



# Water Well Decommissioning and Groundwater protection in the Milk River Watershed

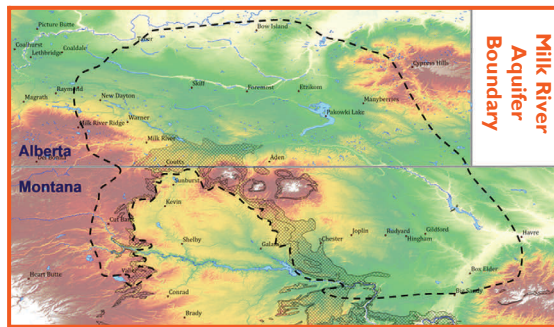
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## Background

The Milk River Aquifer is critical in the provision of water for urban and rural residents and in sustaining base flows of the Milk River during low flow periods. In the 1960s, a study showed that the groundwater resource was depleting. In 2004, the status of groundwater wells in the Milk River Aquifer was investigated by the Milk River Aquifer Reclamation and Conservation Program (MRARC). This study

indicated the desire to decommission unused and abandoned wells, the work is cost-prohibitive. About 101 wells (only 23%) were decommissioned through the MRARC program, while the majority of wells are still abandoned and not properly sealed.

During the summer of 2013 the MRWCC facilitated a workshop to promote awareness on the importance of proper decommissioning of



of abandoned wells and also allow watershed residents and extension staff to see the procedures and discuss chal-

lenges of decommissioning water wells. This workshop was sponsored by the Shell FuelingChange program and was open to producers, community members, and extension staff working with well owners to protect groundwater resources in Southern Alberta.

found over 1,000 water wells in the Milk River watershed that were either unused or abandoned. More recently, the Milk River Transboundary Aquifer Project verified the status and location of an additional 266 water wells, of which 45 wells were abandoned. Some of these abandoned wells continue to flow at surface and many others are left uncapped and exposed at the surface. There is a tangible concern that contaminants can enter the aquifer from the surface or mixing of lesser quality unconfined aquifers with the Milk River aquifer in abandoned wells.

Although most well owners

indicated the desire to decommission unused and abandoned wells, the work is cost-prohibitive. About 101 wells (only 23%) were decommissioned through the MRARC program, while the majority of wells are still abandoned and not properly sealed.

### Why should abandoned wells be properly decommissioned?

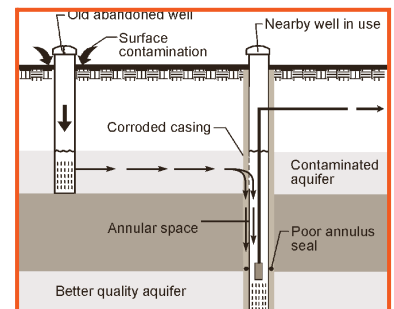
Once a water well is no longer being used or maintained for future use, it is considered abandoned. Abandoned wells pose a serious threat to the preservation of groundwater quality. They are also a serious safety hazard. There are approximately 59,000 farmsteads in Alberta

and most of these have at least one well. In addition there are a great number of non-farming rural residents that rely on water wells. The exact number of abandoned wells in Alberta is unknown but is estimated to be in the tens of thousands. Plugging an abandoned well prevents groundwater contamination. Contaminants can enter an old well through:

- ◆ Top of casing (if there is no lid)
- ◆ Unsealed spaces along the outside of the casing
- ◆ Holes in the casing

Unfortunately, groundwater contamination and its effects are usually not recognized until groundwater quality is seriously affected and nearby wells have been contaminated.

When the steel casing of an abandoned well starts to corrode, holes will develop. When this takes place, surface contaminants or poor quality water from shallow aquifers may migrate into the deeper aquifers of nearby operating wells.



Contamination From an Abandoned Well

“Plug it to Protect and Conserve the Milk River Aquifer!”

### What is an abandoned well?

A water well is considered “abandoned” if it is:

- ◆ no longer in use and not intended to be used in the future for water supply.
- ◆ no longer being maintained with annual chlorination treatments.
- ◆ in a poor state of repair and the pumping equipment has been removed or cannot be repaired or replaced.
- ◆ unable to produce water and no longer an asset to the property.



Flowing abandoned well

## Process of Plugging a Well

There are several steps to take before actually plugging the well. Some steps you will be able to do yourself and others you may want to consult with, or hire, a licensed water well contractor to complete.

### Preparation

To know exactly how much plugging material is needed, measure the total depth and diameter of the well, plus the non-pumping water level (the depth to the standing water in the well). If possible, compare these measurements to the information on the drilling re-

port from when the well was originally constructed. The only time you should even consider plugging a well yourself is when the well is open to its original depth.

Ideally the casing should be removed from the well before the plugging process begins. Often only the liner casing is removed and the surface casing is left intact because it is more difficult to remove and it could separate down hole. The older the well, the more difficult it will be to successfully remove the casing.

## Methods

Aside from choosing the appropriate plugging material, the method of placing material into the well is most critical. Regulation requires that the plugging material must be introduced from the bottom of the well and placed progressively upward to ground surface. If the plugging material is cement grout, concrete or bentonite slurry, special equipment is needed. The material must be placed into the well through a tremie pipe that is usually about 3in. in diameter. At all times this pipe must be kept below the surface of the plugging material to prevent it from diluting or separating. It is recommended that you hire a licensed water well contractor when a slurry is chosen as the plugging ma-

terial because they will have the proper equipment and experience to do the job correctly. When bentonite pellets are chosen for the plugging material, they can be poured into the well from the ground surface. These pellets have a weight material added to help them sink to the bottom of the hole. They are also coated to prevent immediate swelling on contact with water. When poured slowly, they should reach the bottom of the well before swelling. If you are not careful, however, these pellets will bridge off down hole and the well will be only partially plugged (see Figure: Bridging right). Before you pour in the pellets, you can determine how many feet of well cas-

If the casing is left in place, it should be perforated, particularly if there is evidence of water movement in the annulus of the well. Any casing left in place must be cut off 0.5 m (20 in.) below ground surface after the well is plugged.

### Materials

The materials to be used for plugging need to be clean and free of contaminants. Generally the best products to use are cement, high yield bentonite, or for large diameter and hand dug wells clean clay.

ing can be filled with the size of pellets you have chosen. As the well is being filled, measure the depth to the top of the plugging material quite frequently. Then you will know if the plug is rising faster than expected indicating a bridge has formed. If this happens, be sure to break it up before adding more material to the well.

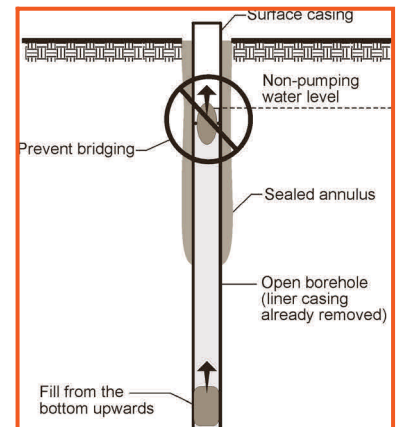


Figure: Bridging

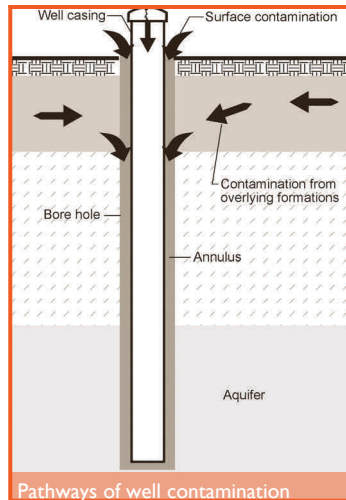


## The MRWCC Water Well Decommissioning Project



Before decommissioning

After decommissioning



Pathways of well contamination



Specialized tools for removing well obstructions



Clearing well-casing obstructions



Restoring casing integrity prior to cementing well



Pumping cement to seal well



Bentonite chips over the decommissioned well

### Special Problems

Flowing wells present special problems for plugging. It is highly recommended that you use the services of a licensed water well contractor. Before a flowing well can be plugged, the flow must be controlled. Several methods can be used:

- ◆ Reduce the flow by pumping high specific gravity fluids such as drilling mud or cement into the well.
- ◆ If there is a nearby well that is tapped into the same aquifer as the flowing well being plugged, pump it to create a drawdown in the well being plugged.
- ◆ Where practical, extend the well casing high enough above the ground surface to stop the flow.

### How do I know if I have an abandoned well on my property?

Abandoned wells can be difficult to identify. Look for physical evidence of a well, including:

- ◆ pipes sticking out of the ground or basement floor.
- ◆ a ring of concrete or bricks surrounding a hole in the ground.
- ◆ windmills, wishing wells, hand pumps or hydrants.
- ◆ a dip in the land surface or a damp circular depression.
- ◆ a pit in the yard or basement.
- ◆ a basement offset (small room).
- ◆ a waterline or patched hole through the basement floor or wall.
- ◆ small outside buildings.

### Well plugging quick facts

- ◆ Plugging abandoned wells reduces landowners' environmental liability and increases property values.
- ◆ When a replacement well is drilled, it is most economical to have your licensed water well contractor plug the old well before leaving the site.
- ◆ Most farmsteads have at least one abandoned well. If left alone or improperly plugged, it could be a significant threat to your groundwater resources.

### Did you know!!

It is important to maintain unused wells during prolonged periods of non-use. Settling of fine clay particles on infiltration galleries may cement wells in if they are not being regularly pumped.

In 2013 the MRWCC decommissioned two abandoned flowing wells. Funding for this decommissioning was provided by Shell FuellingChange Program. The second well was partly funded by Growing Forward, an AARD program that provides technical assistance to agricultural producers to complete a Long-Term Water Management Plan (LTWMP), and shares the cost of related enhancements of their on-farm water supply management. The program addresses the following two key priorities:

- ◆ Improved resource management by helping producers achieve greater water security and more effective and efficient management of their on-farm water resources and enhancing the sustainability of those resources.
- ◆ Improved production capacity. Producers who improve their water management capability advance the long-term competitiveness of their operation, making them better able to embrace business opportunities.

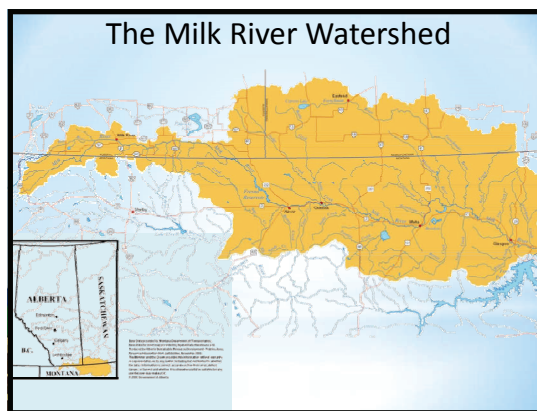
The MRWCC wishes to thank Shell FuellingChange and Growing Forward Program for providing funding to ensure decommissioning implementation of the wells was achieved and the workshop was conducted to bring awareness to the community on the importance of decommissioning unused wells.

To find out more about the On-Farm Water Management program, or to speak with an ARD Water Specialist, please contact the Ag-Info Centre at 310-FARM (3276).

For questions on well decommissioning please contact:

Alberta Environment Information Centre  
780-427-2700  
(toll-free, dial 310-0000)  
or  
MRWCC at 403-647-3808

During decommissioning, a well must be filled full length with impervious material. That material must be introduced into the well at the bottom and be placed progressively upward to ground surface.



## Next Steps

The MRWCC is committed to continue partnerships with other stakeholders to source funding to help interested landowners decommission their abandoned wells and also bring awareness to the community on how to protect and conserve the Milk River Aquifer.

Sponsored by



Alberta Agriculture and Rural Development



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