6.5 Discussion of Specific Study Areas

As per the Request for Proposal, Ponoka County requested that comments be made, where possible, on the following three study areas and issues. The issue is stated at the beginning of each of the following sections. Figure 38 shows the three specific study areas in the County; in Figure 39, the three specific study areas have been color outlined on the bedrock geology map; Figure 40 shows the apparent yield for water wells completed in the Sand and Gravel Aquifer(s); and Figure 41 shows the apparent yield for water wells completed in the Upper Bedrock Aquifer(s).

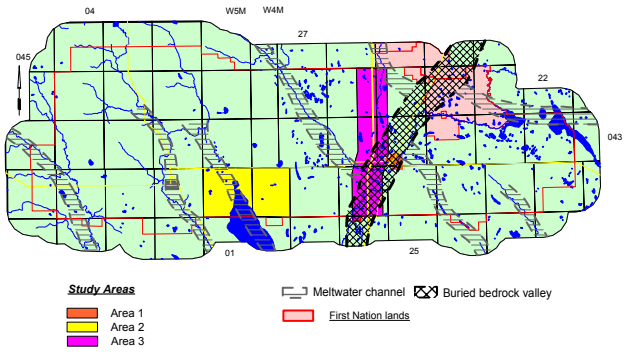

Figure 38. Specific Study Areas

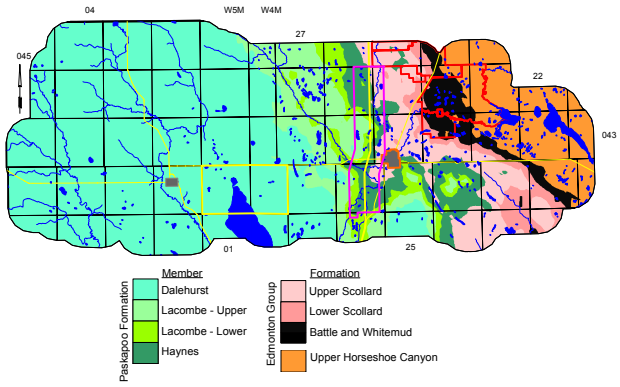

Figure 39. Bedrock Geology of Specific Study Areas

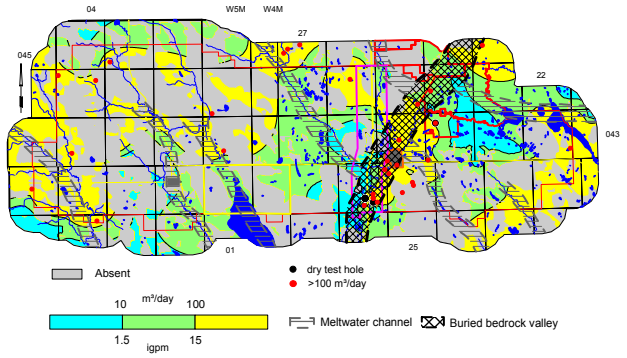

Figure 40. Apparent Yield for Water Wells Completed in Sand and Gravel Aquifer(s) - Specific Study Areas

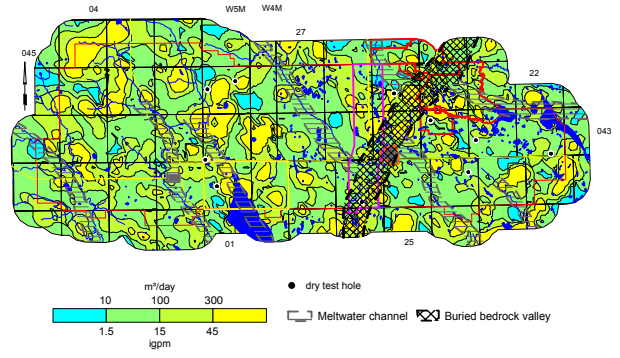

Figure 41. Apparent Yield for Water Wells Completed in Upper Bedrock Aquifer(s) - Specific Study Areas

6.5.1 Area 1 – Town of Ponoka

What is the approximate extent and potential (yield and water quality) of the aquifers in this area? What comments can be made regarding the apparent water-level decline in the aquifer supplying the Town of Ponoka?

The Town of Ponoka requires additional water for their municipal water system. The population of the Town of Ponoka has been growing at a rate of more than 2% per year. Based on the current population of 6,330 (Phinney, 2003), the Town of Ponoka requires an average groundwater supply of 1,520 m³/day. The eight existing water supply wells are mainly completed in the Upper Scollard Aquifer and are authorized to divert up to 4,015 m³/day for municipal purposes, as shown in the adjacent figure. Of the eight water supply wells, four could be linked to water wells in the AENV groundwater database; aquifer test data were available for two of the water supply wells.

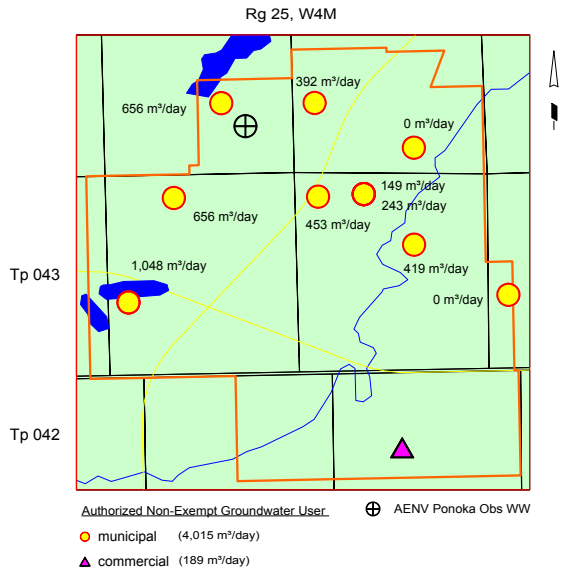

Figure 42. Authorized Non-Exempt Groundwater Water Wells – Area 1

There are indications that there has been a continual decline of more than ten metres in the water-level surface in the Upper Scollard Aquifer, as shown by the AENV Ponoka Obs WW hydrograph (see page A-57).

Water-level monitoring data from the Town of Ponoka water supply wells would need to be provided by the Town in order to determine the extent of the water-level decline.

It was indicated in the 1979 groundwater program conducted by HCL for the Town of Ponoka that once the two 1979 water supply wells completed in the Upper Scollard Aquifer in 12-05 and 14-05-043-25 W4M are put into production, the groundwater available from the Aquifer within the Town boundaries would be at or near the maximum. Since 1979, an additional 656 m³/day has been authorized to be diverted from a water supply well completed in the Upper Scollard Aquifer in 07-08-043-25 W4M.

It was recommended in the 1979 report, that in the event that groundwater production from the water supply wells in 12-05 and 14-05 could not be increased above the total recommended rates of 1,570 m³/day, and if groundwater production from the Buried Red Deer Valley deposits is not feasible, additional groundwater supplies would have to be developed from sites outside the Town boundaries, possibly in sections 35 and 36, township 042, range 26, W4M. It is not known if the Town has conducted any groundwater investigations at sites outside the Town boundaries.

Before the Town of Ponoka can be helped, there is a need for meaningful management of the groundwater resource and a need for the Town to consider developing additional groundwater supplies from outside the Town's corporate limits.

6.5.2 Area 2 – Gull Lake

What is the approximate extent and potential (yield and water quality) of the aquifers in this area?

The Sand and Gravel Aquifer(s) is present over 50% of Area 2. The saturated sand and gravel deposits are expected to be mainly less than five metres thick. In Area 2, the apparent yields for water wells completed through the Lower Sand and Gravel Aquifer are expected to be less than 50 m³/day. In Area 2, there are no apparent yield data for water wells completed in the Sand and Gravel Aquifer(s). The closest water well to Area 2 with apparent yield data is a water well completed in the Lower Sand and Gravel Aquifer in 16-28-042-27 W4M, which has an apparent yield of 27 m³/day.

Groundwaters from water wells completed in Area 2 in the surficial deposits are expected to have TDS concentrations that are less than 1,000 mg/L.

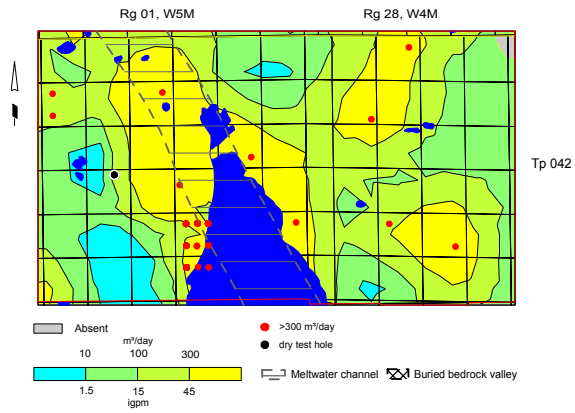

Figure 43. Apparent Yield for Water Wells Completed in Dalehurst Aquifer – Area 2

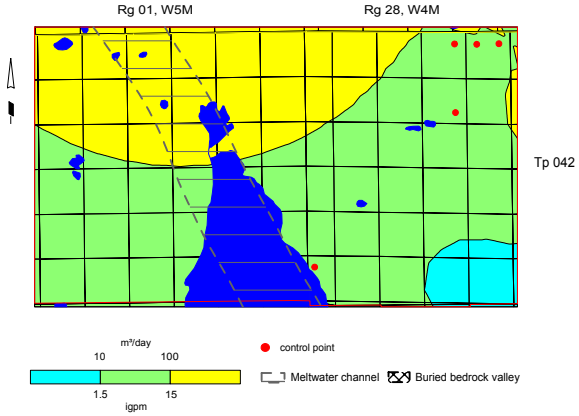

Figure 44. Apparent Yield for Water Wells Completed in Upper Lacombe Aquifer – Area 2

The upper bedrock in Area 2 is the Dalehurst Member. In approximately 60% of Area 2, the apparent yields for water wells completed through the Dalehurst Aquifer are expected to be greater than 100 m³/day, as shown above in Figure 43. The water wells that are shown in Gull Lake are the result of having an available legal location only to the nearest half section.

In Area 2, the depth to the top of the Upper Lacombe ranges from less than 30 metres in the extreme northeastern part of Area 2 to greater than 100 metres in the western part of Area 2. In Area 2, there are five water wells completed in the Upper Lacombe Aquifer with apparent yield data. The completed depths of the water wells range from 36 to 50 metres below ground surface. The apparent yields for water wells completed in the Upper Lacombe Aquifer are expected to be mainly greater than 30 m³/day.

Groundwaters from water wells completed in the Dalehurst Aquifer in Area 2 are expected to have TDS concentrations that are mainly less than 1,000 mg/L, sulfate concentrations that are less than 200 mg/L, chloride concentrations that are less than ten mg/L, and fluoride concentrations that are less than one mg/L.

In Area 2, there are two water wells completed in the Upper Lacombe Aquifer that have chemistry data for TDS, sulfate and chloride concentrations as shown in the adjacent table. One water well in SE 26-042-28 W4M indicates a fluoride concentration that significantly exceeds the SGDWQ.

Based on the available data in Area 2, apparent yields are expected to be the highest in the Dalehurst Aquifer.

Constituent	Legal Description	Results mg/L	Analysis Date	Recommended Maximum Concentration SGCDWQ
TDS	NE 24-042-28 W4M	2,452	22-Aug-60	500
		2,042	22-Aug-60	
	SE 26-042-28 W4M	528	10-Dec-86	
Sulfate	NE 24-042-28 W4M	1,142	22-Aug-60	200
		902	22-Aug-60	
	SE 26-042-28 W4M	10	10-Dec-86	
Chloride	NE 24-042-28 W4M	4	22-Aug-60	250
		4	22-Aug-60	
	SE 26-042-28 W4M	30	10-Dec-86	
Fluoride	SE 26-042-28 W4M	10	10-Dec-86	1.5

Note: indicated concentrations are for Aesthetic Objectives except for Fluoride, which is for Maximum Acceptable Concentration (MAC)

SGCDWQ - Summary of Guidelines for Canadian Drinking Water Quality Federal-Provincial-Territorial Committee on Drinking Water, April 2002

Table 19. Concentrations of TDS, Sulfate and Fluoride for Water Wells in Upper Lacombe Aquifer – Area 2

6.5.3 Area 3 – Highway 2 Corridor

What is the approximate extent and potential (yield and water quality) of the aquifers in this area?

There are aquifers in six separate geological units in Area 3. The hydrogeological data for each aquifer is summarized below in Table 20.

Geologic Unit	Number of Water Wells	*Water Well Use (m³/day)	Elevation to Bottom (m AMSL) Maximum	Minimum	% of Area Aquifer Present	Range in Apparent Yield (m³/day) Low	High	Chemical Quality (mg/L) Hardness	TDS	Fluoride
Lower Sand and Gravel	27	80	860	760	65	>10	<300	<400	<1,000	---
Upper Lacombe	3	---	850	790	15	<10	<100	<200	<1,000	<0.5
Lower Lacombe	12	76	840	780	35	<10	<100	<400	<1,000	<1.0
Haynes	182	900	810	760	80	<10	>300	<400	<1,000	<1.0
Upper Scollard	104	730	780	700	100	<10	>300	<200	<1,500	<1.0
Lower Scollard	11	60	740	660	100	<10	<100	<200	<1,500	<2.0

*Estimated 2003 groundwater use based on criteria in section 6.2 of this report

Table 20. Summary of Aquifers in Area 3

The Lower Sand and Gravel Aquifer is present in approximately 65% of Area 3. The apparent yields for water wells completed in the Lower Sand and Gravel Aquifer range from ten m³/day to 300 m³/day, with higher yields in the Buried Red Deer Valley (see page A-76).

Groundwaters from water wells completed in Area 3 in the surficial deposits are expected to have TDS concentrations that are less than 1,000 mg/L,

The upper bedrock over most of Area 3 is the Paskapoo Formation and the Scollard formations (see page A-77).

The apparent yields for water wells completed through the upper bedrock aquifer(s) are expected to range between ten and 300 m³/day, with the highest yielding water wells being completed in the Haynes and Upper Scollard aquifers (see pages A-78 and A-89).

Groundwaters from water wells completed in the upper bedrock aquifer(s) are expected to have TDS concentrations that range between 500 and 1,000 mg/L (see page A-77).

Figure 45 shows the main areas where apparent yields for bedrock water wells are expected to be greater than 300 m³/day and where TDS concentrations in the groundwaters are expected to be less than 500 mg/L.

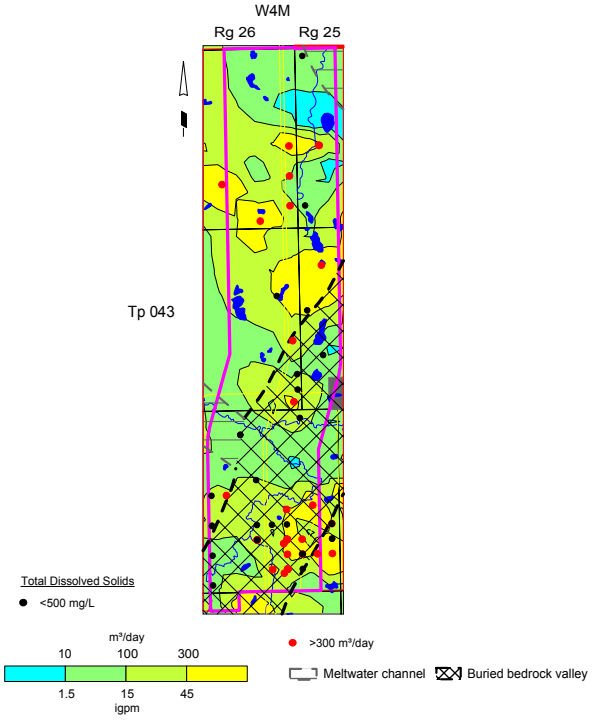

Figure 45. Apparent Yield and Total Dissolved Solids in Groundwater for Water Wells Completed in Upper Bedrock Aquifer(s) – Area 3

7 RECOMMENDATIONS

The present study has been based on information available from the groundwater database. The database has three problems:

1) the quality of the data
2) the coordinate system used for the horizontal control
3) the distribution of the data.

The quality of the data in the groundwater database is affected by two factors: a) the technical training of the persons collecting the data, and b) the quality control of the data. The possible options to upgrade the database include the creation of a "super" database, which includes only verified data. The first step would be to field-verify the 240 existing water wells listed in Appendix E. These water well records indicate that a complete water well drilling report is available along with at least a partial chemical analysis. The level of verification would have to include identifying the water well in the field, obtaining meaningful horizontal coordinates for the water well and the verification of certain parameters such as water level and completed depth. There are 13 water wells for which the County has responsibility; the County-operated water wells are included in Appendix E. It is recommended that the County-operated water wells plus the 240 water wells be field-verified, water levels be measured, a water sample be collected for analysis, and a short aquifer test be conducted. An attempt to update the quality of the entire database is not recommended.

The most notable areas where surficial water wells are completed are the sand and gravel aquifer(s) that are in association with the linear bedrock lows. There are 37 surficial water wells with an apparent yield value completed in the Sand and Gravel Aquifer(s) that are in association with the Buried Red Deer Valley and meltwater channels. The median apparent yield value from these 37 water wells is 65 m^3/day (10 igpm).

The results of the present study indicate that the main source of groundwater in the County is aquifers in the upper bedrock aquifer(s). The median apparent yield value from all water wells completed in the upper bedrock aquifer(s) is in the order of 60 m^3/day (9 igpm). More than 35% of the water wells completed in the upper bedrock aquifer(s) have an apparent yield of greater than 100 m^3/day.

Before an attempt is made to provide a major upgrade to the level of interpretation provided in this report, the accompanying maps and the groundwater query, it is recommended that the 240 water wells listed in Appendix E for which water well drilling reports are available, plus the 13 County–operated water wells, be subjected to the following actions (see pages C-2 to C-3):

1) The horizontal location of the water well should be determined within ten metres. The coordinates must be in 10TM NAD 27 or some other system that will allow conversion to 10TM NAD 27 coordinates.
2) A four-hour aquifer test (two hours of pumping and two hours of recovery) should be performed with the water well to obtain a realistic estimate for the transmissivity of the aquifer in which the water well is completed.
3) Water samples should be collected for chemical analysis after five and 115 minutes of pumping, and analyzed for major and minor ions.

This additional information would provide a baseline to be used for comparison to either existing chemical analyses or aquifer tests, or to determine if future monitoring would be necessary if significant changes in the aquifer parameters had occurred.

A list of the 253 water wells that could be considered for the above program is given in Appendix E and on the CD-ROM.

An attempt to link the AENV groundwater and licensing databases was 35% successful in this study (see CD-ROM); sixty-five percent of authorized non-exempt water wells do not appear to have corresponding records in the AENV groundwater database. There is a need to improve the quality of the AENV licensing database. It is recommended that attempts be made in a future study to find and add missing drilling records to the AENV