

SASKATCHEWAN HIGHWAYS AND TRANSPORTATION
GEOLOGY OF THE MARQUIS DRIVE INTERCHANGE

Report 0176-002 November 13, 2001

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Saskatchewan Highways and Transportation
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Attention: Mr. P. Jorge Antunes

Dear Mr. Antunes:

Enclosed is a copy of Report 0176-002 on the "Geology of Marquis Drive interchange". Cross section A-A' is at 60% reduction to facilitate folding and placing in envelope at the back.

If you wish to have more copies or have any queries about the report, please call me.

Sincerely yours,



E. A. Christiansen, P.Eng., P.Geo.

Enclosure



ASSOCIATION OF PROFESSIONAL ENGINEERS OF SASKATCHEWAN		
CERTIFICATE OF AUTHORIZATION		
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INTRODUCTION

This report on the “Geology of the Marquis Drive interchange” is based on cross section A-A’, a stratigraphic chart, and a map showing the location of the borehole logs and cross section A-A’. Borehole logs 1, 2, and 5 were obtained from data banks and borehole logs 3 and 4 and the three piezometers in borehole 3 were provided by Saskatchewan Highways and Transportation. The sediments include the Montana, Empress, Sutherland, and Saskatoon groups.

MONTANA GROUP

The Late Cretaceous, Montana Group is represented, in ascending order, by the Lea Park (1), Judith River (2), and Bearpaw (3) formations. The Judith River and Bearpaw formations were preserved from erosion at the site of borehole log 2 by collapse in the Saskatoon Low (Christiansen and Sauer 1998, Figs. 7, 10 and 2001).

EMPRESS GROUP

The Empress Group (4) is composed of sediments between bedrock and the oldest till. In the enclosed cross section, the Empress Group is between the Bearpaw and Mennon formations. Tertiary gravels are known to exist in the bottom of the Tyner valley south of Figure 1, but they are not present in cross section A-A’. The Empress Group is composed of up to 23m of silt, sand, and gravel deposited in the Tyner valley.

SUTHERLAND GROUP

The Sutherland Group is composed of the Mennon, Dundurn, and Warman formations. The Mennon Formation (5) is composed of up to 7m of low carbonate till (borehole log 2). The Dundurn Formation is composed of a lower unit of up to 39m of till and sand (6a) and up to 22m of silt, sand, and gravel (6b) and an upper unit of up to 24m of till (6c). The Warman Formation

(7) is composed of up to 10m of low carbonate till which forms an important marker bed for the separation of tills in the Saskatoon area.

SASKATOON GROUP

The Saskatoon Group is composed of the Floral and Battleford formations. The Floral Formation is composed of a lower unit of up to 10m of sand (8a) and up to 7m of till (8b) and an upper unit of up to 7m of sand (8c) and up to 23m of till (8d). South of the pinch-out of the sand (8c), tills 8b and 8d are undifferentiated. The Battleford Formation is composed of up to 5m of soft till (9).

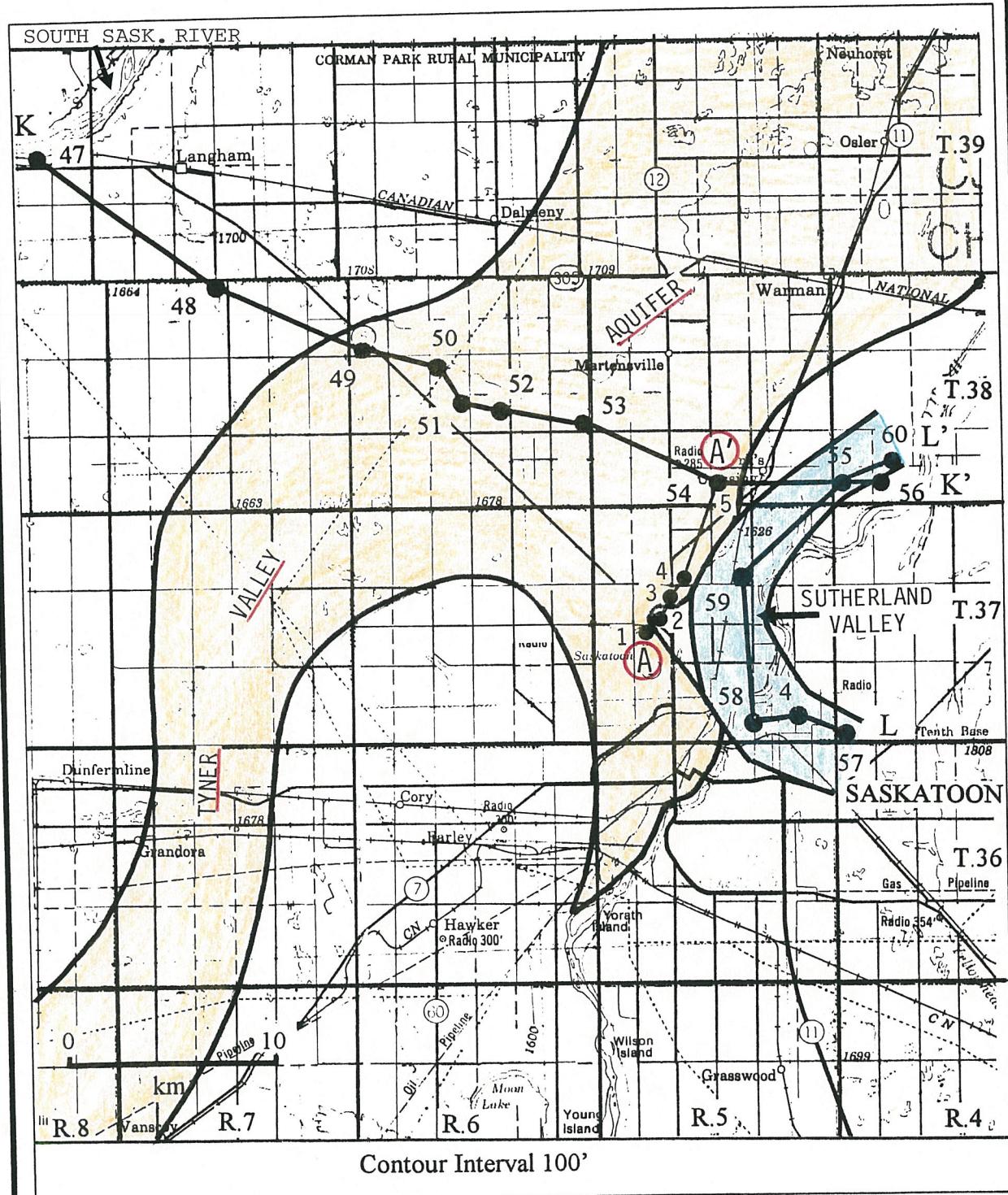
GROUNDWATER

Occurrence

Groundwater occurs in sands in the Judith River Formation (unnamed aquifer No. 1), in sands and gravels in the Empress Group (Tyner valley aquifer), in intertill sands and gravels in the Dundurn Formation (unnamed aquifer No. 2), and in sands in the Floral Formation (Dalmeny aquifers Nos. 1 and 2).

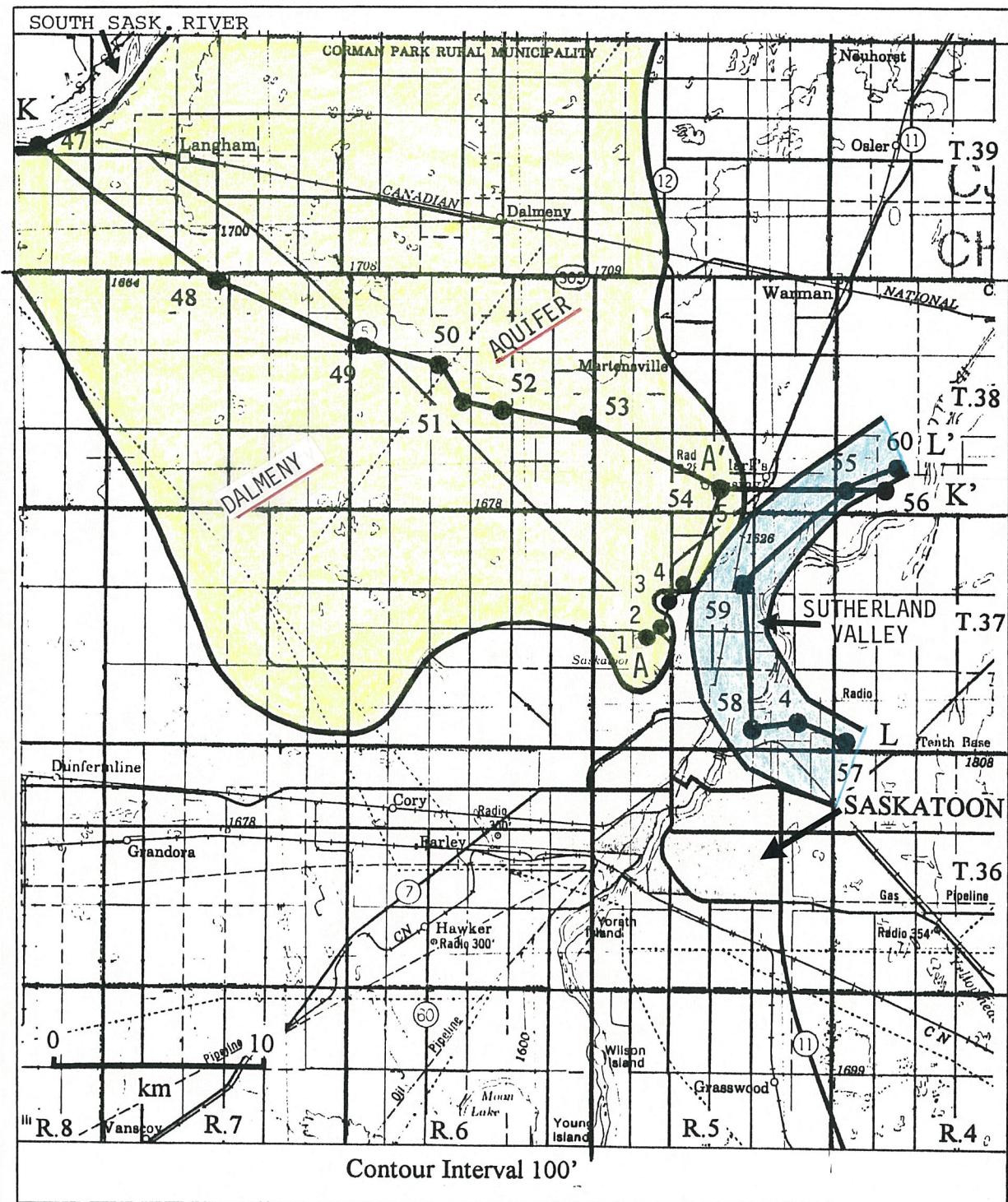
The unnamed aquifer No. 1 in the Judith River Formation occurs south of the northern boundary of the city of Saskatoon. At Sask Place, 32m of interbedded sands and silts were encountered in borehole No. 2. The depth to the top of the aquifer ranges from about 90m to 250m depending mainly on the amount of collapse that has taken place in the Saskatoon Low.

The Tyner valley aquifer trends from southwest to northeast across the map sheet (Fig. 1). The aquifer is composed of up to 23m of sands and gravels which are between bedrock and the oldest till of the Mennon Formation. According to Meneley (1970), the Tyner valley aquifer is potentially the most productive aquifer in the Saskatoon area.



The unnamed aquifer No. 2 is between the lower and upper tills of the Dundurn Formation. The aquifer is composed of up to 21m of sands and gravels. The areal extent of the aquifer is unknown. The potentiometric surface of unnamed aquifer No. 2 in borehole log 3 is about 496m which is about 2.5m below the ground surface.

The Dalmeny aquifer (Fig. 2) is composed of two stratigraphically separate aquifers in the Floral Formation. The lower aquifer (Dalmeny aquifer No. 1) is composed of up to 10m of sand which is inferred to be restricted to a valley cut through the Warman Formation into the upper till of the Dundurn Formation. The upper aquifer (Dalmeny aquifer No. 2) is composed of up to 7m of sand between the lower and upper tills of the Floral Formation.



MAP MODIFIED FROM SAUER AND CHRISTIANSEN 1996
DALMENY AQUIFER MODIFIED FROM MENELEY 1970

Fig. 13.29 Topographic map showing the location of cross section K-K' and longitudinal section L-L'.
A-A' SHT MARQUIS DRIVE INTERCHANGE

Figure 2. Map showing the location of the Dalmeny aquifer and cross section A-A'. For cross section K-K' and L-L', see Sauer and Christiansen 1996.

REFERENCE

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- Christiansen, E. A., and Sauer, E. K., 2001. Stratigraphy and structure of a Late Wisconsinan salt collapse in the Saskatoon Low, south of Saskatoon, Saskatchewan, Canada: an update. Canadian Journal of Earth Sciences, **39**: 1601-1613.
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Sincerely yours,

E. A. Christiansen, P.Eng., P.Geo.

