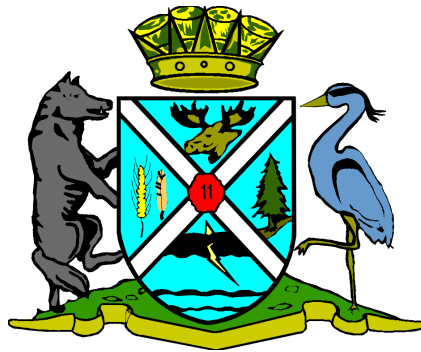


County of Barrhead No. 11

Parts of the Pembina and Athabasca River Basins
Parts of Tp 056 to 063, R 01 to 08, W5M
Groundwater Potential Evaluation

Prepared for



In conjunction with



Agriculture and
Agri-Food Canada

Agriculture et
Agroalimentaire Canada

Prairie Farm Rehabilitation
Administration

Administration du rétablissement
agricole des Prairies

Canada 

Prepared by
hydrogeological consultants ltd.
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Our File No.: **97-103**

September 1998
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PERMIT TO PRACTICE

HYDROGEOLOGICAL CONSULTANTS LTD.

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Geologists and Geophysicists of Alberta

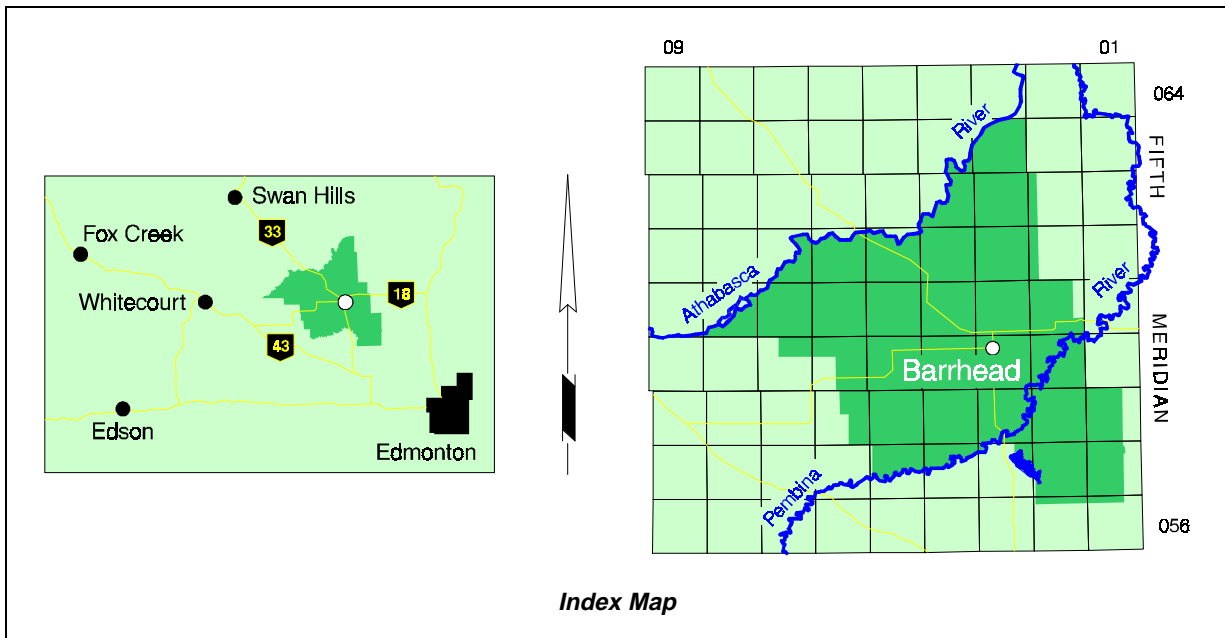
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I. INTRODUCTION

A. Purpose

The County of Barrhead covers an area of 2,470 square kilometres. The northwest boundary of the County is the Athabasca River and part of the southern boundary is the Pembina River. The remaining boundaries are straight, for the most part following township or section lines. The population of the County is 5,600 with 74% in the Town of Barrhead.



The purpose of this study is to collect, synthesize and interpret the available hydrogeological data. The results will be stored digitally in a format that can be easily updated in the future. This process will result in a regional analysis of the hydrogeology and a means by which the County of Barrhead can quickly and easily determine the suitability of areas for activities which may be affected by or may affect the quantity or quality of available groundwater. This report will also provide recommendations for future work which would enhance the understanding of the hydrogeology of the County of Barrhead.

B. Scope

There are numerous sources of data that have been used in the present program. The main data source is the Alberta Environmental Protection (AEP) groundwater database, which in part contains information related to many water wells in the Province of Alberta. The main published works include two regional hydrogeological reports and two bedrock topography reports, all prepared by Alberta Research Council. Several unpublished reports by AEP and various consultants have also provided hydrogeological data.

The only new data include approximate Universal Transverse Mercator (UTM) coordinates for control points and then assigning ground elevations for the control points; the elevation data have been obtained electronically from Defense Mapping.

II. GENERAL HYDROGEOLOGY

The uppermost bedrock in the County of Barrhead is the Wapiti Formation¹. The Wapiti Formation is described by Green² as “grey, feldspathic, clayey sandstone; grey bentonitic mudstone and bentonite; scattered coal beds; non-marine.” In the western part of the County, the Wapiti Formation is more than 500 metres thick. Because of the regional dip, the Wapiti Formation is less than 300 metres thick in the northeastern part of the County.

The Alberta Research Council bedrock topography maps^{3,4} show two main linear bedrock lows passing through the County of Barrhead. One is the High Prairie Valley which is present in the northern part of the County and is overlain in part by the present-day Athabasca River Valley. The second is the Dapp Valley which occupies the same general area as the present-day Pembina River.

The surficial deposits can be more than 50 metres thick⁵ and are mostly draped or stagnation morainal deposits⁶ with some lacustrine deposits present throughout the area. Aeolian deposits occur along the Athabasca River and organic deposits, bogs and marshes are scattered throughout the area. The Athabasca, Pembina and Paddle Rivers all have associated fluvial deposits. The greatest thickness of the surficial deposits are found in association with linear depressions within the bedrock surface⁷.

The side maps associated with bedrock topography maps show the thickness of surficial sediments ranging from zero, where the bedrock outcrops northeast of Barrhead, to greater than 50 metres along some of the linear bedrock lows. The bedrock topography map provides control points where gravel and/or sand deposits, at least 3 metres thick, are resting on the bedrock surface. However, these deposits are not grouped so as to suggest the presence of extensive gravel aquifers.

¹ Mossop, Grant and Irina Shetsen, editors, 1994. Geological Atlas of the Western Canada Sedimentary Basin. Produced jointly by the Canadian Society of Petroleum Geology, Alberta Research Council, Alberta Energy, and the Geological Survey of Canada.

² Green, R. 1971. Geological Map of Alberta. Alberta Research Council Map.

³ Carlson, V. A. 1970. Bedrock Topography of the Wabamun Lake Area, NTS 83-G, Alberta. Alberta Research Council Map.

⁴ Carlson, V. A. 1972. Bedrock Topography of the Whitecourt Area, NTS 83-J, Alberta. Alberta Research Council Map.

⁵ Carlson, V. A. 1972. Ibid.

⁶ Shetsen, I. 1990. Quaternary Geology, Central Alberta. Alberta Research Council Map. Natural Resources Division. Terrain Sciences Department.

⁷ Carlson, V. A. 1972. Ibid.

The regional hydrogeology maps^{8,9} show that the probable long-term yields of water wells in the majority of the County of Barrhead are expected to be in the order of 30 to 150 cubic metres per day (m³/day). In approximately 15 percent of the area, the water well yields are expected to be between 5 and 30 m³/day. There are seven separate areas where the 5 to 30 m³/day yield water wells are expected. The lower yield areas are not concentrated in any given region but are distributed throughout the County. There is one small area northeast of Barrhead where the projected long-term yields for water wells are expected to be less than 5 m³/day. Areas where water well yields are expected to be in the order of 150 to 650 m³/day are mostly along the Paddle, Pembina, and Athabasca Rivers.

The geological side map associated with the hydrogeology map shows that the regional dip on the top of the Lea Park Formation is 4 metres/kilometre to the southwest. The hydrochemistry side maps indicate that both shallow and moderately deep groundwaters are mostly sodium-bicarbonate type waters with some calcium-bicarbonate and sodium-sulfate type waters also present. Total dissolved solids (TDS) in the upper bedrock groundwaters range from less than 1000 milligrams per litre (mg/L) to greater than 2000 mg/L; the higher TDS concentrations are mainly the sodium-sulfate type waters.

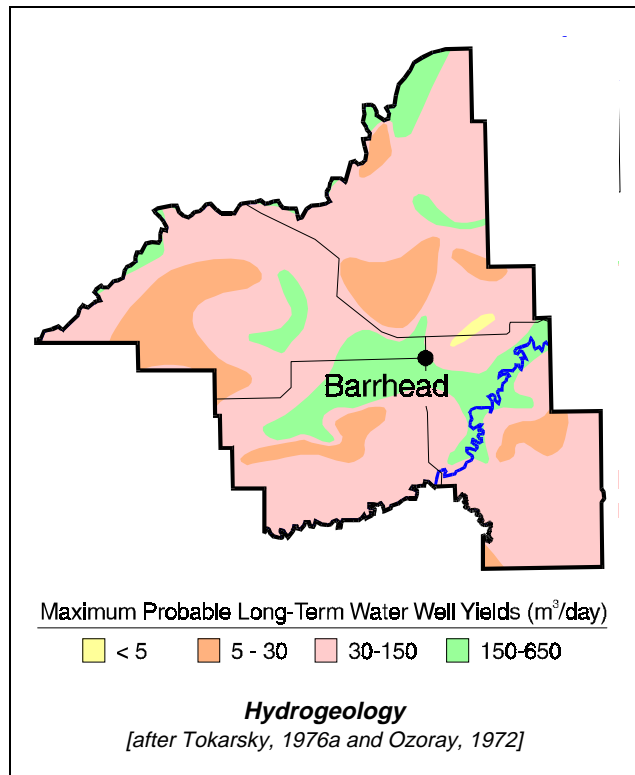
The meteorology side maps indicate that the average yearly rainfall varies from less 450 mm in the southeast part of the County to more than 500 mm in the northwest.

III. PRESENT PROGRAM

A. Maps

The County of Barrhead is included in the Energy, Mines and Resources (EMR) National Topographic Series (NTS) 1:250,000 Map sheets 83G and 83J. Additional details are available from the 1:50,000 NTS Map sheets 83G 15 and 16, and 83J 1, 2, 3, 7 and 8.

The digital elevation control for the present program has been obtained from the Defense Mapping Agency 3 arc second Digital Terrain Elevation Dataset.



⁸ Ozoray, G. F. 1972. Hydrogeology of the Wabamun Lake Area, Research Council of Alberta Report 72-8.

⁹ Tokarsky, O. 1976a. Hydrogeology of the Whitecourt Area, Alberta. Alberta Research Council Report 76-3.