County of Lamont No. 30

Part of the North Saskatchewan River Basin
Parts of Tp 051 to 058, R 15 to 20, W4M
Regional Groundwater Assessment

Prepared for

In conjunction with

Agriculture and Agri-Food Canada
Agriculture et Agroalimentaire Canada
Prairie Farm Rehabilitation Administration
Administration du rétablisseme agricole des Prairies

Canada

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1 PROJECT OVERVIEW

"Water is the lifeblood of the earth." - Anonymous

How a county takes care of one of its most precious resources - groundwater - reflects the future wealth and health of its people. Good environmental practices are not an accident. They must include genuine foresight with knowledgeable planning. Implementation of strong practices not only commits to a better quality of life for future generations, but creates a solid base for increased economic activity. **This report, even though it is regional in nature, is the first step in fulfilling a commitment by the County toward the management of the groundwater resource, which is a key component toward the well-being of the County, and is a guide for future groundwater-related projects.**

1.1 About This Report

This report provides an overview of (a) the groundwater resources of the County of Lamont No. 30, (b) the processes used for the present project and (c) the groundwater characteristics in the County.

Additional technical details are available from files on the CD-ROM provided with this report. The files include the geo-referenced electronic groundwater database, maps showing distribution of various hydrogeological parameters, the groundwater query, and ArcView files. Likewise, all of the illustrations and maps from the present report, plus additional maps, figures and cross-sections, are available on the CD-ROM. For convenience, poster-size maps and cross-sections have been prepared as a visual summary of the results presented in this report. Copies of these poster-size drawings have been forwarded with this report, and are included as page-size drawings in Appendix D.

Appendix A features page-size copies of the figures within the report plus additional maps and cross-sections. An index of the page-size maps and figures is given at the beginning of Appendix A.

Appendix B provides a complete list of maps and figures included on the CD-ROM.

Appendix C includes the following:

1) a procedure for conducting aquifer tests with water wells;
2) a table of contents for the Water Well Regulation under the Environmental Protection and Enhancement Act; and
3) additional information.

The Water Well Regulation deals with the wellhead completion requirement (no more water-well pits), the proper procedure for abandoning unused water wells and the correct procedure for installing a pump in a water well.

1.2 The Project

It must be noted that the present project is a regional study and as such the results are to be used only as a guide. Detailed local studies are required to verify hydrogeological conditions at given locations.

The present project is made up of five parts as follows:

Module 1 - Data Collection and Synthesis
Module 2 - Hydrogeological Maps
Module 3 - Covering Report
Module 4 - Groundwater Query
Module 5 - Training Session

This report and the accompanying maps represent Modules 2 and 3.

1.3 Purpose

This project is a regional groundwater assessment of the County of Lamont No. 30. The regional groundwater assessment provides the information to assist in the management of the groundwater resource within the County. Groundwater resource management involves determining the suitability of various areas in the County for particular activities. These activities can vary from the development of groundwater for agricultural or industrial purposes, to the siting of waste storage. **Proper management ensures protection and utilization of the groundwater resource for the maximum benefit of the people of the County.**

The regional groundwater assessment includes:

- identification of the aquifers[1] within the surficial deposits[2] and the upper bedrock;
- spatial definition of the main aquifers;
- quantity and quality of the groundwater associated with each aquifer;
- hydraulic relationship between aquifers; and
- identification of the first sand and gravel deposits below ground level.

Under the present program, the groundwater-related data for the County have been assembled. Where practical, the data have been digitized. These data are then being used in the regional groundwater assessment for the County.

[1] See glossary
[2] See glossary

2 INTRODUCTION

2.1 Setting

The County of Lamont No. 30 is situated in east-central Alberta. This area is part of the Alberta Plains region. The County exists within the drainage basin of the North Saskatchewan River, the northern boundary of the County. The area includes some or all of townships 051 to 058, ranges 15 to 20, west of the 4th Meridian.

Most of the County boundaries follow township or section lines. The exception is the northern boundary. The ground elevation varies between 590 and 740 metres above mean sea level (AMSL). The topographic surface generally decreases toward the North Saskatchewan River.

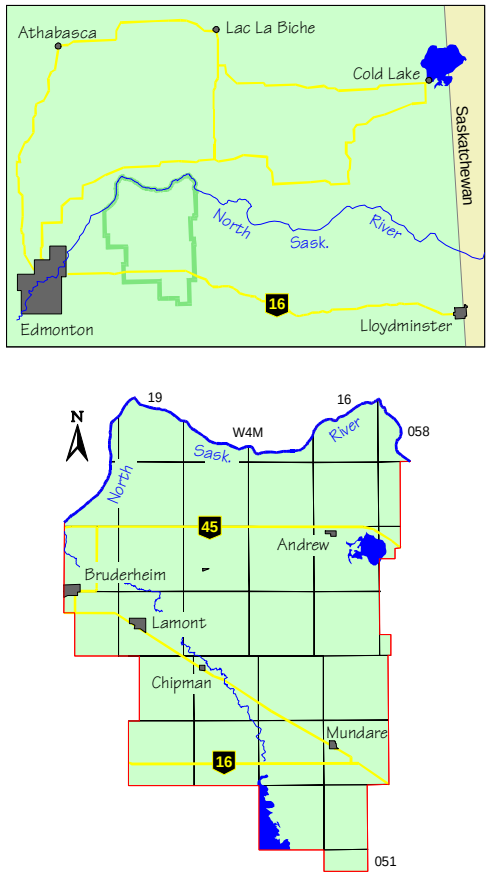

Figure 1. Index Map

2.2 Climate

The County of Lamont lies within the Dfb climate boundary. This classification is based on potential evapotranspiration values determined using the Thornthwaite method (Thornthwaite and Mather, 1957), combined with the distribution of natural ecoregions in the area. The ecoregions map (Strong and Legatt, 1981) shows that the County is located in both the Low Boreal Mixedwood region and the Aspen Parkland region. This vegetation change is influenced by increased precipitation and cooler temperatures, resulting in additional moisture availability.

A Dfb climate consists of long, cool summers and severe winters. The mean monthly temperature drops below –3 °C in the coolest month, and exceeds 10 °C in the warmest month.

The mean annual precipitation averaged from four meteorological stations within the County measured 473 millimetres (mm), based on data from 1954 to 1993. The mean annual temperature averaged 2.9 °C, with the mean monthly temperature reaching a high of 16.6 °C in July, and dropping to a low of -11.5 °C in January. The calculated annual potential evapotranspiration is 534 millimetres.

2.3 Background Information

There are currently records for 3,481 water wells in the groundwater database for the County. Of the 3,481 water wells, 1,768 are for domestic/stock purposes. Based on a rural population of 4,200, there are two water wells per family of four. The domestic or stock water wells vary in depth from less than 2 metres to 232.9 metres below ground level. Lithologic details are available for 1,663 water wells.

Data for casing diameter are available for 1,212 water wells, with 733 indicated as having a diameter of more than 300 mm and 479 having a diameter of less than 300 mm. The casing diameters of less than 300 mm are for drilled water wells, of which 40% were drilled before 1980. The water wells with a diameter of greater than 300 mm are mainly bored water wells.

Before 1980, plastic casing was not used in the water wells in the groundwater database. From the beginning of 1980 to 1995, plastic casing was used in 42% of the water wells.

Water wells not used for domestic needs must be licensed. At the end of 1996, 47 groundwater diversions were licensed in the County. The total maximum authorized diversion from these 47 water wells is 1,453 cubic metres per day (m^3/day); 76% of the authorized groundwater diversion is allotted for agricultural use. The largest licensed groundwater diversion of 845 m^3/day for Sil Silica is for a water well completed in the Buried Beverly Valley. The Village of Bruderheim, and the Towns of Lamont, Chipman and Mundare obtain their water via pipeline from the City of Edmonton.

At many locations within the County, more than one water well is completed at one legal location. Digitally processing this information is difficult. To obtain a better understanding of the completed depths of water wells, a digital surface was prepared representing the minimum depth for water wells and a second digital surface was prepared for the maximum depth. Both of these surfaces are used in the groundwater query on the CD-ROM. When the maximum and minimum water well depths are similar, there is only one aquifer that is being used.

Groundwaters from the surficial deposits can be 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 County are generally less than 2,000 milligrams per litre (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. Very few chemical analyses indicate a fluoride concentration above 1.0 mg/L.