

Flagstaff County

Part of the Battle River Basin
Parts of Tp 039 to 046, R 09 to 17, W4M
Regional Groundwater Assessment

Prepared for



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Administration

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The Association of Professional Engineers,
Geologists and Geophysicists of Alberta

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- A HYDROGEOLOGICAL MAPS AND FIGURES
- B MAPS AND FIGURES ON CD-ROM
- C GENERAL WATER WELL INFORMATION
- D MAPS AND FIGURES INCLUDED AS LARGE PLOTS

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 preliminary 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 of 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 Flagstaff County, (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 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 Flagstaff County. 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 aquifers¹ within the surficial deposits² 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 Flagstaff 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

Flagstaff County is situated in east-central Alberta. This area is part of the Alberta Plains region. The County exists within the Battle River basin. The southern boundary of the County is the Battle River. The other boundaries follow township or section lines. The area includes some or all of townships 039 to 046, ranges 09 to 17, west of the 4th Meridian.

The ground elevation varies between 565 and 790 metres above mean sea level (AMSL). Regionally the topographic surface generally decreases from southwest to northeast. However, local drainage is toward the Battle River.

2.2 Climate

Flagstaff County lies within the transition zone between a humid, continental Dfb climate and a semiarid Bsk climate. This classification is based on potential evapotranspiration values determined using the Thornthwaite method (1957), combined with the distribution of natural ecoregions in the area. The ecoregions map shows that the County is located in the Aspen Parkland region, a transition between boreal forest and grassland environments.

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. A Bsk climate is characterized by its moisture deficiency, where mean annual potential evapotranspiration exceeds the mean annual precipitation.

The mean annual precipitation averaged from four meteorological stations within the County measured 415 millimetres (mm), based on data from 1914 to 1990. The mean annual temperature averaged 2.9°C , with the mean monthly temperature reaching a high of 17.1°C in July, and dropping to a low of -14.5°C in January. The calculated annual potential evapotranspiration is 530 millimetres.

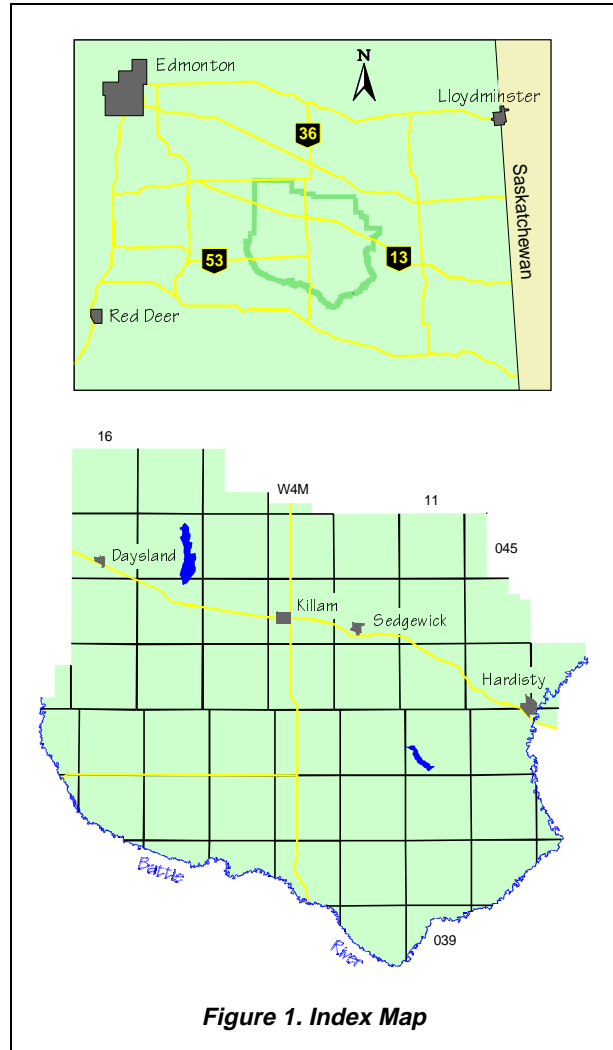


Figure 1. Index Map

2.3 Background Information

There are records available for 3,926 water wells in the groundwater database for Flagstaff County. Of the 3,926 water wells, 3,456 are for domestic/stock purposes. The remaining 470 water wells were completed for a variety of uses, including municipal and industrial purposes, and small irrigation projects. Based on a rural population of 4,015, there are 3.4 domestic/stock water wells per family of four. The domestic or stock water wells vary in depth from less than 1 metre to 181 metres below ground level. Lithologic details are available for 1,921 water wells.

There are 1,542 water well records with sufficient information to identify the aquifer in which the water wells are completed. The water wells that were not drilled deep enough to encounter the bedrock plus water wells that have the bottom of their completion interval above the bedrock surface are water wells completed in surficial aquifers. The number of water wells completed in aquifers in the surficial deposits is 823. The adjacent map shows that these water wells are mainly in the buried bedrock valley and the southeastern part of the County. Approximately 48% of the water wells completed in the surficial aquifers have a completion depth of less than 30 metres and 52% have a completion depth of more than 30 metres.

The remaining 719 water wells have the top of their completion interval deeper than the depth to the bedrock surface. From the adjacent map, it can be seen that water wells completed in bedrock aquifers occur mainly outside the areas where surficial water wells are completed.

Water wells not used for domestic needs must be licensed. At the end of 1996, 134 groundwater diversions were licensed in the County. The total maximum authorized diversion from these 134 water wells is 4,554 cubic metres per day (m³/day); 63 percent of the authorized groundwater diversion is allotted for agricultural use. The largest licensed groundwater diversion within the County not used for industrial purposes is for the Town of Killam, having a combined diversion of 585 m³/day from two water supply wells.

The largest licensed industrial groundwater diversion within the County is 400 m³/day for a PanCanadian Petroleum (PCP) water source well. The water source well is completed at a depth of 872 metres below ground surface. This water source well, in 01-06-045-11 W4M, is completed 600 metres below the depth to the top of the Lea Park Formation.

