Groundwater Management in the Milk River Watershed

Discussion Paper for the Milk River Integrated Watershed Management Plan

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November 18, 2012

Note to Reader:

This is a working document. You will note that there are areas highlighted in red, some areas where question marks remain etc. or thoughts are not well developed. Your comments and feedback will be considered in the final version of this document.

- Most of the recommendations for the Whisky Valley Aquifer were taken from Golder (2004). Some of the information may be dated – discussion is needed to determine the status of some of these recommendations.
- Recommendations for the Milk River Aquifer are pending – the findings of the Milk River Transboundary Aquifer Project (MiRTAP) will help to inform recommendations. Many of the recommendations made for the Whisky Valley Aquifer may also apply to the Milk River Aquifer.
- Please add in your comments!

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1.0 INTRODUCTION

Groundwater is an important resource in the Milk River watershed, supplying water to numerous rural residents, farms, ranches and communities. The two main aquifers that supply groundwater are the Whisky Valley Aquifer and the much larger Milk River Aquifer (Figure 1). One hundred and twenty-five wells have been identified in the Whisky Valley Aquifer, 27 of which were reported for household use and the remainder for livestock water. In addition, the aquifer serves as a water source for three water co-ops, the Milk River East Water Co-op, the Milk River West Water Co-op and the Warner West Water Co-op[1]. This Whisky Valley Aquifer overlies the Milk River Sandstone Aquifer. The Milk River Sandstone Aquifer is an extensive groundwater formation and is the primary source of water for over 800 farms and ranches. The aquifer extends beyond the Milk River watershed boundaries and water use can impact quantity throughout the region (Figure 2). The total groundwater volume allocated to licensed users within the watershed equals about 931,840 m^3 (SOW 2008). Groundwater users are generally concerned with groundwater depletion and maintaining groundwater quality.

In 2004, Golder Associates was commissioned to undertake a study to begin the development of a groundwater management/protection plan for the smaller Whisky Valley Aquifer. This included identifying the reasonable and potential risks to the aquifer as well as the measures required and future work needed to protect the aquifer. A number of recommendations were made within this report that warrant further consideration here.

1.1 Objectives

Within the Milk River Integrated Watershed Management Plan planning area, groundwater is associated with water supply and management objectives and the conservation and protection of vulnerable aquifers objective described below.

Objective 3. Recommend water conservation strategies that promote the efficient use of water for all sectors (i.e., municipal, industrial, irrigation).

Objective 6. Recommend groundwater protection and conservation measures for vulnerable areas, including the Whisky Valley and Milk River aquifers.

Outcome/Policy Statements

Specific: Groundwater is recognized as a valuable resource in the Milk River watershed and management is in place to provide for its protection and conservation.

General: Groundwater is mapped, interactions are understood and the resource is properly managed.

[1] The Alberta Federation of Rural Water Co-operatives Ltd. (AFRWC) was formed in 1994 in Southern Alberta. Farmers, ranchers, and rural dwellers created distribution systems to get water to their homes and livestock. Some of this water was potable water, some used for livestock and irrigation. The water co-ops were formed to pool resources, to share ownership and costs, and to share the benefits of a self-owned system (http://abwaterco-op.com/).

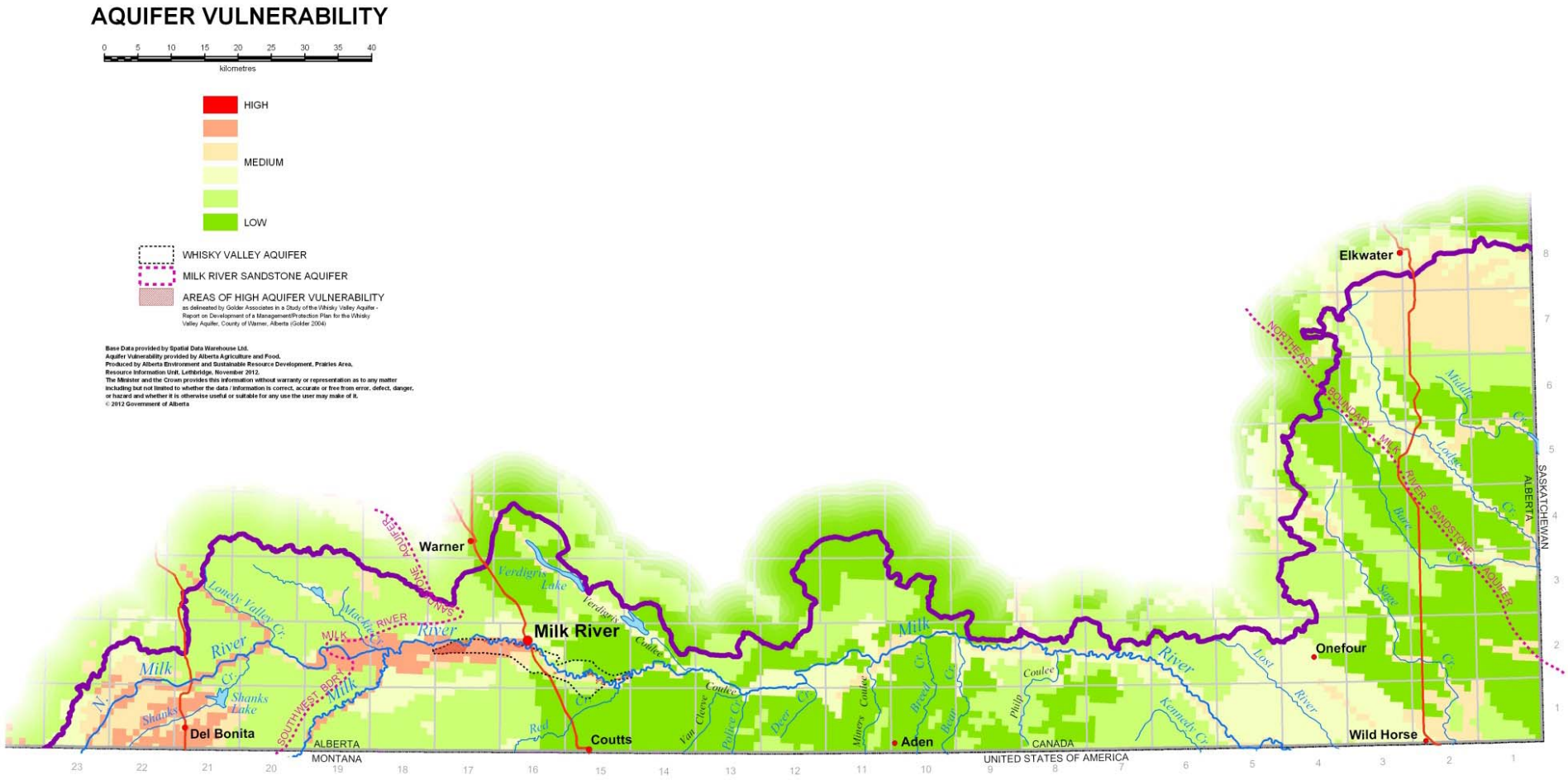


Figure 1. Milk River watershed aquifer vulnerability map showing the Milk River and Whisky Valley Aquifers. (Refer to Appendix B for a second aquifer vulnerability mapped prepared by Golder Associates (2004).

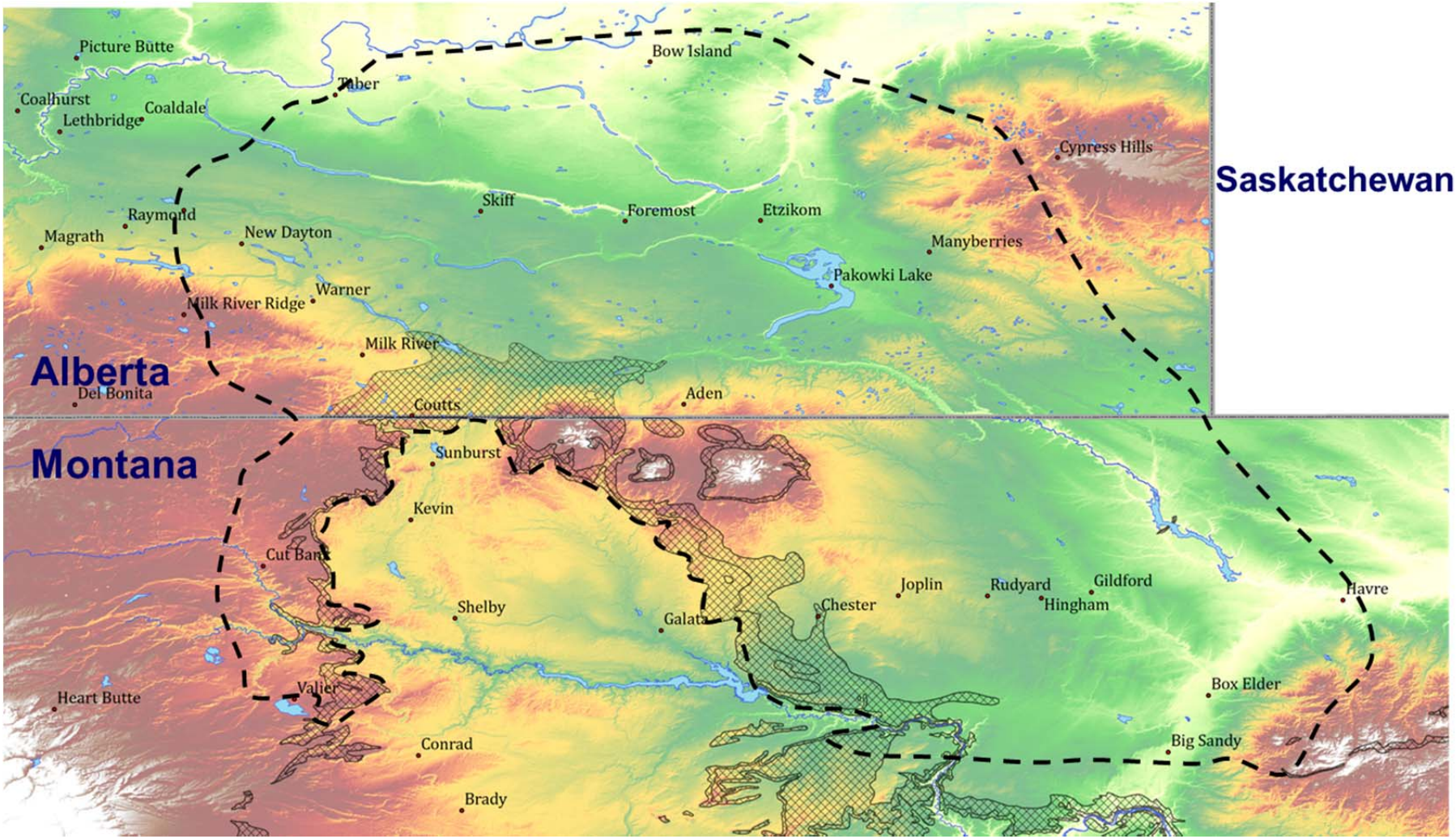


Figure 2. Map showing Alberta and Montana and the extent of the Milk River Aquifer (Petre, 2012). The hatched area corresponds to areas where the Milk River Formation outcrops.

General: Groundwater is available and able to provide for human and livestock use, as well as upland functions where appropriate.

General: A healthy, vibrant economy that will attract people and investment to the watershed.

2.0 BACKGROUND

2.1 Whisky Valley Aquifer

The Whisky Valley Aquifer is a regional sand and gravel aquifer that extends approximately 30 km along the river in the vicinity of the Town of Milk River and has an aerial extent of XX hectares. The Whisky Valley aquifer is a "surficial deposit" that is generally less than 50 m below ground (Stantec Consulting Ltd. 2002; Hydrogeological Consultants Ltd. 2004).

The Whisky Valley Aquifer is fairly secure from water quality impacts as it is generally confined and protected by overlying moderate to low permeability deposits. In addition, land use in the area typically does not pose a significant risk to water quality. However, there are exceptions:

- There are several areas where the Aquifer is either close to surface or overlain by more permeable deposits and is thus more vulnerable (Figure 1).
- There are a few locations where land uses include the presence of hazardous materials with significant potential to impact groundwater quality if they were released to the ground.

2.2 Milk River Aquifer

The following is an excerpt from Golder Associates (2004):

"Along with the Whisky Valley Aquifer, the Milk River sandstone aquifer is a valuable water resource in the [Milk River watershed]. The main recharge area for the Milk River sandstone aquifer was initially considered to be the Sweetgrass Hills immediately south of the Canada/United States border, with minor contribution from the outcrop along the Milk River (Meyboom, 1960). According to Agra Earth and Environmental (1998), Toth and Corbet (1986) noted a similarity between piezometric levels in the Milk River sandstone aquifer and topography, and considered that recharge occurred not only in the Sweetgrass Hills outcrop area along the Milk River, but also in other topographically high areas, including Milk River Ridge, the Cypress Hills and the Lucky Strike upland (located between the Milk River outcrop and Etzikom Coulee). Toth and Corber (1986) further indicated that discharge conditions from the Milk River sandstone aquifer were concentrated along buried valleys (Skiff, Medicine Hat and Lethbridge)."

More recently, the connection between the Milk River Aquifer and the Milk River were also noted by MacCulloch and Wagner-Watchel (2010). Analysis of streamflow measurements showed a distinct west to east declining trend in flow magnitude in August 2007 and a distinct west to east increasing trend in stremflow during the October 2007 survey (MaCulloch and Wagner-Watchel 2010).

2.3 Milk River-Whisky Valley Aquifer Connection

With regard to surface water – groundwater connections, the Whisky Valley Aquifer Model investigated two scenarios and determined that an increased rate of induced recharge from the Milk River occurred

when 1) a 50% increase in pumpage from existing communal production wells or 2) a new production well was established in another area pumping 1550 m^3/day. Although the water balance assessment indicated that the Milk River was not presently a significant contributor to the existing groundwater supplies, the increased pumping rate substantially increased the contribution (Golder Associates 2004).

The following is an excerpt from Golder Associates (2004):

"In the majority of the County of Warner, water levels in the Milk River sandstone aquifer are lower than those in the glacial deposits , which indicate a potential for recharge conditions (Stantec, 2002). This would suggest that leakage through overlying shale units may be a significant recharge mechanism to the aquifer, as initially proposed by Toth and Corbet (1986). The potential for discharge conditions appears to exist in local areas, one south of the Town of Milk River which roughly coincides with the Whisky Valley, and another southwest of Writing-on-Stone Provincial Park (Stantec, 2002). In the area of the Whisky Valley, there is also some indication of discharge conditions in the Pakowki Formation and also in the Foremost Formation, which would suggest that discharge from the Milk River sandstone aquifer could potentially be recharging the basal Whisky Valley Aquifer. Based on Toth and Corbet's (1986) observations, leakage through the overlying shale beds may be an important recharge mechanism for the Milk River Sandstone Aquifer. Meyboom (1960) indicated that the Milk River sandstone aquifer has low hydraulic conductivity and, hence, very low groundwater velocities, which he indicated to be in the order of 0.15 to 1.5 m/yr. Considering an average transmissivity of 1.5 m^2/day, a thickness of 45 m, an average hydraulic gradient of 0.016 m/m and a porosity of 0.1, the inferred groundwater velocity would be in the order of 2 m/yr (Stantec, 2002)."

3.0 TARGETS AND THRESHOLDS

3.1 Groundwater Quality

3.1.1 Target

Groundwater quality targets should be set at a level 10% higher than the seasonally high concentration for key parameters, or at the drinking water standard concentration, if it represents less than a 10% increase.

Example: If the highest concentration of total dissolved solids is measure at 500 mg/L then the target concentration should be set at $\leq$550 mg/L; seasonal variation of groundwater quality occurs, so separate targets may be necessary to reflect spring vs. fall conditions. If the measured TDS concentration (or the measured TDS concentration + 10%) is higher than the recommended drinking water standard concentration, then the drinking water standard should apply.

Key parameters include: electrical conductivity nitrate plus nitrite, total dissolved solids, chloride, phenolics, hardness, total organic carbon and BTEX (benzene, toluene, ethylbenzene, xylenes).

3.2 Groundwater Quantity

3.2.1 Target

Existing groundwater and surface water demands are met with no observed decreasing trend in groundwater levels.

Effect on groundwater levels/volumes should be determined if applications are made that will place greater demand on the resource.

Should the IWMP suggest a cap (limit) on water withdrawals from the 2 aquifers, and how many new water wells might be accommodated in the future for: domestic and livestock uses; commercial/industrial uses (and the conditions and requirements for establishing any new wells?)

4.0 RECOMMENDATIONS

3.1 Groundwater Supply

a) The inter-connection between the Milk River, the Milk River Sandstone Aquifer and the Whisky Valley Aquifer must be recognized by federal, provincial and municipal decision-makers. Note that water from the Milk River percolates into the Whisky Valley Aquifer, particularly when withdrawals from the aquifer are significant (Golder Associates 2004).

a) There are some areas on the Whisky Valley Aquifer where the Aquifer may be thicker (Figure 3) and have good potential for additional supply. The potential effects of establishing production wells at a particular location should be assessed using the Whisky Valley Aquifer Model, keeping in mind the potential for affecting flow in the Milk River (Golder Associates 2004). Does this then mean that new producing water wells will not be allowed if they have the effect of reducing river flows?

b) To assess the potential for expanded use of the Aquifer, these areas should be test drilled to confirm that the quality and volume available are suitable for use and do not impact on existing users (Golder Associates 2004).

3.2 Groundwater Quality

a) Limit new development within “medium-high” and “high” risk areas as defined on the Aquifer Vulnerability Map (Figure 1) if it is not known how new development would impact the Aquifer (i.e., the precautionary principle will be observed). (Also refer to appropriate land uses in Section 3.3).

b) Appropriate best management practices should be applied when storing or handling hazardous materials that could impact surface waters and inadvertently reach groundwater and vice versa.

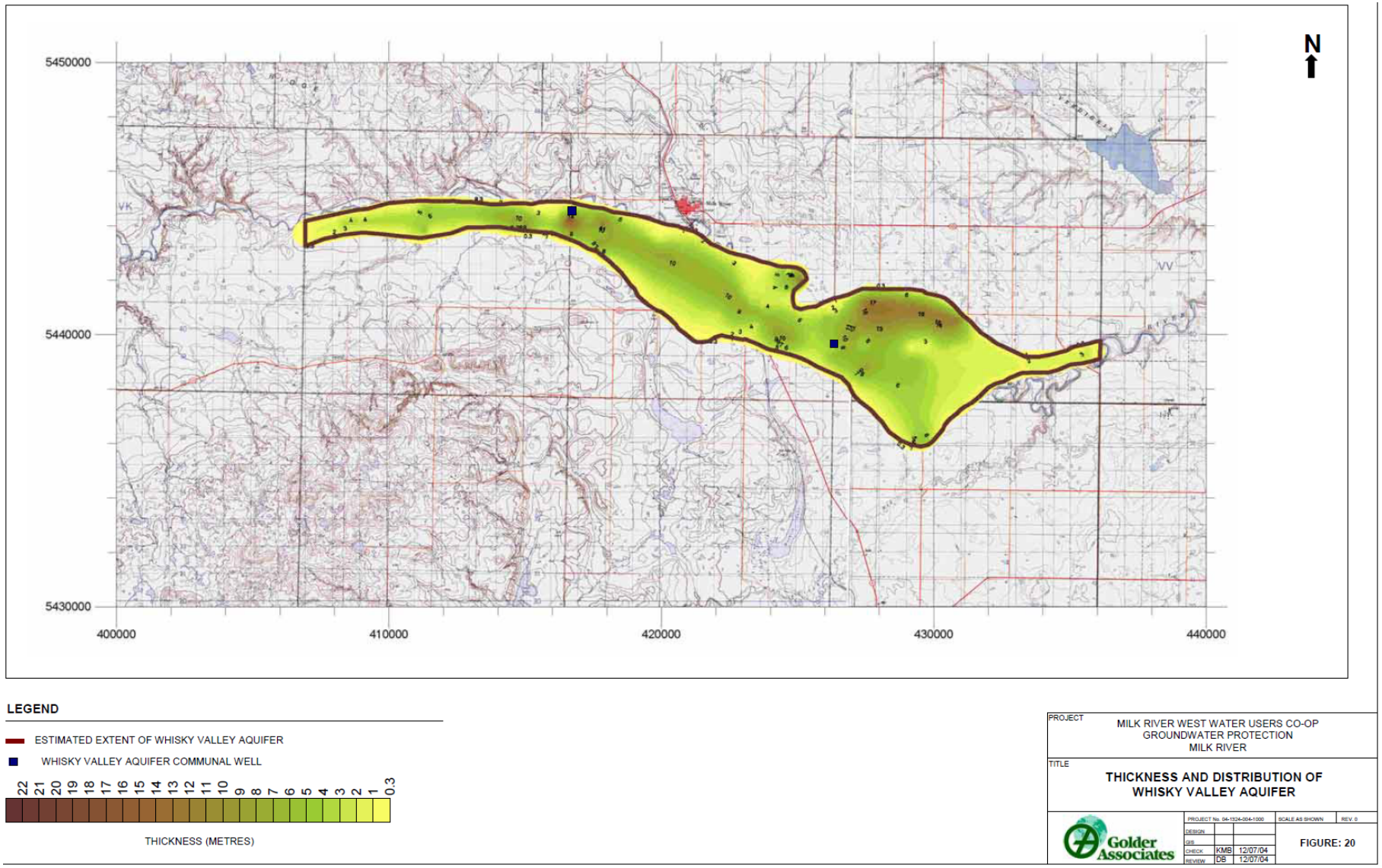


Figure 3. Thickness and distribution of the Whisky Valley Aquifer (Golder Associates 2004).

3.3 Land Use

a) The location of the highly vulnerable areas and co-op well capture zones shown on Figure 4, should be reviewed when considering changes in land use in areas overlying or adjacent to the Whisky Valley Aquifer. Land uses that should be excluded from these areas include
   a. Those that require the storage or handling of hazardous substances that could be released to the ground, or

   Those uses that include high water consumption (Golder Associates 2004).

   Is "exclusion" the right approach? If proven safeguards are adopted, and if the risk can be controlled through BMPs, would the activity or land use be permitted? Table 1 provides examples of the kind of land uses/activities that might be excluded from the aquifer area.

b) Each of the communal well capture zones (Figure 4) should be identified in the County of Warner No.5 Land Use Bylaw as an environmentally sensitive area (Golder Associates 2004).

c) Municipalities should enforce "Discretionary and Prohibited Land Uses" within the immediate Whisky Valley Aquifer boundary and recharge area (Table 1).

Table 1. List of discretionary and prohibited land uses[2] on the Whisky Valley Aquifer as outlined in the County of Warner No. 5 Land Use Bylaw No. 831-03 (Golder Associates 2004).

Discretionary Land Uses	
• Agricultural services	• Kennels
• Airports and airstrips	• Private recreation
• Anhydrous ammonia storage	• Public/institutional
• Autobody repair and paint shop	• Public recreation
• Automotive dealership	• Resource extraction and associated works
• Automotive repair and service shop	• Second or more residences (re: sections 45-47)
• Campgrounds	• Signs of greater than 0.9 square metres
• Cut-off country residential	• Stockpiles
• Farm machinery and industrial vehicle sales and service	• Public or private utilities
• Garden suites	• Wind energy conversion systems
• Grain elevators	
• Highway commercial	**Prohibited Uses:**
• Home occupations	• Grouped country residential
• Intensive horticulture	• Grouped industrial developments
• Isolated single lot commercial	• Hazardous/noxious uses
• Isolated single lot country residential (for subdivision)	• Stripping and sale of topsoil
• Isolated single lot industry	• Confined Feeding Operations

[2] The control of land use in the County of Warner No. 5 is guided by its Subdivision and Development Authority (SDA), which is a committee of County Council.

d) Potential new contaminant sources in the Aquifer and recharge areas should be identified on an on-going basis primarily through the review of development applications by appropriate authorities (Golder Associates 2004).[3]

e) Changes in land use that may pose a risk to the Aquifer, but do not require a development application, should be identified by the Municipal Special Constables who act as a local bylaw enforcement officer. Issues of concern should be brought to the attention of the Subdivision and Development Authority or the landowner in order to come to an equitable arrangement to mitigate the potential for impacts (Golder Associates 2004).

f) Appropriate Municipal Development Plan policies should be adapted to enhance the protection of the quality and quantity of groundwater in the Whisky Valley Aquifer. Some of the policies for the County of Warner are found in Appendix B (Golder Associates 2004).

g) Land use restrictions shown in Figure 3 should be applied to the entire Whisky Valley Aquifer area which also partly coincides with the Milk River floodplain to protect these environmentally sensitive areas (Golder Associates 2004). Is there value in discriminating between an aquifer's total geographical extent and recharge areas associated with an aquifer. Should not more stringent guidelines be applied to known recharge areas (as opposed to the aquifer as a whole)?

[3] An appropriate authority may include the County of Warner No. 5 Subdivision and Development Authority (SDA) which is a committee of County Council.

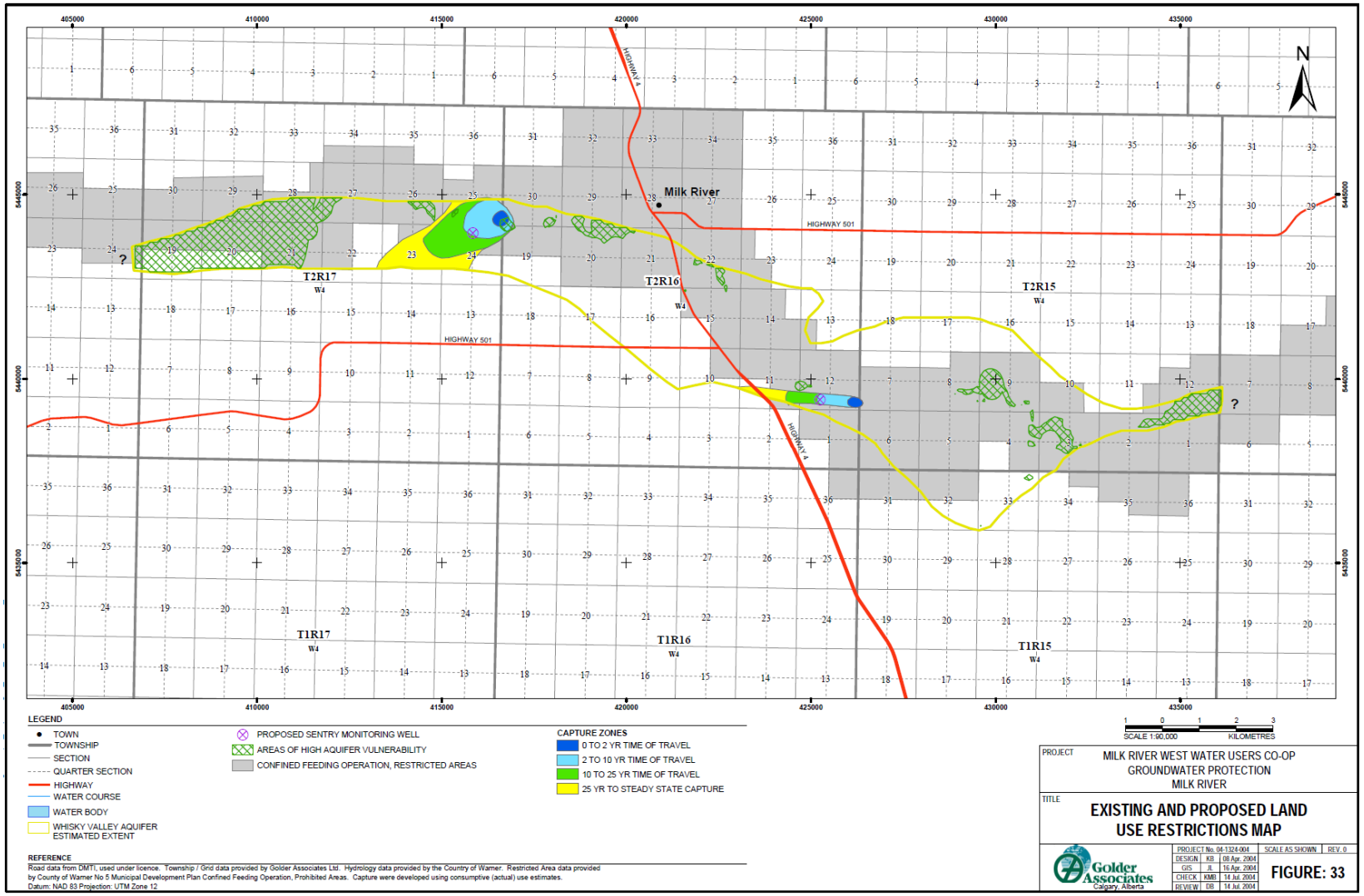


Figure 4. Existing and proposed land use restrictions map.

3.4 Public Education and Awareness

a) An education program should be developed to inform residents of the importance of groundwater to the community and the need for aquifer protection measures, particularly those members of the community who live or work in the area overlying or near the Whisky Valley Aquifer or its recharge area (Golder Associates 2004).

b) The education program should emphasize water management strategies such as:
   - the common sense storage, handling and use of hazardous materials such as pesticides, fertilizers and fuels;
   - on proper water well location, maintenance, and abandonment,
   - the importance of adopting water conservation measures (Golder Associates 2004), and
   - metering water usage from the aquifers.

c) Inform all water consumers of the importance of conserving the communal water supply and encourage the use of beneficial management practices (e.g., the use of low flow facilities, maintaining all taps and stock watering outlets to reduce leaks and overflows) (Golder Associates 2004)[4].

d) Communication methods to be used include:
   - News media features and advertisements;
   - preparation of pamphlets and posters;
   - a grade-school program;
   - the placement of signs at strategic locations identifying the Aquifer and recharge areas;
   - the presentation of talks and workshops to local agricultural and community groups (Golder Associates 2004).

e) Municipal public works and Provincial Transportation department staff should be informed of the risks to groundwater supplies in the Aquifer and recharge areas from the application of road deicing chemicals and other contaminants such as herbicides. They should be made aware of the extent of the aquifer boundary and recharge area and the importance of proper storage, handling and use of chemicals as well as petroleum products, pesticides and other hazardous materials (Golder Associates 2004).

f) In the agricultural community, it is recommended that a cooperative program be developed with those who farm in the Aquifer and recharge areas to encourage use of Environmental Farm Plans and the proper storage, handling and application of fertilizers, farm chemicals, fuels and other hazardous substances that would pose a risk to the aquifer if spilled or leaked to the subsurface or to the Milk River (Golder Associates 2004).

3.5 Monitoring

[4] Each of the three water co-ops limit each of their customers to a water withdrawal of approximately 2 gpm by equipping each inlet with a flow control valve. This represents a potential withdrawal of 2880 gpd for domestic use, stock watering and general farm use. While this is a good conservation practice, some consumers may allow their inlets to flow freely and there may still be some wastage of water. Are flow control valves tamper proof?

a) In addition to on-going monitoring of water quality for the four existing Water Co-op wells, it is recommended that up-gradient "sentry" monitoring wells be established in the Whisky Valley Aquifer and routinely monitored for indicator parameters. This would allow an early warning of the contamination or gradual degradation of the water before it reached any of the four critical water supply wells. The recommended location of the sentry monitoring wells is shown approximately on Figure 4. The recommended parameters for routine, quarterly monitoring include: electrical conductivity nitrate plus nitrite, total dissolved solids, chloride, phenolics, hardness, total organic carbon and BTEX (benzene, toluene, ethylbenzene, xylenes) (Golder Associates 2004)

b) Groundwater quantity in the Whisky Valley Aquifer should also be monitored by continuing to measure flow from the communal wells and water level in nearby monitoring wells. On the same quarterly basis, the two new sentry monitoring wells should also be monitored for water level and be properly purged prior to water quality sampling (Golder Associates 2004).

c) The results of the on-going water quality and quantity monitoring programs should be compiled into an electronic database and reviewed on a regular basis. The review should include a comparison with established plan targets (refer to Section 3.0) (Golder Associates 2004).

d) If the aquifer water level drops below a specified level, or if a water quality parameter exceeds its target, specific actions such as re-sampling or notifying the Water Co-Op or AESRD should be triggered. If possible, all routine monitoring results should be posted on a Co-op or municipal internet site to allow access by all the water users (Golder Associates 2004).

e) The logs of any new wells drilled in the area, including private wells and those drilled as part of the research and monitoring programs, should be added to the Whisky Valley Aquifer model, along with any water levels etc., to increase its accuracy and value for future use in managing the Whisky Valley Aquifer (Golder Associates 2004). Who manages the Whisky Valley Aquifer model and who updates it?

f) Potential new contaminant sources in the Aquifer and recharge areas should be identified on an on-going basis primarily through the review of development applications by Municipalities.

3.6 Emergency Preparedness and Contingency Plan

a) Emergency Preparedness and Contingency Plans (EPCPs) should be developed for each of the co-op water supplies to minimize the impact of disruption[5], primarily related to the chemical contamination of groundwater, on water users.

The objectives of the EPCP include:

- Documentation of existing well capacities;
- A monitoring program for early detection of aquifer contamination

[5] Periodic emergencies or disruptions of supply may occur due to natural disasters, chemical contamination, or physical disruption. Disruptions may vary in time (a few hours) or an undetermined length of time in the case of contamination. Contamination may interfere with the use of the water supply or its pumping, treatment or supply to consumers.

- Anticipation of potential conditions which could result in loss of water supply;
- A protocol for notification of appropriate officials and the water consumers;
- Prevention and emergency procedures for response to groundwater contamination in a
- communal well capture zone or highly vulnerable aquifer area;
- identification of available environmental cleanup or water treatment contractors; and
- Identification of replacement groundwater supplies or potential alternate water sources for use in the event of well or aquifer contamination (Golder Associates 2004).

b) The Emergency Preparedness and Contingency Plans should use the Aquifer Vulnerability Map (Figure 1) to establish protection and management strategies to help prevent the contamination of co-op water supplies (Golder Associates 2004).

c) Due to the proximity and increased risk of groundwater contamination associated with three facilities (e.g., the petroleum bulk storage facility on Highway 4 south of Milk River, the ammonium nitrate fertilizer storage facility next to the above tank farm, and the crude oil pipeline that extends across the Whisky Valley Aquifer), the County of Warner #5 and/or AESRD should further investigate the vulnerability of the Aquifer at these locations and discuss with the owners/operators whether appropriate preventive measures are in place to protect the Aquifer should a leak or spill occur (link to commercial and industrial recommendations) (Golder Associates 2004).

3.7 Research

a) The potential interconnection of the Whisky Valley Aquifer with the Milk River is an important factor in the security and further development of the Whisky Valley Aquifer. Further investigation should be carried out to understand this relationship. The drilling of perhaps a half dozen test holes, and installation and sampling of monitoring wells, close to the river and along the length of the aquifer would improve understanding (Golder Associates 2004).

b) The baseflow contribution from groundwater to the Milk River should be better evaluated with streamflow measurements (Golder Associates 2004).

c) Further investigation of the extent of the capture zones for the four co-op wells should be made, beginning with the installation of the sentinel wells recommended in Section 3.6 a) (Golder Associates 2004).

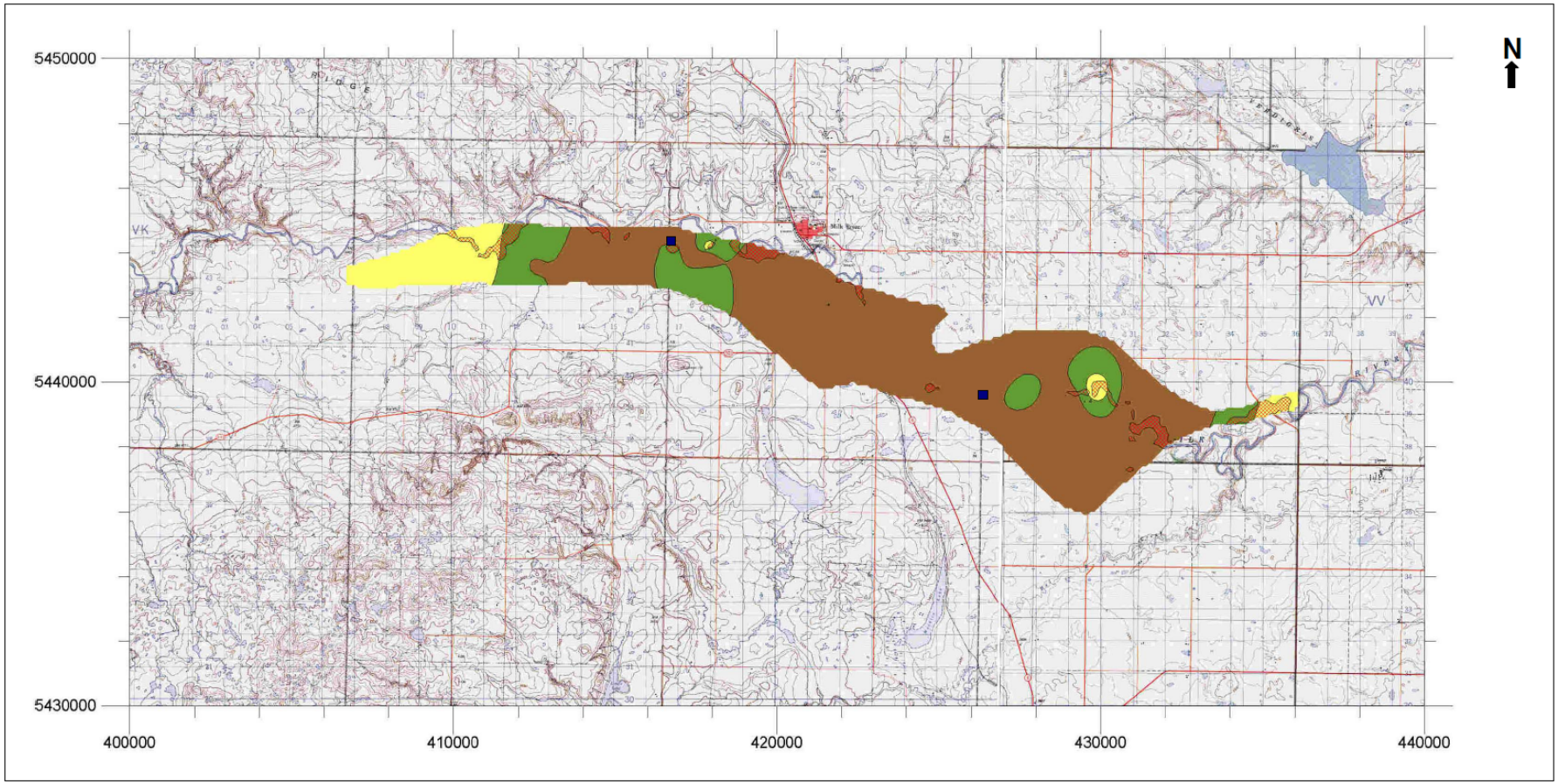
4.0 LITERATURE CITED (INCOMPLETE)

Golder Associates. 2004. Report on Development of a Management/Protection Plan for the Whisky Valley Aquifer, County of Warner, Alberta. Milk River West Water User's Co-op, Milk River, AB. 72 pp. + Appendices.

MacCulloch, G. and J. Wagner-Watchel. 2010. Milk River Main Channel: Channel Losses and Gains Assessment, Field Study 2007. Milk River Technical Working Group. 27 pp. + Appendices.

Petre, Marie-Amelie. 2012. Milk River Transboundary Aquifer Project. Quebec.

APPENDIX A. WHISKY VALLEY AQUIFER VULNERABILITY MAP (Golder Associates 2004).



LEGEND

- WHISKY VALLEY AQUIFER COMMUNAL WELL
- LOW VULNERABILITY (AVI SCORE: 221 TO 1031)
- MEDIUM VULNERABILITY (AVI SCORE: 141 TO 220)
- HIGH VULNERABILITY (AVI SCORE: 41 TO 140)
- HIGH VULNERABILITY DUE TO OVERLYING SEDIMENT <5 METRES

PROJECT: MILK RIVER WEST WATER USERS CO-OP
GROUNDWATER PROTECTION
MILK RIVER

TITLE: WHISKY VALLEY AQUIFER
VULNERABILITY MAP

Golder Associates

PROJECT No. 04-1324-004-1000			SCALE AS SHOWN	REV. 1
DESIGN				
GIS				
CHECK	KMB	12/07/04		
REVIEW	DB	12/07/04		

FIGURE: 30

APPENDIX B. MUNICIPAL DEVELOPMENT PLAN POLICIES IDENTIFIED BY GOLDER (2004) THAT CAN ASSIST TO PROTECT THE QUALITY AND QUANTITY OF GROUNDWATER IN THE WHISKY VALLEY AQUIFER. (Note that this may be dated information and a more recent review should take place.)

Under the Municipal Development Plan Policies, the following selected policies are considered relevant and/or can be adapted for the protection of the quality and quantity of groundwater in the Whisky Valley Aquifer:

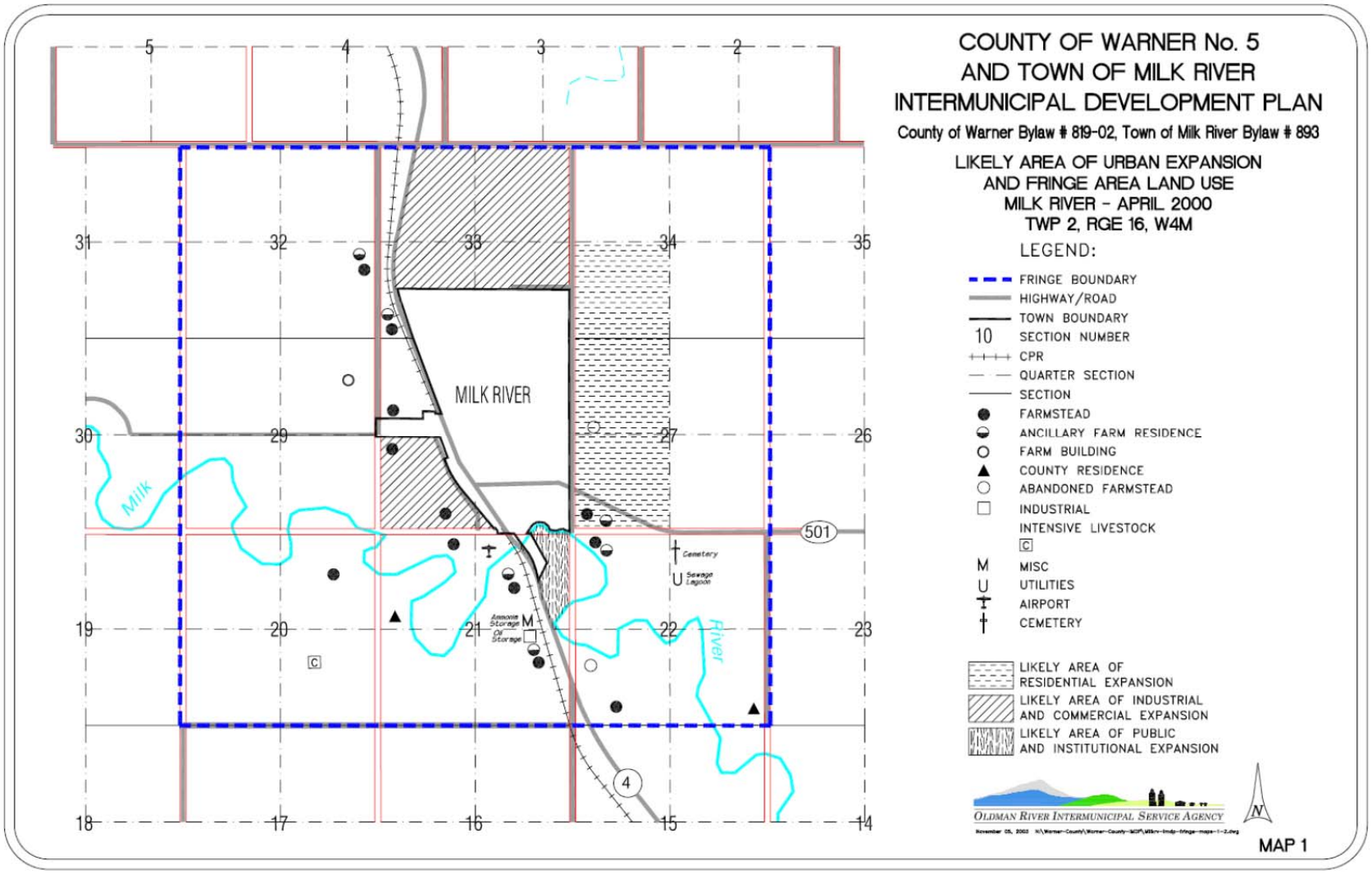
1. Section 4.1.2 requires 'area structure plans and development schemes" when a subdivision plan or land use bylaw amendment is to "create parcels within close proximity to environmentally sensitive areas".

2. The information supplied with the area plan must include (Section 4.1.3) "identification of other hazards or environmentally sensitive areas", the "provision of municipal and/or environmental reserve" and "public input – developers are encouraged to contact neighbours and others" and Section 4.1.4 states that "the design scheme should be circulated to the various agencies" including Alberta Environment.

3. Section 4.1.8 requires that grouped Industrial and Commercial Uses be "removed from sensitive environmental… features"

4. Section 4.1.8 also states that "The Approval Authority should consider the following matters when reviewing an application for a commercial or industrial land use:… protection of water sources… Industrial developments should not be allowed to contribute to the degradation of watercourses or groundwater aquifers. The County will cooperate with the appropriate authorities to ensure that the highest standards are imposed on industries to protect water sources.

5. Section 4.1.9 states that Noxious or Hazardous Industries should be
   a) discouraged from locating within a minimum 61 m (200 ft) of water bodies
   b) may be required to locate in a designated industrial area
   c) the Development Authority shall solicit and consider the comments of Alberta Environment
   d) Council or the Development Authority shall hold a public meeting to solicit the views of the public prior to a decision being made.


COUNTY OF WARNER No. 5
AND TOWN OF MILK RIVER
INTERMUNICIPAL DEVELOPMENT PLAN
County of Warner Bylaw # 819-02, Town of Milk River Bylaw # 893
LIKELY AREA OF URBAN EXPANSION
AND FRINGE AREA LAND USE
MILK RIVER - APRIL 2000
TWP 2, RGE 16, W4M
LEGEND:
FRINGE BOUNDARY
HIGHWAY/ROAD
TOWN BOUNDARY
10 SECTION NUMBER
CPR
QUARTER SECTION
SECTION
FARMSTEAD
ANCILLARY FARM RESIDENCE
FARM BUILDING
COUNTY RESIDENCE
ABANDONED FARMSTEAD
INDUSTRIAL
INTENSIVE LIVESTOCK
C
M MISC
U UTILITIES
AIRPORT
CEMETERY
LIKELY AREA OF RESIDENTIAL EXPANSION
LIKELY AREA OF INDUSTRIAL AND COMMERCIAL EXPANSION
LIKELY AREA OF PUBLIC AND INSTITUTIONAL EXPANSION
OLDMAN RIVER INTERMUNICIPAL SERVICE AGENCY
MAP 1
MILK RIVER
Milk
River
501
4
Cemetery
Sewage Lagoon
Ammonia Storage Or Storage
5
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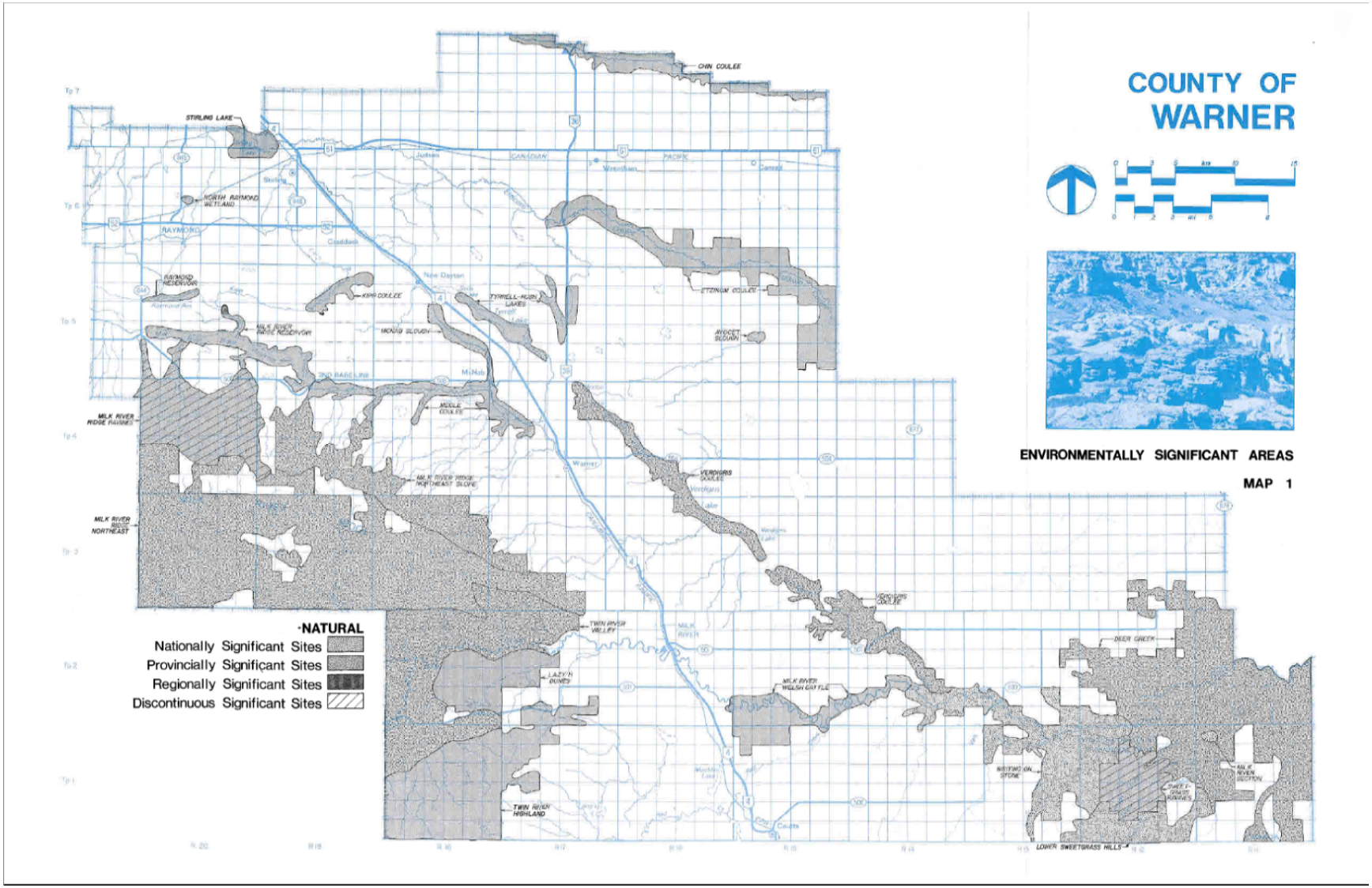
COUNTY OF
WARNER
ENVIRONMENTALLY SIGNIFICANT AREAS
MAP 1
NATURAL
Nationally Significant Sites
Provincially Significant Sites
Regionally Significant Sites
Discontinuous Significant Sites
CHIN COULEE
STIRLING LAKE
NORTH RAYMOND WETLAND
RAYMOND
RAYMOND RESERVOIR
KIPP COULEE
TYRRELL-RUSH LAKES
ETTENIM COULEE
AVOCET SLOUGH
MILK RIVER RIDGE RESERVOIR
MONIA SLOUGH
2ND BASELINE
McNab
MILK RIVER RIDGE
MILK RIVER RIDGE NORTHEAST SLOPE
MILK RIVER RIDGE NORTHEAST
VERDIGRIS COULEE
TWIN RIVER VALLEY
MILK RIVER
LAZY H DUNES
MILK RIVER WELSH CATTLE
DEER CREEK
WRITING ON STONE
MILK RIVER SECTION
SWEETGRASS HILLS
TWIN RIVER HIGHLAND
LOWER SWEETGRASS HILLS