
Cross section D–D'
Testhole/well
Drift, undifferentiated
(aquitard)
Intertill Aquifer
Empress Gp Aquifer
Bredenbury Aquifer
Pierre Shale
(aquitard)
Accompanies: Maathuis, H. and Simpson, M. 2006, Groundwater Resources in the Yorkton Aquifer Management Plan Area, Final Report. Saskatchewan Research Council report 10419–1E06.
g:\current_projects\Yorkton\2005_cross_sections\xsec_D.dwg


E
F–F'
G–G'
H–H'
I–I'
J–J'
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
E'
SRC
smart science solutions
Cross section E–E'
Testhole/well
metres above sea level
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
Drift, undifferentiated
(aquitard)
Unnamed
Empress Aquifer
Unnamed
Empress Aquifer
Ottman Aquifer
("Bredenbury Fm.")
Drift, undifferentiated
(aquitard)
Unnamed aquifer
("Bredenbury Fm.")
Bredenbury Aquifer
(Possible collapse)
Pierre Shale
Pierre Shale
(aquitard)
Leech Lake Aquifer
(Glacial)
Pierre Shale
(aquitard)
0
1000m
2000m
Drift, undifferentiated
(aquitard)
Intertill Aquifer
Empress Gp Aquifer
Bredenbury Aquifer
Pierre Shale
(aquitard)
Accompanies: Maathuis, H. and Simpson, M. 2006, Groundwater Resources in the Yorkton Aquifer Management Plan Area, Final Report. Saskatchewan Research Council report 10419-1E06.
g:\current_projects\Yorkton\2005_cross_sections\xsec_E.dwg


F
F'
148
149
150
151
152
E–E'
126
153
154
D–D'
108
155
156
C–C'
83
C–C'
82
157
158
159
160
161
B–B'
26
B–B'
27
162
163
164
165
A–A'
1
metres above sea level
Drift, undifferentiated (aquitard)
Bredenbury Aquifer
Unnamed Empress Aquifer
Pierre Shale (aquitard)
Willowbrook Aquifer ("Bredenbury Fm.")
Willowbrook "A" Aquifer (Empress Gp.)
0
1000m
2000m
smart science solutions
Cross section F–F'
Testhole/well
Intertill Aquifer
Empress Gp Aquifer
Accompanies: Maathuis, H. and Simpson, M. 2006, Groundwater Resources in the Yorkton Aquifer Management Plan Area, Final Report. Saskatchewan Research Council report 10419–1E06.
g:\current_projects\Yorkton\2005_cross_sections\xsec_F.dwg

Accompanies: Maathuis, H. and Simpson, M. 2006, Groundwater Resources in the Yorkton Aquifer Management Plan Area, Final Report. Saskatchewan Research Council report 10419–1E06.

g:\current_projects\Yorkton\2005_cross_sections\xsec_G.dwg

smart science solutions

Cross section H–H'

Testhole/well

Drift, undifferentiated (aquitard)

Intertill Aquifer

Empress Gp Aquifer

Bredenbury Aquifer

Pierre Shale (aquitard)

Accompanies: Maathuis, H. and Simpson, M. 2006, Groundwater Resources in the Yorkton Aquifer Management Plan Area, Final Report. Saskatchewan Research Council report 10419–1E06.

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LL5 CROSS SECTION
199 201 200 202 143 142 203 204 118 119 205 206 207 208 209 210 96 211 212 213 214 215 216 217 218-222 223 48 47 224 225 226 11 10 9 227 228 229 198
E-E'
D-D'
2-2'
C-C'
B-B'
A-A'
I-I'
metres above sea level
Drift, undifferentiated (aquitard)
Leech Lake Aquifer (Glacial)
Bredenbury Aquifer
Leech Lake Aquifer (Intertill)
Logan Aquifer (Intertill sand & gravel)
Collacott Aquifer (Intertill)
Logan Aquifer ("Bredenbury Fm.")
Till (Glacial)
Orcadia Aquifer ("Bredenbury Fm.")
Empress Aquifer
Pierre Shale (aquitard)
Crater Lake Salt Collapse Structure
0 1000m 2000m
Cross section I-I'
Testhole/well
Drift, undifferentiated (aquitard)
Intertill Aquifer
Empress Gp Aquifer
Bredenbury Aquifer
Pierre Shale (aquitard)
Accompanies: Maathuis, H. and Simpson, M. 2006, Groundwater Resources in the Yorkton Aquifer Management Plan Area, Final Report. Saskatchewan Research Council report 10419-1E06.
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J
J'
230 231
147
232
233
124
234
235 236
237
238
103
239
240
241
242
243
78
244
245
24
246
247
E–E'
D–D'
C–C'
B–B'
A–A'
metres above sea level
530
520
510
500
490
480
470
460
450
440
430
420
410
400
Bredenbury Aquifer
("Bredenbury Fm.")
Drift, undifferentiated
(aquitard)
Bredenbury Aquifer
(Dunleath Aquifer)
("Bredenbury Fm.")
Pierre Shale
(aquitard)
salt
collapse ?
0
1000m
2000m
Cross section J–J'
Testhole/well
Drift, undifferentiated
(aquitard)
Intertill Aquifer
Empress Gp Aquifer
Bredenbury Aquifer
Pierre Shale
(aquitard)
Accompanies: Maathuis, H. and Simpson, M. 2006, Groundwater Resources in the Yorkton Aquifer Management Plan Area, Final Report. Saskatchewan Research Council report 10419–1E06.
g:\current_projects\Yorkton\2005_cross_sections\xsec_J.dwg

smart science solutions

Cross section Leech Lake 1–1'

Accompanies: Maathuis, H. and Simpson, M. 2006, Groundwater Resources in the Yorkton Aquifer Management Plan Area, Final Report. Saskatchewan Research Council report 10419–1E06.

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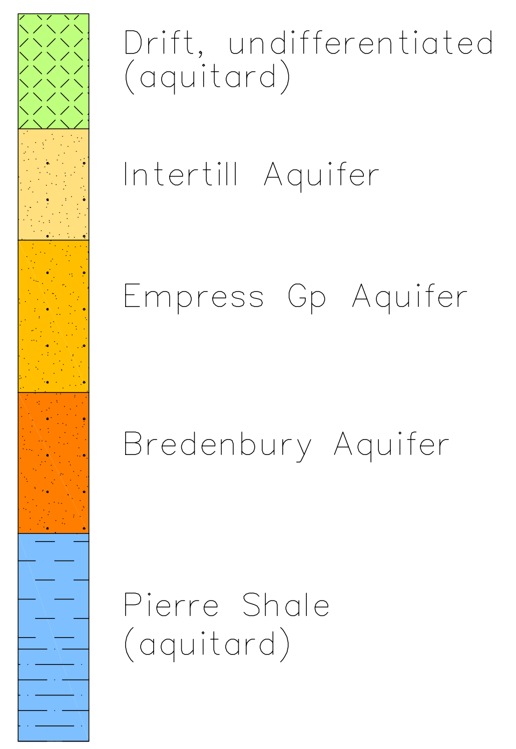
Cross section Leech Lake 2–2'



Accompanies: Maathuis, H. and Simpson, M. 2006, Groundwater Resources in the Yorkton Aquifer Management Plan Area, Final Report. Saskatchewan Research Council report 10419–1E06.

g:\current_projects\Yorkton\2005_cross_sections\xsec_LL_2.dwg

Cross section Leech Lake 3–3'

Accompanies: Maathuis, H. and Simpson, M. 2006, Groundwater Resources in the Yorkton Aquifer Management Plan Area, Final Report. Saskatchewan Research Council report 10419–1E06.

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smart science solutions

Cross section
Leech Lake 3–4'

Drift, undifferentiated (aquitard)

Intertill Aquifer

Empress Gp Aquifer

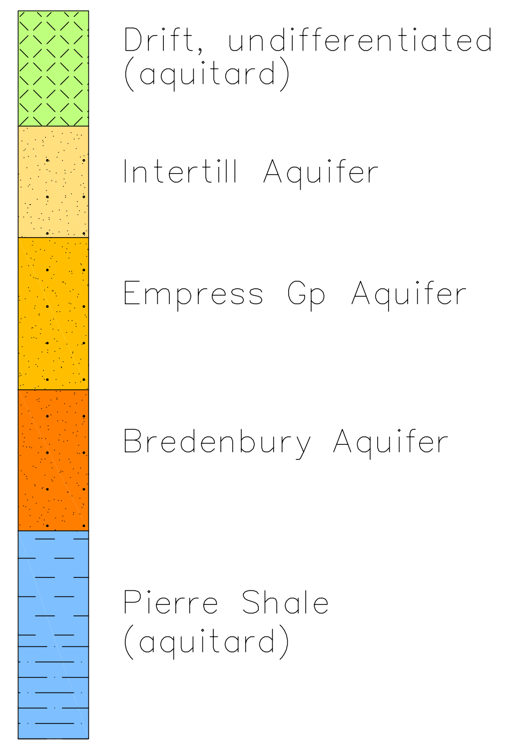
Bredenbury Aquifer

Pierre Shale (aquitard)

Accompanies: Maathuis, H. and Simpson, M. 2006, Groundwater Resources in the Yorkton Aquifer Management Plan Area, Final Report. Saskatchewan Research Council report 10419–1E06.

g:\current_projects\Yorkton\2005_cross_sections\xsec_LL_4.dwg

Cross section Leech Lake 5–5'



Accompanies: Maathuis, H. and Simpson, M. 2006, Groundwater Resources in the Yorkton Aquifer Management Plan Area, Final Report. Saskatchewan Research Council report 10419-1E06.

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Cross section
Logan Valley

Drift, undifferentiated (aquitard)
Intertill Aquifer
Empress Gp Aquifer
Bredenbury Aquifer
Pierre Shale (aquitard)

Accompanies: Maathuis, H. and Simpson, M. 2006, Groundwater Resources in the Yorkton Aquifer Management Plan Area, Final Report. Saskatchewan Research Council report 10419-1E06.

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Accompanies: Maathuis, H. and Simpson, M. 2006, Groundwater Resources in the Yorkton Aquifer Management Plan Area, Final Report. Saskatchewan Research Council report 10419–1E06.

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smart science solutions

Cross section Collacott

- Drift, undifferentiated (aquitard)
- Intertill Aquifer
- Empress Gp aquitard
- Empress Gp Aquifer
- Bredenbury aquitard
- Bredenbury Aquifer
- Pierre Shale (aquitard)

Accompanies SRC report 10419–1E05, H. Maathuis and M. Simpson, Hydrostratigraphy of the Yorkton area, Saskatchewan.

g:\current_projects\Yorkton\2005_cross_sections\xsec_COL_1.dwg