

### 5.3.4 Paskapoo Aquifer

The Paskapoo Aquifer is any part of the Paskapoo Formation that is porous and permeable. The Paskapoo Aquifer is present under the extreme western one third of the County. Within the County, the thickness of the Paskapoo Formation is generally less than 100 metres; in the remaining two thirds of the County, the Paskapoo Formation has been eroded. In general terms, the permeability of the Paskapoo Aquifer is very low. Higher local permeability can be expected when the depth of burial is less than 100 metres and the weathering process has occurred.

#### 5.3.4.1 Depth to Top

The depth to the top of the Paskapoo Formation is mainly less than 20 metres below ground level.

#### 5.3.4.2 Apparent Yield

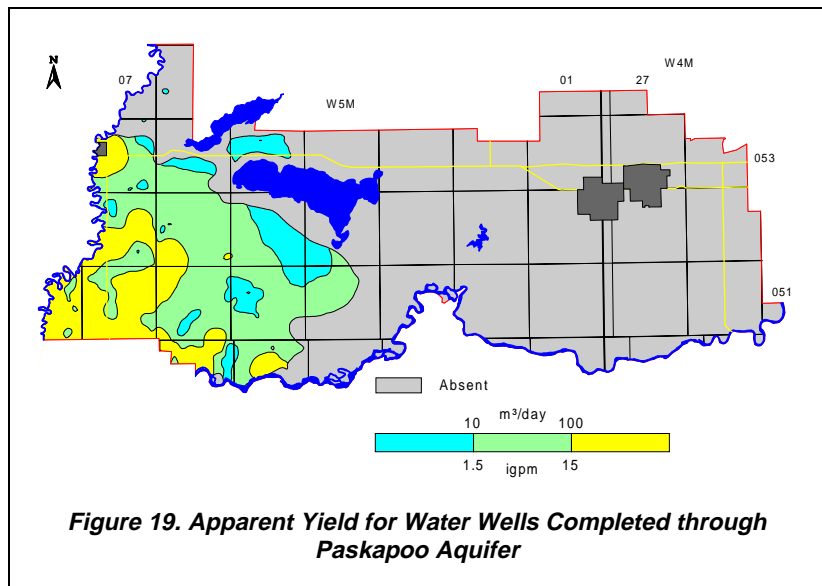
The projected long-term yield for individual water wells completed through the Paskapoo Aquifer is mainly 10 to 100 m<sup>3</sup>/day. The areas where water wells with higher yields are expected within the Paskapoo Aquifer are mainly in the southwestern part of the County.

An extended aquifer test conducted with a water test hole completed in the Paskapoo Aquifer for Pembina River Provincial Park (Hydrogeological Consultants Ltd., 1988) indicated a long-term yield of more than 70 m<sup>3</sup>/day.

#### 5.3.4.3 Quality

The TDS concentrations for groundwater from the Paskapoo Aquifer are mainly between 500 and 1,000 mg/L. There are two areas where the TDS are less than 500 mg/L and one small area where TDS are expected to be more than 1,000 mg/L. The sulfate concentrations are less than 250 mg/L in over 90% of the County where the Paskapoo subcrops.

The chloride concentration from the Paskapoo Aquifer can be expected to be mainly less than 10 mg/L.



**Figure 19. Apparent Yield for Water Wells Completed through Paskapoo Aquifer**

### 5.3.5 Upper Scollard Aquifer

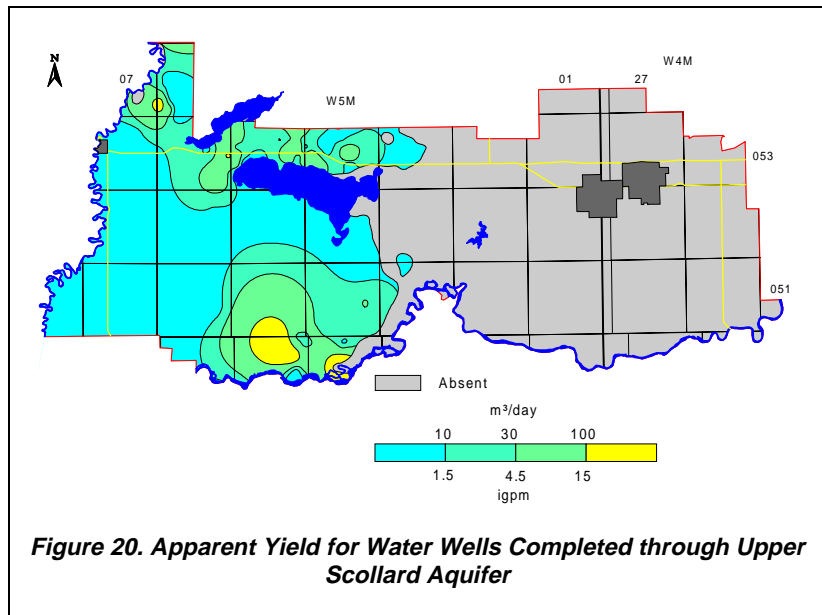
The Upper Scollard Aquifer is any part of the Upper Scollard Formation that is porous and permeable. The Upper Scollard subcrops in the western-central part of the County. The thickness of the Upper Scollard Formation is generally less than 60 metres. The Upper Scollard Formation has been eroded in more than two thirds of the County. In general terms, the permeability of the Upper Scollard Aquifer is very low. Higher local permeability can be expected when the depth of burial is less than 100 metres and the weathering process has occurred.

#### 5.3.5.1 Depth to Top

The depth to the top of the Upper Scollard Formation is mainly less than 20 metres below ground level where the Formation subcrops. The greatest depth is in areas where the Paskapoo Formation is present.

#### 5.3.5.2 Apparent Yield

Fifty percent of the projected long-term yields for individual water wells completed through the Upper Scollard Aquifer are between 10 and 100 m<sup>3</sup>/day. Water well yields are highest in township 050, range 05, W5M. One of the more extensive hydrogeological studies of the Upper Scollard Formation was by Alberta Environmental Protection (AEP, 1980). The AEP study was in connection with the mining of the Ardley Coal Seam at the Whitewood Mine north of Wabamun Lake.



**Figure 20. Apparent Yield for Water Wells Completed through Upper Scollard Aquifer**

#### 5.3.5.3 Quality

The TDS concentrations for groundwater from the Upper Scollard Aquifer are mainly less than 1,500 mg/L, with 50% of the values being less than 1,000 mg/L. The sulfate concentrations are generally less than 500 mg/L. The higher concentrations are expected in the northwestern part of the County.

The chloride concentration of the groundwater from the Upper Scollard Aquifer can be expected to be less than 100 mg/L, except in the southwestern part of the County.

### 5.3.6 Lower Scollard Aquifer

The Lower Scollard Aquifer is any part of the Lower Scollard Formation that is porous and permeable. The Scollard Formation subcrops along a narrow north-south trending band through the central part of the County. The thickness of the Lower Scollard Formation is generally less than 30 metres and is absent in the northeastern two thirds of the County. In general terms, the permeability of the Lower Scollard Aquifer is very low. Higher local permeability can be expected when the depth of burial is less than 100 metres and the weathering process has occurred.

#### 5.3.6.1 Depth to Top

The depth to the top of the Lower Scollard Aquifer is mainly less than 100 metres below ground level, increasing toward the southwestern edge of the County.

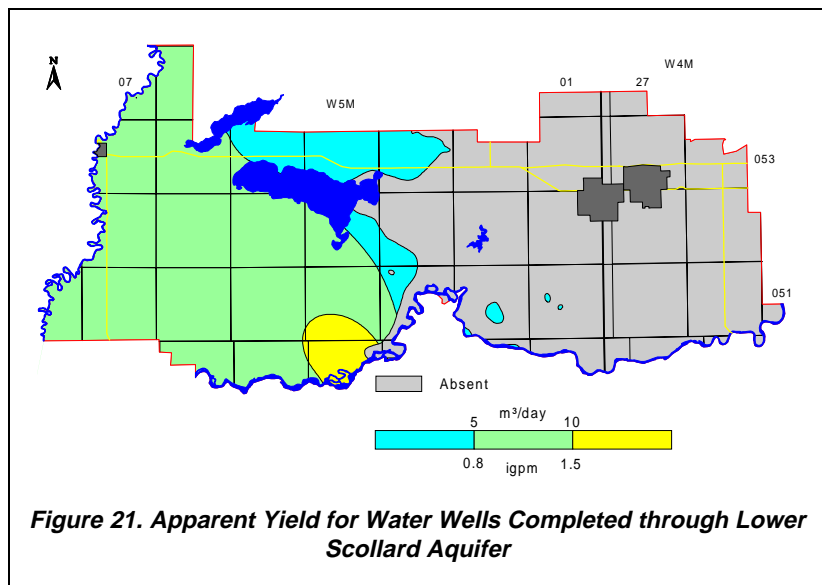
#### 5.3.6.2 Apparent Yield

The projected long-term yields for individual water wells completed through the Lower Scollard Aquifer are mainly 5 to 10 m<sup>3</sup>/day.

#### 5.3.6.3 Quality

The TDS concentrations for groundwater from the Lower Scollard Aquifer are mainly less than 1,500 mg/L. The sulfate concentrations are generally less than 500 mg/L.

The chloride concentration of the groundwater from the Lower Scollard Aquifer can be expected to be less than 10 mg/L except in the western part of the County.



**Figure 21. Apparent Yield for Water Wells Completed through Lower Scollard Aquifer**

### 5.3.7 Upper Horseshoe Canyon Aquifer

The Upper Horseshoe Canyon Aquifer is the porous and permeable parts of the Upper Horseshoe Canyon Formation. The Formation subcrops under the majority of the eastern half of the County. The thickness of the Upper Horseshoe Canyon Aquifer increases to the west and can reach more than 100 metres in the western part of the County. In general terms, the permeability of the Upper Horseshoe Canyon Aquifer is very low. Higher local permeability can be expected when the depth of burial is less than 100 metres and weathering processes have occurred.

#### 5.3.7.1 Depth to Top

The depth to the top of the Upper Horseshoe Canyon Formation is variable, ranging from less than 20 to more than 300 metres. The largest area where the top of the Upper Horseshoe Canyon Formation is more than 150 metres below ground level is in the western part of the County, where the Upper Horseshoe Canyon Formation underlies the Paskapoo Formation.

#### 5.3.7.2 Apparent Yield

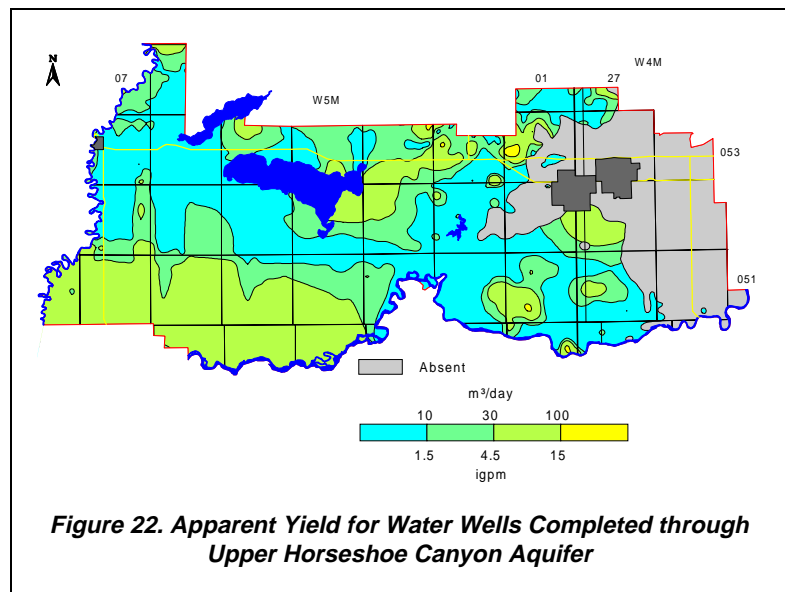
The projected long-term yields for water wells completed through the Upper Horseshoe Canyon Aquifer are mainly 10 to 100 m<sup>3</sup>/day. The lower yields presented west of range 03, W5M within the County could be a result of the gridding procedure used to process a very limited number of data points.

An extensive aquifer test conducted with a water test hole completed in the Upper Horseshoe Canyon Aquifer and drilled in NW 02-053-03 W5M on the northeast side of Wabamun Lake (Hydrogeological Consultants Ltd., 1976) indicated a long-term yield of 70 m<sup>3</sup>/day.

#### 5.3.7.3 Quality

The Piper tri-linear diagrams show that sodium-bicarbonate and calcium-magnesium-bicarbonate are the dominant types of groundwater that occur in the Upper Horseshoe Canyon Aquifer. The TDS concentrations in groundwater from the Upper Horseshoe Canyon Aquifer range mainly from 500 to 1,000 mg/L. The sulfate concentrations in groundwater from the Aquifer are mainly less than 250 mg/L.

Chloride concentrations in the groundwater from the Upper Horseshoe Canyon Aquifer are mainly less than 100 mg/L. The exception occurs in a small area along the southern extent of the County. In this area, chloride concentrations range from 100 to 250 mg/L.



### 5.3.8 Middle Horseshoe Canyon Aquifer

The Middle Horseshoe Canyon Aquifer is the porous and permeable parts of the Middle Horseshoe Canyon Formation which subcrops under a small area in the eastern part of the County. The thickness of the Middle Horseshoe Canyon Aquifer increases to the southwest and can reach more than 60 metres in the western part of the County. In general terms, the permeability of the Middle Horseshoe Canyon Aquifer is very low. Higher local permeability can be expected when the depth of burial is less than 100 metres and weathering processes have occurred.

#### 5.3.8.1 Depth to Top

The depth to the top of the Middle Horseshoe Canyon Formation is variable, ranging from less than 50 to more than 400 metres. The largest area where the top of the Middle Horseshoe Canyon Formation is more than 200 metres below ground level is west of Wabamun Lake, where the Middle Horseshoe Canyon underlies the Upper Horseshoe Canyon Formation.

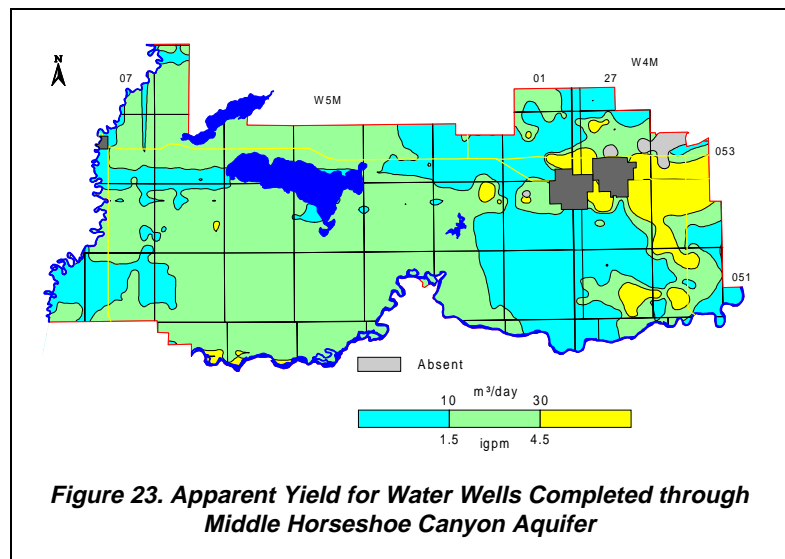
#### 5.3.8.2 Apparent Yield

The projected long-term yields for water wells completed through the Middle Horseshoe Canyon Aquifer range from 10 to more than 30 m<sup>3</sup>/day where the Formation is the upper bedrock. However, there are little or no data for the western half of the County due to the large depth to the top of the Formation.

#### 5.3.8.3 Quality

The Piper tri-linear diagrams show that groundwaters in the Middle Horseshoe Canyon Aquifer are mainly a sodium-bicarbonate-type. The TDS concentrations in groundwater from the Middle Horseshoe Canyon Aquifer are mainly less than 1,000 mg/L. The higher TDS values are in the northeastern part of the County where the Middle Horseshoe Canyon is present as the upper bedrock. When TDS values exceed 1,200 mg/L, the sulfate concentrations exceed 400 mg/L.

Chloride concentrations in the groundwater from the Middle Horseshoe Canyon Aquifer are mainly less than 10 mg/L.



**Figure 23. Apparent Yield for Water Wells Completed through Middle Horseshoe Canyon Aquifer**

### 5.3.9 Lower Horseshoe Canyon Aquifer

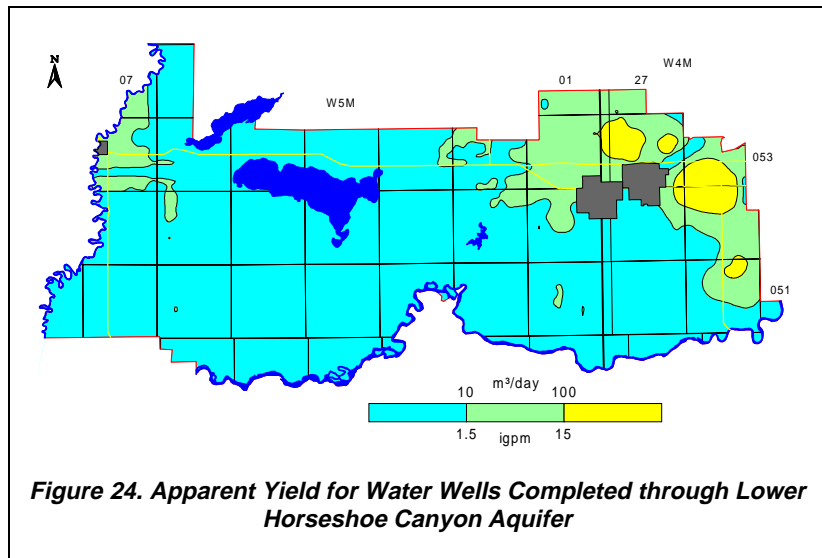
The Lower Horseshoe Canyon Aquifer is the porous and permeable parts of the Lower Horseshoe Canyon Formation which subcrops in the extreme northeastern part of the County. The thickness of the Lower Horseshoe Canyon Aquifer is generally 170 metres.

#### 5.3.9.1 Depth to Top

The depth to the top of the Lower Horseshoe Canyon Formation ranges from less than 50 metres in the northeastern part of the County where the Formation subcrops, to more than 500 metres in the southwestern part of the County where the Paskapoo Formation is present.

#### 5.3.9.2 Apparent Yield

The projected long-term yields for individual water wells completed in the Lower Horseshoe Canyon Aquifer are mainly less than 10 m<sup>3</sup>/day. The adjacent map indicates that apparent yields of 10 to more than 100 m<sup>3</sup>/day are expected mainly in the northeastern part of the County; however, there are little or no data for the Aquifer for the majority of the County due to the large depth to the top of the Formation.



**Figure 24. Apparent Yield for Water Wells Completed through Lower Horseshoe Canyon Aquifer**

#### 5.3.9.3 Quality

Groundwaters from the Lower Horseshoe Canyon Aquifer are mainly sodium-bicarbonate or sodium-sulfate-type waters. TDS concentrations are expected to be in the order of 500 to 1,000 mg/L where the Aquifer is present, although there is a paucity of data for the majority of the County. When TDS values exceed 1,200 mg/L, the sulfate concentrations exceed 400 mg/L.

Chloride concentrations in the groundwater from the Lower Horseshoe Canyon Aquifer are mainly less than 100 mg/L. However, the chloride ion concentration can be expected to increase to the southwest as the depth of burial increases.