CYPRESS COUNTY

Groundwater Development Potential in the Gros Ventre Creek Area

In response to water supply concerns in Alberta's Cypress County, and the additional adverse effects of recent drought conditions in Southeastern Alberta, a groundwater investigation was launched by Agriculture and Agri-Food Canada's Prairie Farm Rehabilitation Administration (PFRA) in order to confirm the groundwater development potentials at two locations in the Gros Ventre Creek area. Extra Rural Water Development Program (RWDP) funding for the 2001-2002 year enabled AAFC-PFRA to contract Sabatini Earth Technologies Inc. to perform this study.

Area of Study

The study was carried out in two areas located near Gros Ventre Creek: Area GV I – Sections 17-22 and 27-34 Twp 8 Range 3 W4, and Area GV2 – Sections I-18 Twp 9 Range 4W4. These two areas were considered to have generally poor groundwater development potential.

Objective

The objective of the study was to review available geological information and selected air photos, and determine if suitable aquifers capable of supplying a sustainable yield of I 00 m^3/day (about 15 imperial gallons per minute, igpm) and a peak (short-term) yield of 200 m^3/day (30 igpm) existed in these areas. The water needs to meet chemical and biological objectives for stock watering and, with treatment, for human consumption.

Study Methodology

Existing sources of data were used for this study. They included Drillers' Water Well Reports for the area, electric logs for gas wells in the area, and air photos. Published data was also used, including regional hydrogeological assessments, as well as surficial and bedrock geology maps. A field reconnaissance was also conducted to confirm water well locations and surficial geology features.

Five intervals were examined for potential aquifer zones. These are listed in descending order as: surficial deposits, quaternary deposits, Bearpaw Formation (shallowest bedrock), Oldman Formation, and the Foremost Formation.

Study Findings

The area is generally immediately underlain by silt and clay tills. Five surficial gravel and sand features were identified, one of which (in Section 34-8-3W4 – see air photo on next page) is likely saturated and may be able to supply suitable quantities if the saturated gravels and sands are thick enough. Water quality should meet potable quality guidelines with the possible exception of iron, in which case treatment may be required.

Impacts to nearby users are slight as no wells are within a five-km radius of the site. The area is located within a regional and local groundwater discharge area, which should aid in sustainability of the supply. As this gravel aquifer is close to the surface, and no confining beds are present, some risk of contamination by surface sources is present.

The surficial sediments range in thickness to about 60 m. Some local gravel and sand zones were noted which may be suitable for development. These zones are scattered and no large buried sand and gravel aquifer was identified which would be suitable. Water quality within the quaternary sediments likely contains a total dissolved solids (TDS) concentration of I 000 mg/L.

The Bearpaw Formation consists largely of shale and no aquifers within this zone were identified.

Thick sandstones are found within the Oldman Formation. These sandstones are not regionally continuous but are likely interfingered. The thickest, cleanest sandstones were noted in a well located within 13-19-8-3 W4 at depths of 340-367 m and 387-406 m below ground. Limited pump test and water quality data indicates that this zone may be able to supply water at rates up to 500 m^3/day with a total dissolved solids concentration around 1500 mg/L. The sulphate concentration may approach or slightly exceed drinking water limits. The static water level within the Oldman Formation is believed to be within 25 m of the surface, based on nearby water well records. No domestic water well users are within the vicinity. The aquifer is part of a large regional system similar to the Milk River Aquifer, and would rely on regional groundwater flow for sustainability.

Laterally, more continuous sandstones are found within the Foremost Formation. The base of groundwater protection is located within the Foremost Formation (with a TDS concentration of 4000 mg/L) indicating that the water quality within this zone likely exceeds objectives.

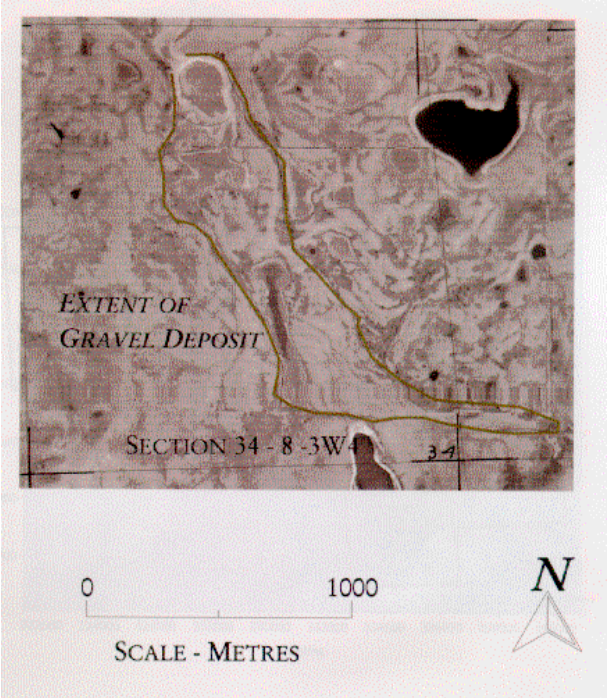

Figure 1

Recommendations for Further Investigation

1) Test drilling was recommended within the sand and gravel unit in Section 34-8-3 W4 to determine the thickness of saturated sands and gravels. Four test holes were subsequently drilled, showing that the site is underlain by a thin gravel unit, underlain by fine-grained sand to a depth of approximately 12 m. The sand is saturated, but it appears unlikely to supply water in excess of l 0 gallons per minute per well, sufficient for a local user but not enough for a regional water supply. Water quality was good (about 150 mg/L TDS).

2) Costs for a deep well to test the sandstones in 13-19-8-3 W4 in the order of $60,000 would be required, and the economics of obtaining a water source from this zone should be investigated prior to drilling. This cost would be for a test hole (without casing) and a pump test to determine aquifer properties.

Concern was expressed by many of the landowners in the area that obtaining large amounts of water from zones that they utilize may have adverse effects on their limited supply. Neither selected site should have an adverse impact on existing groundwater users.

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Report Sabatini Earth Technologies Inc., March 2002, Gros Ventre Groundwater Assessment, Parts of Twp 8-9, Range 3-4, W4M.