The following table shows a breakdown of the 288 licensed groundwater allocations by the aquifer in which the water well is completed. The largest total licensed allocations are in the Lower Horseshoe Canyon and Upper Surficial aquifers; the majority of the groundwater is used for "diversion" and agricultural purposes.

	Licensed Groundwater Users* (m³/day)							
Aquifer**	Agricultural	Industrial	Municipal	Diversion	Domestic	Other	Total	Percentage
Upper Surficial	1,168	0	673	0	9	23	1,873	16
Lower Surficial	110	0	0	0	155	0	265	2
Upper Horseshoe Canyon	82	0	27	0	0	5	114	1
Middle Horseshoe Canyon	43	0	0	0	0	0	43	0
Lower Horseshoe Canyon	327	18	0	4,646	0	0	4,991	42
Bearpaw	671	5	47	0	0	0	723	6
Oldman	349	746	482	0	5	0	1,582	13
Birch Lake	9	55	0	0	0	0	64	1
Ribstone Creek	9	0	0	0	0	0	9	0
Victoria	0	509	0	0	0	0	509	4
Saline	0	1,103	0	0	0	0	1,103	9
Unknown	218	205	236	0	0	0	659	6
Total	2,986	2,641	1,465	4,646	169	28	11,935	100
Percentage	25	22	12	39	2	0	100	

* - data from AE ** - identification of Aquifer by HCL

Table 1. Licensed Groundwater Diversions

Based on the 1996 Agriculture Census, the water requirement for livestock for Special Areas only is in the order of 35,740 m³/day. Ninety-eight percent of the required water has been licensed by Alberta Environment (AE). Groundwater provides 2,986 m³/day and surface water provides 32,208 m³/day.

5) Groundwater Chemistry and Base of Groundwater Protection

Groundwaters from the surficial deposits are expected to be chemically hard with a high dissolved iron content. The Total Dissolved Solids (TDS) concentrations in the groundwaters from the upper bedrock in the project area are generally less than 2,000 mg/L. Groundwaters from the bedrock aquifers frequently are chemically soft with generally low concentrations of dissolved iron. The chemically soft groundwater is high in sodium concentration. Less than 10% of the chemical analyses indicate a fluoride concentration above 1.5 mg/L.

The minimum, maximum and average concentrations of TDS, sodium, sulfate, chloride and fluoride in the groundwaters from water wells completed in the upper bedrock in Special Areas and the M.D. have been compared to the Guidelines for Canadian Drinking Water Quality (GCDWQ) in Table 2. Of the five constituents compared to the GCDWQ, the average values of TDS, sodium, and sulfate concentrations exceed the guidelines.

Constituent	Range for Special Areas and M.D. in mg/L			Recommended Maximum Concentration GCDWQ
	Minimum	Maximum	Average	
Total Dissolved Solids	14.0	8350	1713	500
Sodium	3.0	2690	544	200
Sulfate	1	5187	606	500
Chloride	1.0	2340	65	250
Fluoride	0.02	2.39	0.62	1.5

Concentration in milligrams per litre unless otherwise stated
Note: indicated concentrations are for Aesthetic Objectives

GCDWQ - Guidelines for Canadian Drinking Water Quality, Sixth Edition
Minister of Supply and Services Canada, 1996

Table 2. Concentrations of Constituents in Groundwaters from Upper Bedrock Aquifer(s)

Alberta Environment defines the Base of Groundwater Protection as the elevation below which the groundwater is expected to have more than 4,000 mg/L of total dissolved solids. By using the ground elevation, and the elevation of the Base of Groundwater Protection provided by the Alberta Energy and Utilities Board (EUB), a depth to the Base of Groundwater Protection can be determined. These values are gridded using the Kriging[7] method to prepare a Base of Groundwater Protection surface. This surface is then used throughout the project area. The depth to the Base of Groundwater Protection, for the most part, would be the maximum drilling depth for a water well for agricultural purposes or for a potable water supply. If a water well is completed below the Base of Groundwater Protection with the total dissolved solids of the groundwater exceeding 4,000 mg/L, then the groundwater use does not require licensing by AE.

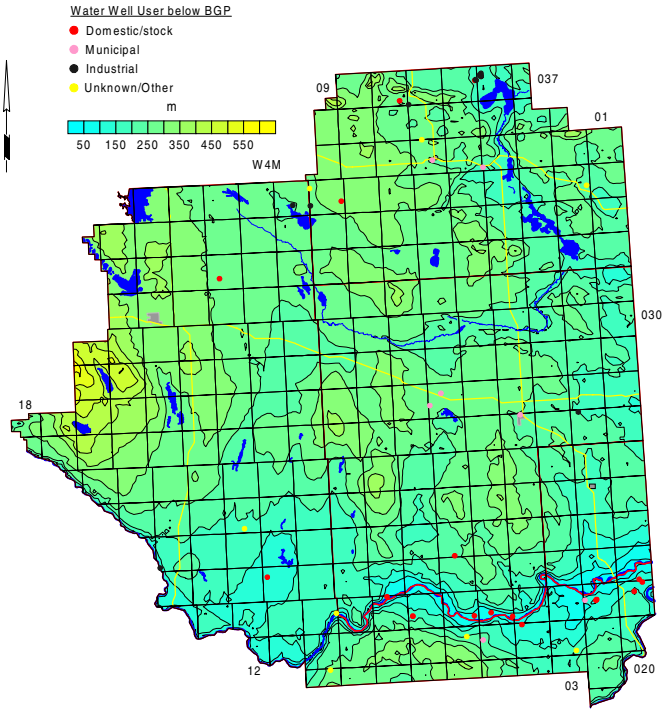

Figure 4. Depth to Base of Groundwater Protection (after EUB, 1995)

There are 46 water wells that have a completion depth below the Base of Groundwater Protection. Many of these water wells are located within a few kilometres of the Red Deer River. Of the 46 water wells, 19 are used for domestic/stock purposes, 12 for industrial purposes, seven for municipal purposes and for eight, the use is unknown or other. Chemistry data are available for only nine water wells, with TDS exceeding 4,000 mg/L in four wells.

Proper management of the groundwater resource requires water-level data. These data are often collected from observation water wells. At the present time, there are 19 AE-operated observation water wells within Special Areas, and none within the M.D. of Acadia. Additional data can be obtained from some of the licensed groundwater diversions. In the past, the data for licensed diversions have been difficult to obtain from AE, in part because of the failure of the licensee to provide the data.

However, even with the available sources of data, the number of water-level data points relative to the size of Special Areas and the M.D. is too few to provide a reliable groundwater budget (see section 6.0). The most cost-efficient method to collect additional groundwater monitoring data would be to have the water well owners measuring the water level in their own water well on a regular basis.

[7] See glossary

III. Terms

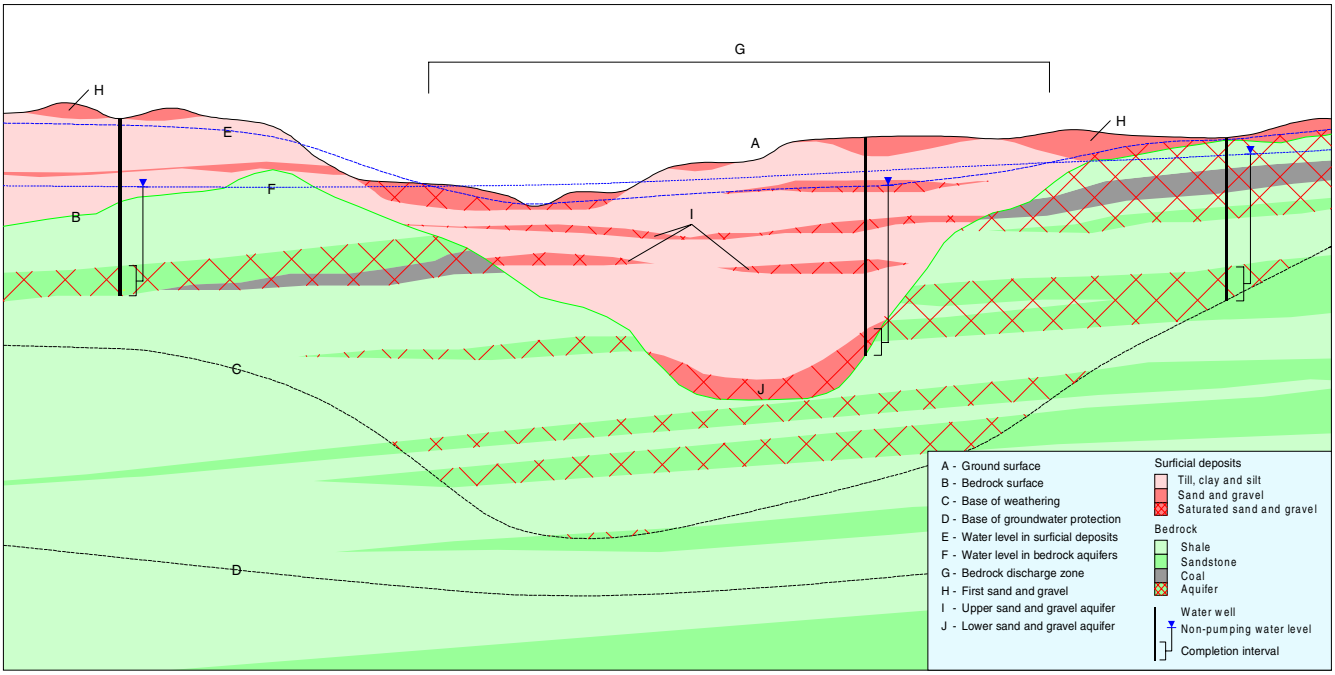

Figure 5. Generalized Cross-Section (for terminology only)

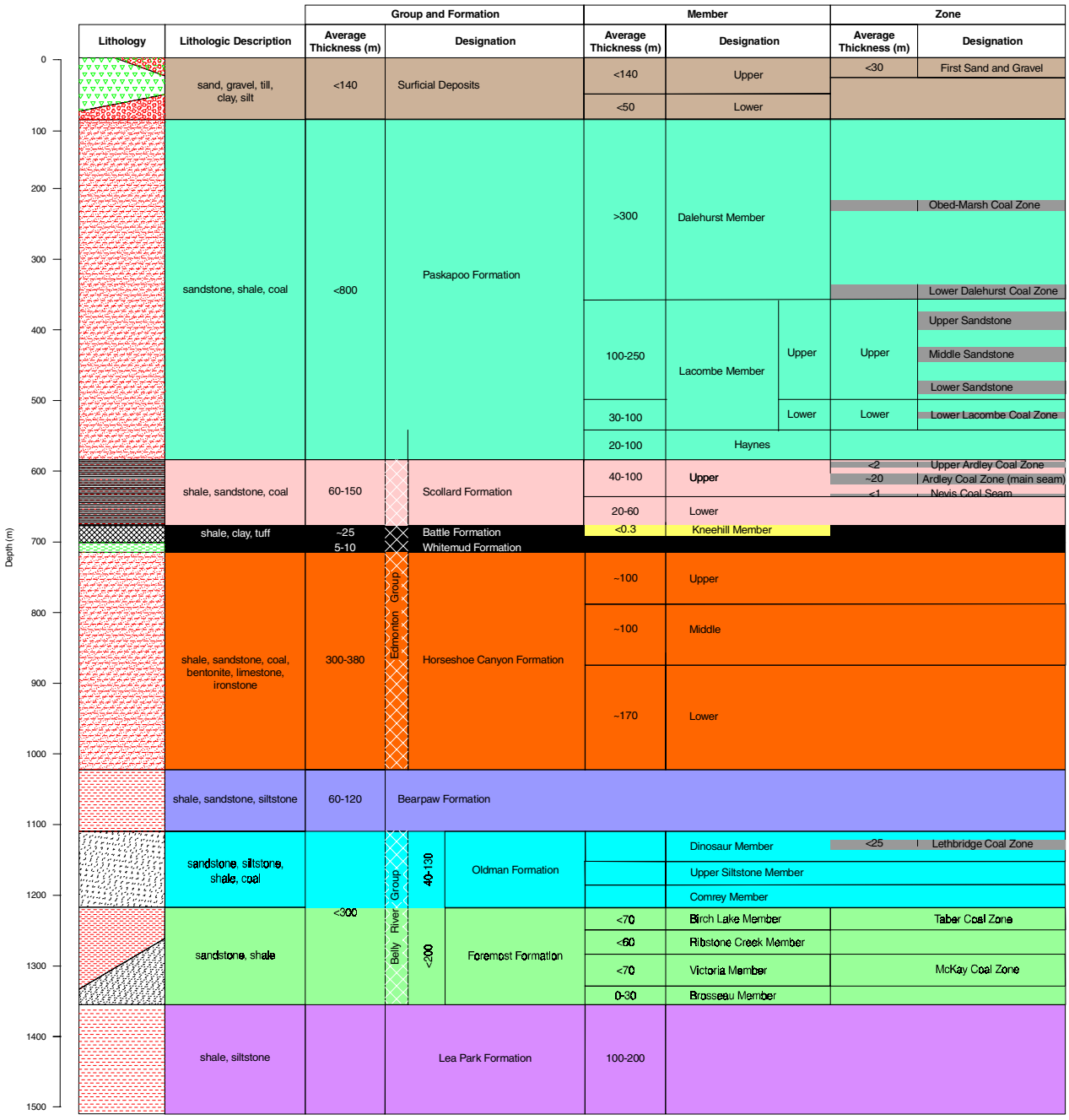

Figure 6. Geologic Column