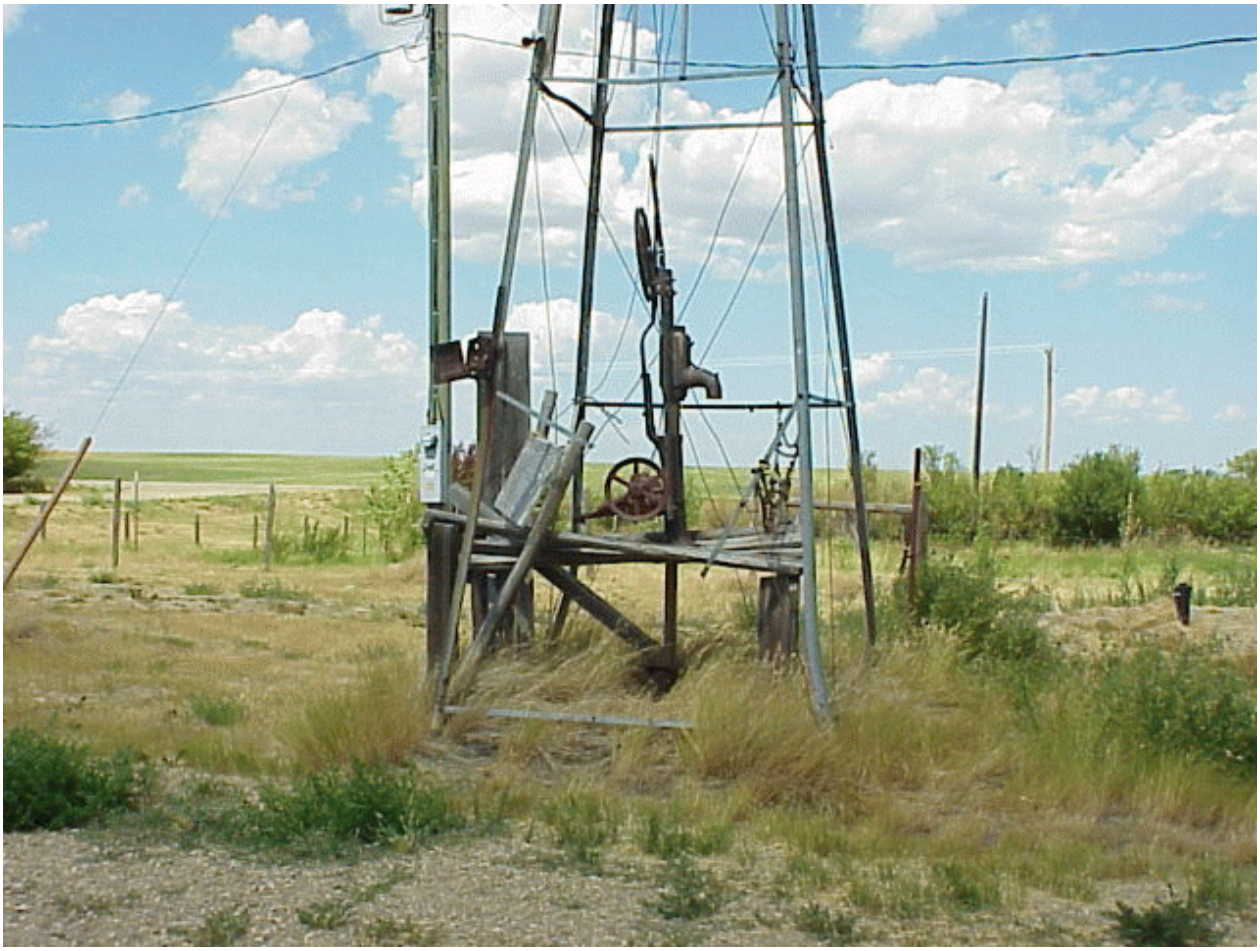
MILK RIVER AQUIFER RECLAMATION & CONSERVATION PROGRAM
1999 - 2004
SUMMARY REPORT



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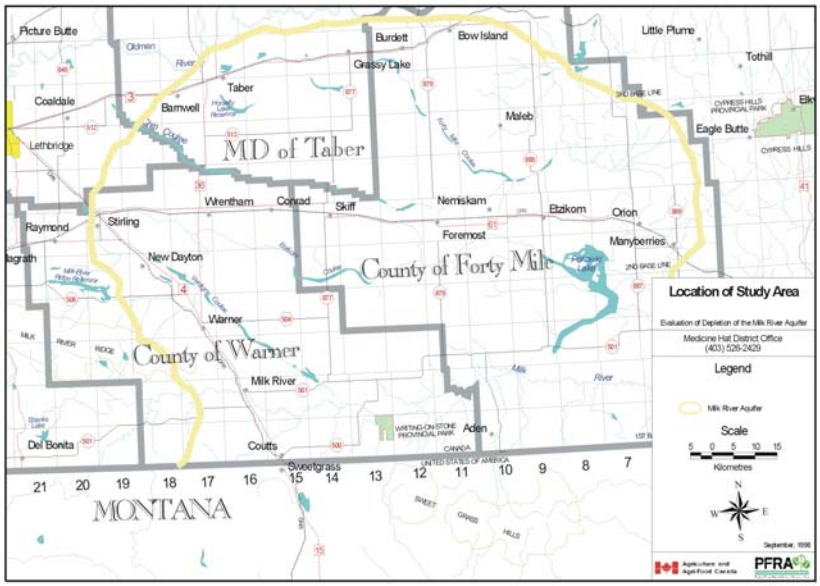
MILK RIVER AQUIFER RECLAMATION & CONSERVATION PROGRAM

Alberta Environment, Agriculture & Agri-Food Canada, and the County of Forty Mile signed a five year Agreement on July 21, 1999, for the Milk River Aquifer Reclamation and Conservation Program. The Milk River Aquifer is an extensive groundwater formation in southern Alberta and is the primary source of water for over 800 farms and ranches, a number of Hutterite Colonies and several small communities.

The program consisted of four main components: education & awareness, a field survey of over 1,000 water wells to determine risks posed to the aquifer, proper sealing of unused wells and monitoring of changes in water levels and water quality to evaluate the impact of the program. Under the Agreement, Agriculture & Agri-Food Canada through the Prairie Farm Rehabilitation Administration department (PFRA) and Alberta Environment agreed to each provide a total of $310,000 [1] over five years. The County of Forty Mile agreed to administer the program at an estimated cost of $20,000 per year. The total cost of the program was estimated to be $720,000.

The Milk River Aquifer is a sandstone formation which underlies most of the County of Forty Mile and portions of the County of Warner and the M.D. of Taber, an area of approximately 11,300 km^2. Water wells were completed in the aquifer as early as 1910, and many wells drilled prior to 1940 are still in existence. Typically these wells have a high static water level and in some places are still flowing to surface. Significant lowering of water levels in certain parts of the aquifer were first identified in 1960. Water level declines exceeding 30 m were noted in a 22 year period between 1937 and 1959 due to water usage by the Village of Foremost.

Location Plan



Extent of the Milk River Aquifer

[1] An amendment to the original Agreement was signed on October 25, 2001, allowing Canada and Alberta to each increase their total contribution from $250,000 to $310,000 over the five years.

Education and Awareness

Since the initiation of the program in July, 1999, open houses have been held on separate occasions at Foremost, Skiff, Grassy Lake and Orion to promote the benefits of plugging unused wells, to explain how to properly seal an unused well, to update the public on the progress being made under the program and to answer questions from rural landowners.

In 1999, nine local schools participated in an essay and logo contest to promote awareness of the Milk River Aquifer. Students were invited to write an essay on the Milk River Aquifer and/or contribute designs for a logo for the volunteer Milk River Aquifer Management Advisory Committee formed in 1998 to promote sound management of the Milk River Aquifer. A student from Milk River won the essay contest and a student from Foremost won the logo contest for the design shown below.

Numerous articles have been written in newspapers regarding the program including the Bow Island County Commentator, the Lethbridge Herald, the Calgary Herald and the Medicine Hat News. Coverage of various aspects of the program have aired on CFCN and CBC television. In June, 2001, the Milk River Aquifer Management Advisory Committee received an Emerald Award from the Alberta Emerald Foundation for Environmental Excellence for their efforts in protecting and managing this valuable groundwater resource.

Unused Well Near Foremost

Well Identification Component

Prior to the Milk River Aquifer Reclamation and Conservation Program, the precise number of wells in the aquifer was unknown. The best estimate of the number of wells had been provided in a study completed in 1998 by AGRA Earth & Environmental Limited, Edmonton entitled, "Evaluation of Depletion of the Milk River Aquifer." The total number of Milk River Aquifer wells in a defined study area was estimated to be 1083. Of this total, 681 wells appeared to be in active use, 88 were determined to be not in use, 42 were testholes or observation wells, 23 were decommissioned and the status of 249 wells was unknown or uncertain.

An ambitious well identification field survey has been conducted under the program to locate over 1000 water wells with global positioning system (GPS) technology and to conduct a detailed questionnaire with landowners. The questionnaire established such information as the status of the well (active or inactive), diameter and material of well casing, reported depth, and static water level. In cases where the well was not in use, the landowners were asked if they would consider having the well properly sealed. Water samples were taken for about 10 % of the wells to provide an overview of water quality within the Milk River Aquifer.

Summer Staff Interviewing Landowner

Under the well identification component of the Milk River Aquifer Program, a total of 1,027 wells have been field verified. Of these, 585 were determined to be active wells and 442 were determined to be inactive. A total of 218 wells were identified as flowing to surface.

Well Identification	Non-Flowing	Flowing	Total
Active	408	177	585
Inactive	401	41	442
	809	218	1,027

Well Plugging Component

Older wells that are no longer being used can provide a direct path for undesirable surface or shallow groundwater to mix with the Milk River Aquifer, thus affecting the water's quality. Mixing can occur from one aquifer to another through corroded well casing or through unsealed gaps along the outside of the well casing. Flowing wells that are not in use result in wastage of water.

The general procedure used to decommission an abandoned Milk River Aquifer water well under the program involved: conducting a pump test on any active wells in the immediate vicinity of the unused well; using a drill rig to remove any obstructions from within the well casing to be cemented (such as drop pipe and sucker rods for a pump jack); and mechanically perforating the inside of the casing to allow the subsequent cementing procedure to fill any spaces which may be present along the outside of the well casing and the original drill hole. Removal of the casing prior to cementing is preferred but is often not practical due to the age of the casing material and the likelihood of the casing pulling apart near surface.

Well With Pump Jack

Lifewater Drilling Cementing Unused Well

The subsequent cementing process involved: lowering small diameter pipe inside the well casing from the back of a rig or a grout truck to a level near the bottom of the well; mixing up a batch of cement; and pumping cement into the well until completely filled. Pump tests were repeated at the conclusion of the work to ensure that the cementing procedure did not affect any nearby active wells.

Participation by landowners was voluntary. Under the program, interested landowners were required to pay a $250.00 application fee and the remainder of the cost of the well decommissioning was split between Alberta Environment and Agriculture & Agri-Food Canada. The actual cost of hiring a well drilling company to cement these wells according to the general procedure described, averaged out to about $5,500.00 per well. Most wells typically ranged from 150 m to 275 m deep.

A total of 101 unused Milk River Aquifer wells were cemented during the five years of the program. Of these, 22 were flowing noticeably to the surface, generally at rates of 1 gal/min or less. The 22 wells represent approximately half of the inactive, flowing wells identified in the landowner survey.

	Non-Flowing	Flowing	Total
Wells Cemented	79	22	101

The work was awarded by public tender and completed by four separate drilling companies over the five year period: Camfield Drilling Ltd, Lethbridge; Lifewater Drilling, Bow Island; Dollman's Water Well Drilling Ltd, Pincher Creek; and Layne Christensen Canada Ltd, Calgary.

Dollman's Water Well Drilling - Rig Set Up Over Unused Well

Monitoring

Alberta Environment has a monitoring network which currently includes 5 observation wells within the limits of the Milk River Aquifer. During the Milk River Aquifer well identification survey, water level measurements were obtained for 69 of the wells and another 218 wells were observed to be flowing to ground surface. Water levels were recorded in an additional 29 Milk River Aquifer wells located in the vicinity of unused wells being decommissioned; prior to and following the decommissioning procedure. Other water level data is submitted to Alberta Environment by owners of higher consumptive use (licenced) Milk River Aquifer wells on an annual basis. Thus far, there has been no noticeable change in the groundwater level as a result of the 101 wells that have been cemented. The 22 flowing wells that were cemented had been wasting approximately 13 million gallons (59,735 m^3) of water per year based on what could be observed at surface.

Flowing Well Near Chin Reservoir

Water chemistry analyses were obtained for 56 wells during the Milk River Aquifer well identification survey to provide an overview of the water quality of the aquifer. An additional 31 chemistry results were obtained during the decommissioning procedures. Water sampling should be repeated in the next three to five years to assess any changes in the water quality.

The risk of contamination to the Milk River Aquifer has been significantly reduced in the 79 non-flowing wells that have been cemented.

Program Costs

The decommissioning of unused wells that pose a risk to the Milk River Aquifer accounted for the majority of the cost of the program. The program costs are shown below:

1999/2000:	
Education and Awareness:	$ 3,400
Well identification:	$ 33,000
Well Decommissioning:	$ 63,600
	$ 100,000
2000/2001:	
Education and Awareness:	$ 2,220
Well Decommissioning:	$ 97,780
	$ 100,000
2001/2002:	
Well Decommissioning:	$ 139,417
2002/2003:	
Education and Awareness:	$ 300
Well Decommissioning:	$ 128,141
	$ 128,441
2003/2004:	
Education and Awareness:	$ 536
Well Decommissioning:	$ 118,532
	$ 119,068
PROGRAM COSTS - 1999/2004:	**$ 586,926**
COUNTY OF FORTY MILE (ADMINISTRATION): [2]	**$ 100,000**
TOTAL PROGRAM COSTS:	**$ 686,926**

[2] Administration costs by the County of Forty Mile during the five years of the program have been estimated to be $20,000 per year, for a total of $100,000.

The program costs of $586,926 were shared equally by Alberta Environment and Agriculture & Agri-Food Canada. The funding by each party is shown below:

Alberta Environment	$293,463
Agriculture and Agri-Food Canada	$293,463
County of Forty Mile (Administration - estimated)	$100,000
Total Program Cost	$686,926

In the second year of the program, $9,800 of the funds received from well plug application fees were used to purchase 300 m (1000 ft) of 45 mm (1.75 inch) diameter drill stem and several drill bits. Many of the wells to be plugged had a casing size less than 75 mm (3 inch) diameter which is smaller than most current wells. Drilling contractors do not typically carry such specialized drilling pipe and drill bits as part of their normal inventory. The small diameter drill stem was made available to drilling contractors for use in well plugging, enabling them to clean out well casings which would otherwise not have been possible to work in. Ten new lengths (61 m) of drill stem were purchased and 13 lengths welded and repaired for use in the final year of the program, at a cost of $5,665 (from the application fee funds).

Benefits of the Program

The Milk River Aquifer Reclamation and Conservation Program has been a successful cooperative effort between rural residents and the three levels of government that has resulted in the following key accomplishments:

- rural residents have a better understanding of the Milk River Aquifer;
- the level of awareness of the benefits of sealing unused wells has increased;
- the data gathered in the well identification survey will allow for better management of the aquifer in the future by rural residents and provincial water resource authorities;
- water wastage in the Milk River Aquifer has been reduced with the decommissioning of 22 unused, flowing wells;
- the threat of local contamination of the Milk River Aquifer has been significantly reduced with the decommissioning of 79 unused, non-flowing wells; and
- local drilling companies involved in the program have improved their capabilities in well decommissioning work, specifically with regard to the development of techniques and equipment for the perforation of well casings left in place.