

### 5.3.6 Upper Lacombe Aquifer

The Upper Lacombe Aquifer comprises the permeable parts of the Upper Lacombe Member, as defined for the present program. Structure contours have been prepared for the top of the Upper Lacombe Member. The structure contours show that the Upper Lacombe Member ranges in elevation from less than 760 to more than 880 metres AMSL and has a maximum thickness of 130 metres. The non-pumping water level in the Upper Lacombe Aquifer is downgradient to the northeast toward the Battle River (see CD-ROM).

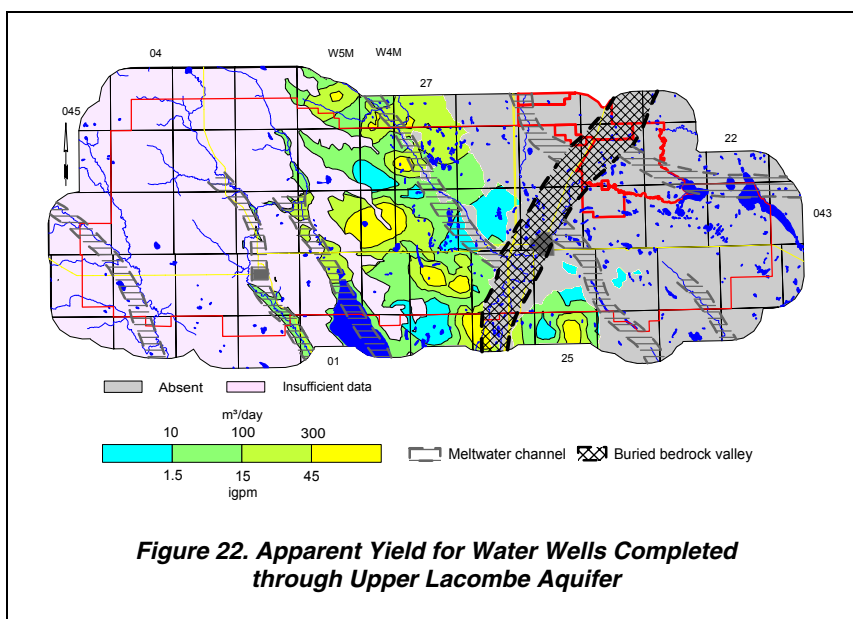
#### 5.3.6.1 Depth to Top

The depth to the top of the Upper Lacombe Member ranges from less than ten metres to more than 200 metres in the western part of the County (page A-37).

#### 5.3.6.2 Apparent Yield

The apparent yields for individual water wells completed through the Upper Lacombe Aquifer are mainly in the range of 10 to 100 m<sup>3</sup>/day. There are no dry water test holes that are completed in the Upper Lacombe Aquifer. The areas showing water wells with yields of greater than 300 m<sup>3</sup>/day are expected are mainly in the areas between the Gull Lake meltwater channel and the Buried Red Deer Valley.

There are 110 non-exempt groundwater users that have water wells completed through the Upper Lacombe Aquifer, for a total authorized groundwater diversion of 1,241 m<sup>3</sup>/day.



**Figure 22. Apparent Yield for Water Wells Completed through Upper Lacombe Aquifer**

Of the 110 non-exempt authorizations, 44 could be linked to water wells in the AENV groundwater database.

The highest non-exempt groundwater use is for an authorization that allows PanCanadian Petroleum Limited to divert up to 500 m<sup>3</sup>/day for industrial injection purposes in SE 23-043-28 W4M.

Two PanCanadian Petroleum Limited water source wells in SE 23-043-28 W4M are authorized to divert a total of 600 m<sup>3</sup>/day (HCL, 2002). The water source wells are completed in the Upper Lacombe Aquifer. Long-term monitoring of the two water source wells and ten observation water wells indicated an effective transmissivity of 40 m<sup>2</sup>/day and corresponding storativity of 0.0008. In addition to the long-term monitoring of the water source wells and the observation water wells, the flow rate from the Paetkau (Lick) Spring, an outcrop of the Upper Lacombe Member, in NW 14-043-28 W4M was monitored from 1989 to 1998.

### 5.3.6.3 Quality

The groundwaters from the Upper Lacombe Aquifer are mainly a sodium-bicarbonate type (see Piper diagram on CD-ROM), with nearly 80% of the groundwater samples having TDS concentrations ranging from 500 to 1,000 mg/L (page A-39). The sulfate concentrations in groundwaters from the Upper Lacombe Aquifer are mainly less than 250 mg/L. The chloride concentrations from the Upper Lacombe Aquifer are mainly less than ten mg/L. Nearly 75% of the groundwater samples have fluoride concentrations that are less than 1.5 mg/L.

A chemical analysis of a groundwater sample collected in February 1988 from one of the PanCanadian Petroleum Limited water source wells in SE 23-043-28 W4M indicates the groundwater is a sodium-bicarbonate type, with a TDS concentration of 582 mg/L, a sulfate concentration of 10 mg/L, a chloride concentration of less than 10 mg/L, and a fluoride concentration of 2.42 mg/L (HCL, Nov-1989).

Of the five constituents that have been compared to the SGCDWQ, the median values of **TDS** and **sodium** exceed the guidelines. The median concentrations of TDS, sulfate and fluoride from water wells completed in the Upper Lacombe Aquifer are greater than the median concentrations from water wells completed in all upper bedrock aquifer(s).

Constituent	No. of Analyses	Range for County in mg/L			All Bedrock Median	Recommended Maximum Concentration SGCDWQ
		Minimum	Maximum	Median		
Total Dissolved Solids	83	241	2,452	655	629	500
Sodium	74	0.5	8,855	225	239	200
Sulfate	82	0	1142	92	52	500
Chloride	82	0	30	3	3	250
Fluoride	80	0	3	0.4	0.3	1.5

Concentration in milligrams per litre unless otherwise stated  
 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 Subcommittee on Drinking Water, April 2002

**Table 8. Apparent Concentrations of Constituents in Groundwaters from Upper Lacombe Aquifer**

### 5.3.7 Lower Lacombe Aquifer

The Lower Lacombe Aquifer comprises the permeable parts of the Lower Lacombe Member, as defined for the present program. Structure contours have been prepared for the top of the Lower Lacombe Member. The structure contours show that the Lower Lacombe Member ranges in elevation from less than 660 to more than 880 metres AMSL and has a maximum thickness of 115 metres. The non-pumping water level in the Lower Lacombe Aquifer is downgradient to the northeast and southwest toward the Battle River (see CD-ROM).

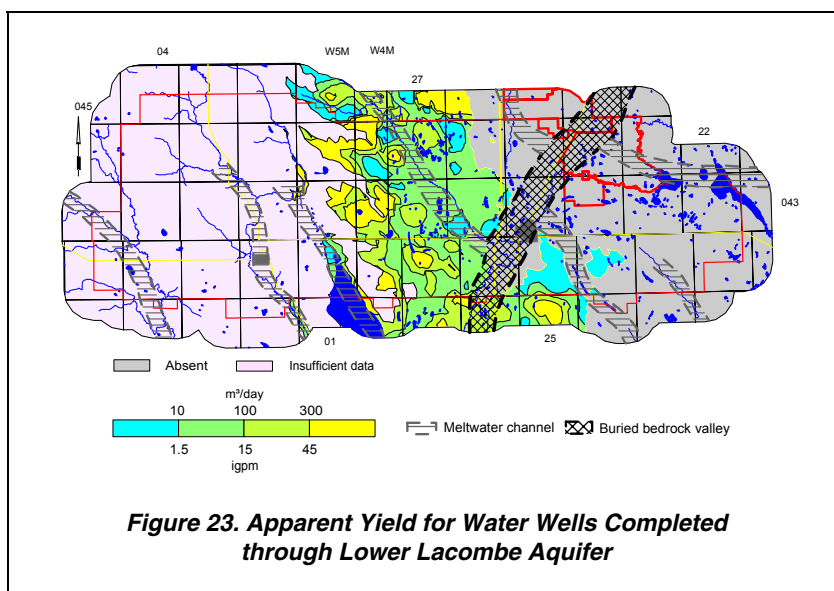
#### 5.3.7.1 Depth to Top

The depth to the top of the Lower Lacombe Member ranges from less than 20 metres below ground level where the Member subcrops to more than 300 metres at the western edge of the County (page A-40).

#### 5.3.7.2 Apparent Yield

The apparent yields for individual water wells completed through the Lower Lacombe Aquifer are mainly in the range of 10 to 100 m<sup>3</sup>/day. There are no dry water test holes that are completed in the Lower Lacombe Aquifer. The areas showing water wells with yields of greater than 300 m<sup>3</sup>/day are expected to be mainly between the Gull Lake meltwater channel and the Buried Red Deer Valley.

There are 46 non-exempt groundwater users that have water wells completed through the Upper Lacombe Aquifer, for a total authorized groundwater diversion of 228 m<sup>3</sup>/day. The highest single allocation is 32 m<sup>3</sup>/day for a water well in 04-10-043-26 W4M licensed to divert groundwater for agricultural purposes. Of the 46 non-exempt authorizations, seven could be linked to water wells in the AENV groundwater database.



**Figure 23. Apparent Yield for Water Wells Completed through Lower Lacombe Aquifer**

#### 5.3.7.3 Quality

The groundwaters from the Lower Lacombe Aquifer are mainly a sodium-bicarbonate type (see Piper diagram on CD-ROM), with more than 80% of the groundwater samples having TDS concentrations ranging from 500 to 1,000 mg/L (page A-42). The sulfate concentrations in groundwaters from the Lower Lacombe Aquifer are mainly less than 200 mg/L. The chloride concentrations from the Lower Lacombe Aquifer are mainly less than ten mg/L. There is only one analysis where the fluoride concentration exceeds 1.5 mg/L.

Of the five constituents that have been compared to the SGCDWQ, the median values of **TDS** and **sodium** exceed the guidelines. The median concentrations of TDS, sodium, and sulfate from water wells completed in the Lower Lacombe Aquifer are greater than the median concentrations from water wells completed in all upper bedrock aquifer(s).

Constituent	No. of Analyses	Range for County in mg/L			All Bedrock Median	Recommended Maximum Concentration SGCDWQ
		Minimum	Maximum	Median		
Total Dissolved Solids	29	354	1,189	703	629	500
Sodium	22	38	6,210	255	239	200
Sulfate	29	9	500	96	52	500
Chloride	29	0	18	1	3	250
Fluoride	24	0	2	0.3	0.3	1.5

Concentration in milligrams per litre unless otherwise stated  
 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 Subcommittee on Drinking Water, April 2002

**Table 9. Apparent Concentrations of Constituents in Groundwaters from Lower Lacombe Aquifer**

### 5.3.8 Haynes Aquifer

The Haynes Aquifer comprises the permeable parts of the Haynes Member, as defined for the present program. Structure contours have been prepared for the top of the Haynes Member. The structure contours show that the Haynes Member ranges in elevation from less than 600 to more than 880 metres AMSL and has a maximum thickness of 50 metres.

#### 5.3.8.1 Depth to Top

The depth to the top of the Haynes Member ranges from less than 20 metres below ground surface at the eastern extent to more than 400 metres in the western part of the County (page A-43). The non-pumping water level in the Haynes Aquifer is downgradient to the northeast and southwest toward the Battle River (see CD-ROM).

#### 5.3.8.2 Apparent Yield

The apparent yields for individual water wells completed through the Haynes Aquifer are mainly in the range of 10 to 100 m<sup>3</sup>/day. Nearly 50% (55) of the 115 water wells completed in the Haynes Aquifer have apparent yield values that are greater than 100 m<sup>3</sup>/day. There are no dry water test holes that are completed in the Haynes Aquifer.

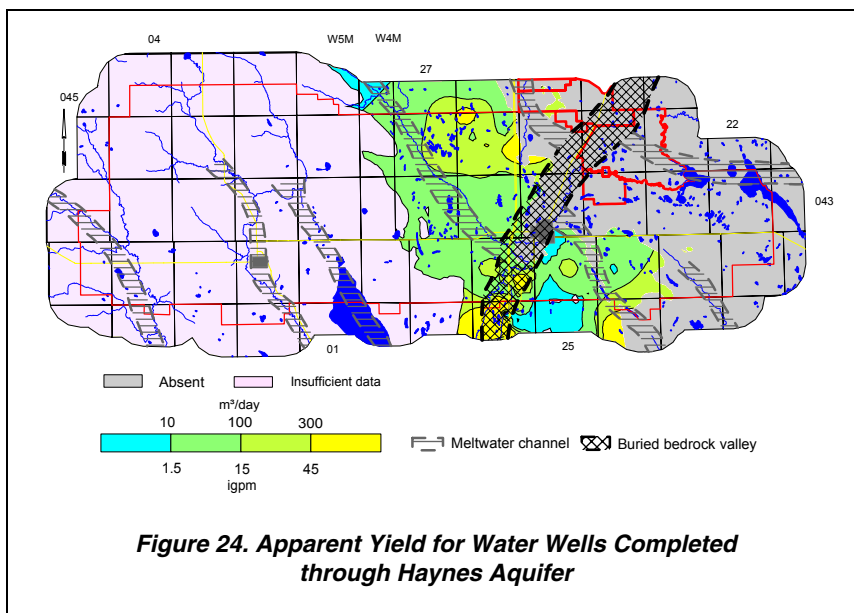
There are 63 non-exempt groundwater users that have water wells completed through the Haynes Aquifer, for a total authorized groundwater diversion of 775 m<sup>3</sup>/day.

The highest allocations total 226 m<sup>3</sup>/day for two water source wells in NW 10-044-26 W4M licensed to divert groundwater for agricultural purposes. Of the 63 non-exempt authorizations, 35 could be linked to water wells in the AENV groundwater database.

An extended aquifer test conducted with a water source well completed in the Haynes Aquifer in NE 28-043-26 W4M indicated a long-term yield of 200 m<sup>3</sup>/day, based on an effective transmissivity of 41.3 m<sup>2</sup>/day and a corresponding storativity of 0.0001 (HCL, Jun-2002).

#### 5.3.8.3 Quality

The groundwaters from the Haynes Aquifer are mainly a sodium-bicarbonate type (see Piper diagram on CD-ROM), with 75% of the values having TDS concentrations ranging from 500 to 1,000 mg/L (page A-45). The sulfate concentrations in groundwaters from the Haynes Aquifer are mainly less than 250 mg/L. The chloride concentrations from the Haynes Aquifer are mainly less than ten mg/L. There is only one analysis where the fluoride concentration exceeds 1.5 mg/L.



A chemical analysis of a groundwater sample collected in June 2002 from a water supply well completed in the Haynes Aquifer for a hog operation indicated the groundwater is a sodium-bicarbonate type, with a TDS concentration of 916 mg/L, a sulfate concentration of 234 mg/L, a chloride concentration of 7.1 mg/L, and a fluoride concentration of 1.1 mg/L (HCL, Jun-2002).

Of the five constituents that have been compared to the SGCDWQ, the median value of **TDS** exceeds the guidelines. The median concentrations of TDS and sulfate from water wells completed in the Haynes Aquifer are greater than the median concentrations from water wells completed in all upper bedrock aquifer(s).

Constituent	No. of Analyses	Range for County in mg/L			All Bedrock Median	Recommended Maximum Concentration SGCDWQ
		Minimum	Maximum	Median		
Total Dissolved Solids	9	240	1,677	729	629	500
Sodium	8	16	601	164	239	200
Sulfate	67	0	404	170	52	500
Chloride	52	0	4	2	3	250
Fluoride	60	0	3	0.2	0.3	1.5

Concentration in milligrams per litre unless otherwise stated  
 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 Subcommittee on Drinking Water, April 2002

**Table 10. Apparent Concentrations of Constituents in Groundwaters from Haynes Aquifer**