Introduction

An increasing demand for hydrocarbons by the North American economy is widening the gap between supply and demand. Geoscience knowledge is an essential component of hydrocarbon- and mineral-exploration strategies. Over the past several decades, however, both industry and governments in Canada have generally reduced funding for geoscience investigations. As a result, Manitoba Industry, Economic Development and Mines (IEDM) and Saskatchewan Industry and Resources (SIR) has embarked on a two-year collaborative investigation (April 1, 2003, to March 31, 2005), in partnership with Natural Resources Canada (NRCan), as part of NRCan's second round of Targeted Geoscience Initiatives (TGI). The resulting study, the Williston Basin Architecture and Hydrocarbon Potential Project (Phase 1), falls under a federal government program called "Consolidating Canada's Geoscience Knowledge". This project will build upon similar geoscience framework studies carried out originally within the Saskatchewan IEA Weyburn CO₂ Monitoring and Storage Project. Such projects have been developed in recognition that an in-depth understanding of the geological framework of the Williston Basin is fundamental to assessing the basin's mineral and

Objectives

The primary objective of the TGI project is to develop a seamless geological model of Paleozoic- and Mesozoic-aged rocks from basement to outcrop in an area that includes most of the Phanerozoic succession present in both eastern Saskatchewan and Manitoba. This model will integrate stratigraphic, geophysical, and hydrogeological data to enhance our knowledge of subsurface mineral potential (e.g., of brines and potash), and of hydrocarbon migration paths and entrapment mechanisms within and beyond traditional geographic areas of potash and hydrocarbon production. Manitoba and Saskatchewan researchers have established the stratigraphic horizons to be picked and, to assist in correlation, have constructed cross-sections across the study area. A database is currently being built that comprises geological picks derived from most of the drillholes penetrating Devonian and deeper horizons and from selected wells (approximately 4 to 6 wells per township in densely drilled areas) penetrating Mississippian- and Mesozoic-aged rocks. When completed, it is expected to include information from more than 4,000 Saskatchewan wells and approximately 3,000 Manitoba wells. A grid of regional cross-sections and computer-generated structure and isopach maps for all major geological units will be produced from these data. The project will acquire remotely sensed imagery, along with seismic, aeromagnetic, gravity, and hydrogeological data, all of which will be integrated with the stratigraphic data into an ArcView GIS product and a Gocad 3-D geological model that will be made publicly available on CD-ROM. A written summary describing known and conceptual plays will accompany this release. Compilation of a comprehensive bibliography of published geoscience information covering the study area is part of the Consolidating Canada's Geoscience Knowledge program and is an important component of this TGI project.

Project Structure

This project has eight principal tasks:geoscience knowledge inventory;

- regional geological mapping;
- geophysical investigations;
- regional hydrogeology;
- remotely sensed imagery;hydrocarbon assessment;
- 3-D Gocad geological model; and
- summary report.

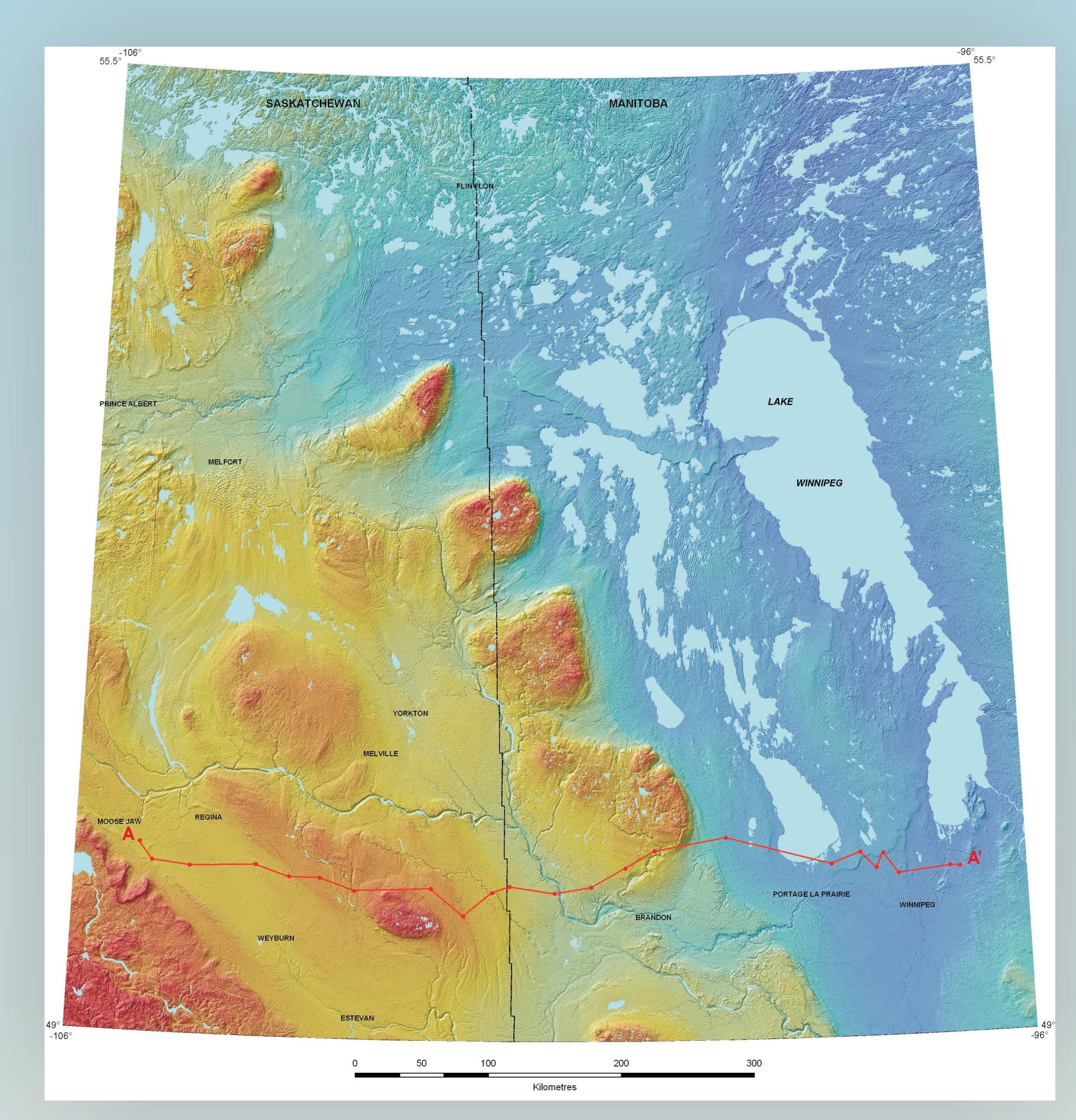
One or more principal task leaders have been assigned to each task. Overall responsibility for management of the project is shared between Saskatchewan (Kim Kreis and Steve Whittaker), Manitoba (Ruth Bezys and Carol Martiniuk), and NRCan (Benoit Beauchamp). The TGI project has attempted to assemble a team with expertise in different geoscience disciplines. Geophysical expertise will mainly come from the Geophysics Department at the University of Saskatchewan. Hydrogeological support will be obtained from the University of Alberta. Biostratigraphic and geochemical work is to be carried out by the Geological Survey of Canada (GSC), Calgary.

Current TGI Update

Presently, a preliminary version of the Lower Paleozoic stratigraphic maps (structure and isopach) will be released at this conference. All maps will be available on the Williston Basin TGI website (www.WillistonTGI.com), which will go live on April 25th, 2005. Along with the maps, the website will display the project bibliography for the Williston Basin, regional cross sections, abstracts for upcoming conferences, and the maps.

Working Group

Working Group			
GSC	SIR	<u>IEDM</u>	Other Partners
Mark Williamson (GSC Atlantic)	Chris Gilboy	Ric Syme	Ben Rostron (U of A)
Benoit Beauchamp (Has left the GSC)	Kim Kreis	Ruth Bezys	Dan Palambi (U of A M.Sc. Student)
Martin Fowler (GSC Calgary)	Steve Whittaker	Carol Martiniuk	Igor Morozov (U of S)
Mark Obermajer (GSC Calgary)	Andre Kosta	Michelle Nicolas	Jiakang Li (U of S Post-Doctoral Fellow)
Kirk Osadetz (GSC Calgary)	Melinda Yurkowski	Gaywood Matile	
Lavern Stasiuk (GSC Calgary)	Jeff Coolican	Greg Keller	
Alexander McCracken (GSC Calgary)	Megan Opseth	Glenn Conley	
David McNeil (GSC Calgary)	Jim Christopher (consultant)	Jim Bamburak	
Arthur Sweet (GSC Calgary)	Don Kent (consultant)	Len Chackowsky	
	Patty Thomas (consultant)	Paul Lenton	
	Stacey Spooner (consultant)	Craig Steffano	
		Lori Janower	
		Bonnie Lenton	
		Dan Barchyn (consultant)	
		Derek Bogdan (consultant)	







Economic Considerations

The total budget for this two-year TGI is \$768,500 with \$378,500 budgeted for fiscal year 2003-2004 and \$390,000 for 2004-2005. The break-down of total financial contribution to the project is \$720,000 from NRCan, \$28,500 from Manitoba, and \$20,000 from Saskatchewan. This represents a large amount of federal dollars being spent in both provinces on geoscience compilation and research in the Williston Basin. Exploration for prospective hydrocarbon reservoirs and mineral resources in the Williston Basin is usually led by small Canadian companies, which rely on government and universities for development of advanced modeling techniques of basins. These large regional syntheses are essentially the framework that all subsequent exploration will be based on, and it is hoped that further oil and gas exploration and mineral exploration will be conducted in southwestern Manitoba as a result of the new compilations and advancements.

Project Participants

Geological Survey of Canada:

The project was initially led by Benoit Beauchamp (GSC-C), who has subsequently left the GSC and has been replaced by Martin Fowler (GSC-C). Mark Williamson (GSC-A) is responsible for finances. **Manitoba Industry, Economic Development and Mines:**

Led by Ruth Bezys and Carol Martiniuk, is responsible for coordinating research work in Manitoba for the TGI project. Michelle Nicolas (Petroleum Branch) is the chief researcher, along with Jim Bamburak; Gaywood Matile and Greg Keller (MGS) will guide the development of a 3-D geological model for the project; Len Chackowsky (MGS) is involved in final map production; Glenn Conley (MGS) is involved in database management; Craig Steffano and Paul Lenton (MGS) are involved in website design; and Derek Bogdan and Lori Janower (MGS) are involved with bibliography.

Saskatchewan Industry and Resources:

Under the direction of Kim Kreis and Steve Whittaker, is responsible for the coordination of all research tasks in Saskatchewan. Melinda Yurkowski will direct Saskatchewan's compilation of a comprehensive geoscience bibliography and development of an ArcView GIS product for the geoscience knowledge inventory. Her stratigraphic expertise with Mesozoic strata will also be used. Other SIR researchers include Andre Costa, Megan Opseth, Jeff Coolican, Stacey Spooner, Fran Haidl and Andrew Nimegeers.

The University of Saskatchewan:

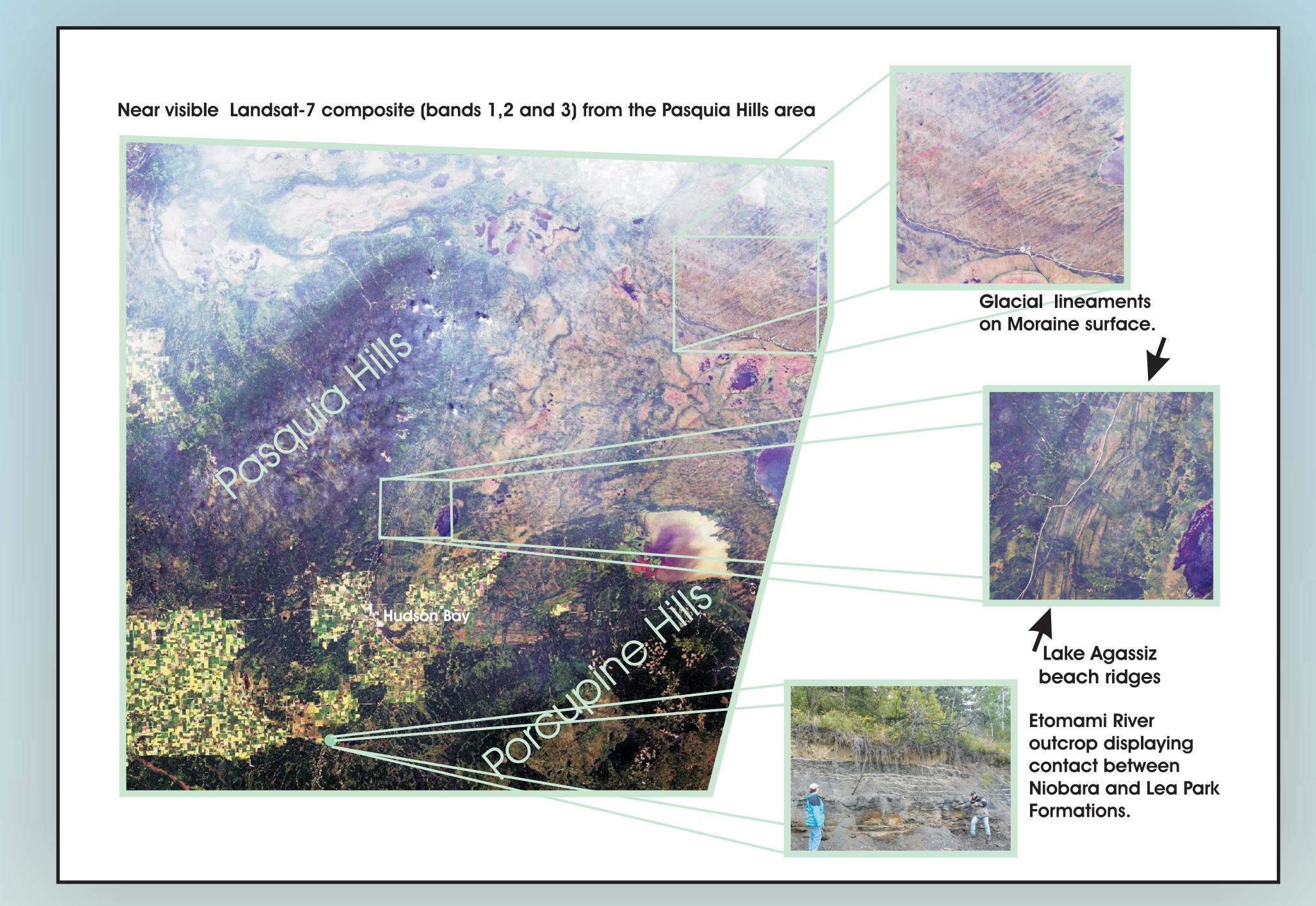
Dr. Igor Morozov will be responsible for regional geophysical investigations in the TGI project area. Dr. Jiakang Li, a Post Doctoral Fellow with the University of Saskatchewan, will work with Dr. Morozov on the compilation, integration, and interpretation of regional gravity and aeromagnetic datasets.

University of Alberta:

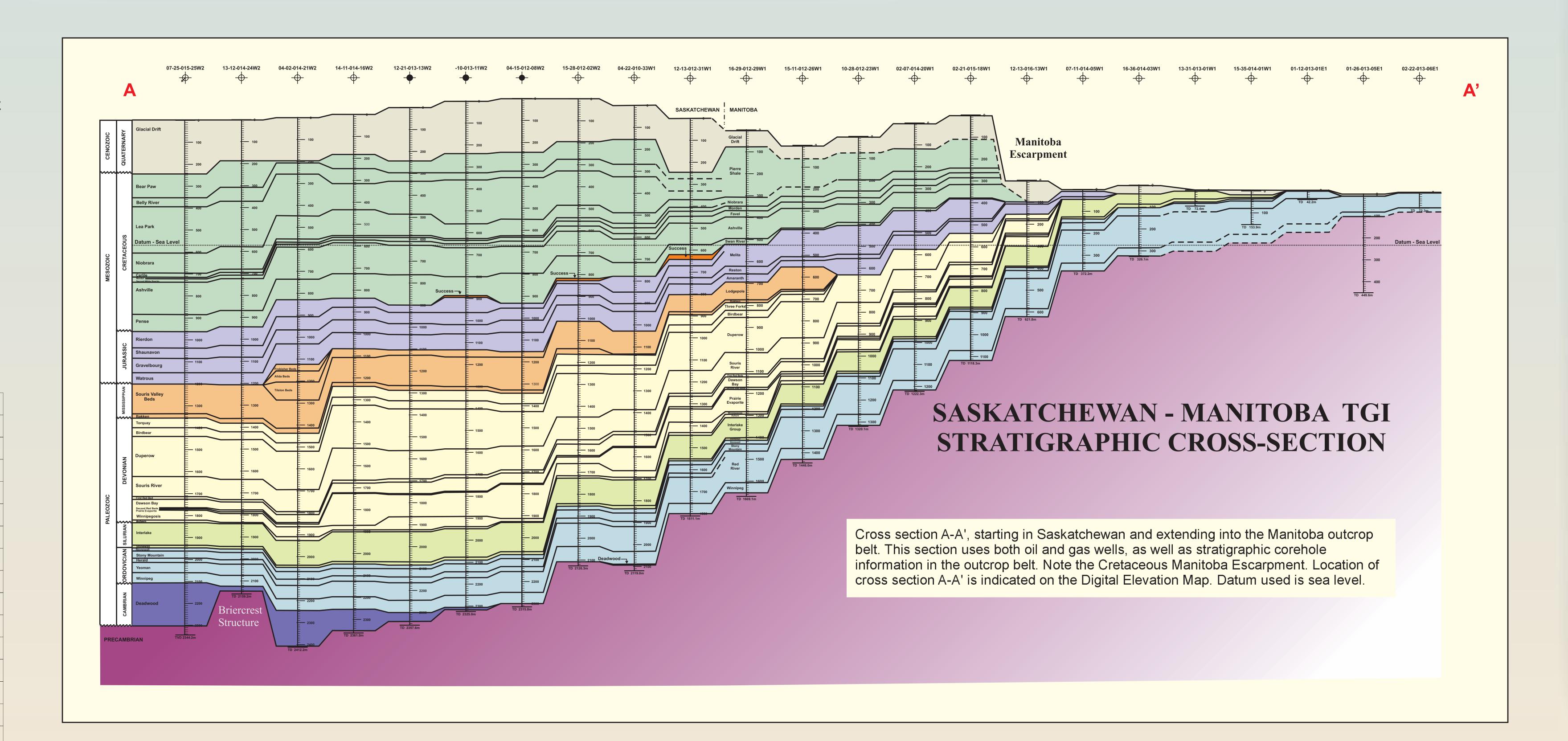
Under the leadership of Dr. Ben Rostron, Dan Palombi (M.Sc. student) will map existing hydrogeological and hydrochemical data for major deep aquifers (>250 m) to describe their flow in three dimensions.

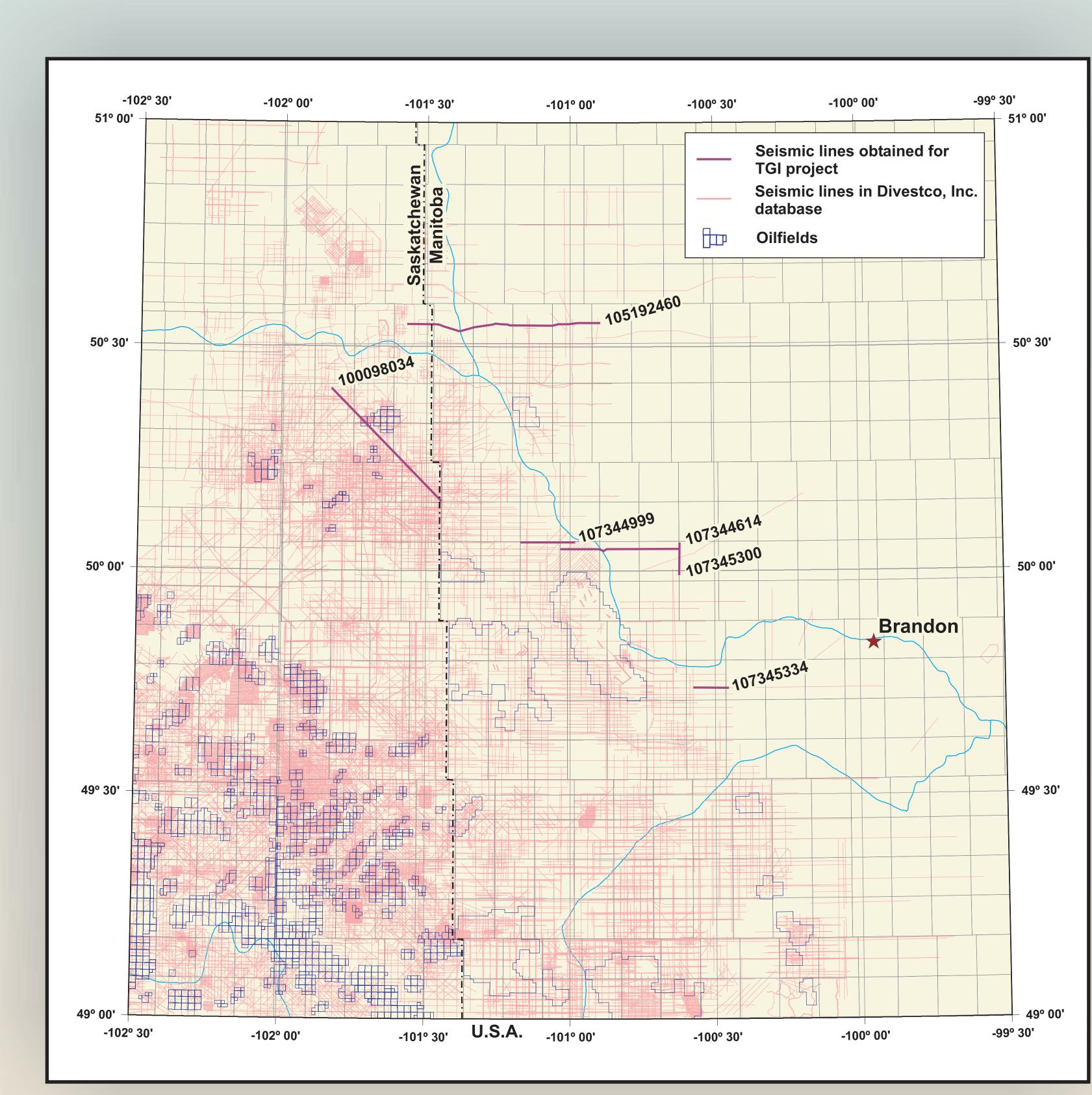
Consultants:

Consultants have been hired in support of the geoscience knowledge inventory and regional geological mapping. Dr. Don Kent and Patty Thomas will be working with SIR geologists, primarily in Saskatchewan, on Paleozoic stratigraphy, while Dr. Jim Christopher will focus on Mesozoic stratigraphy. Dan Barchyn will be working with Manitoba geological staff on all Phanerozoic stratigraphy in Manitoba.

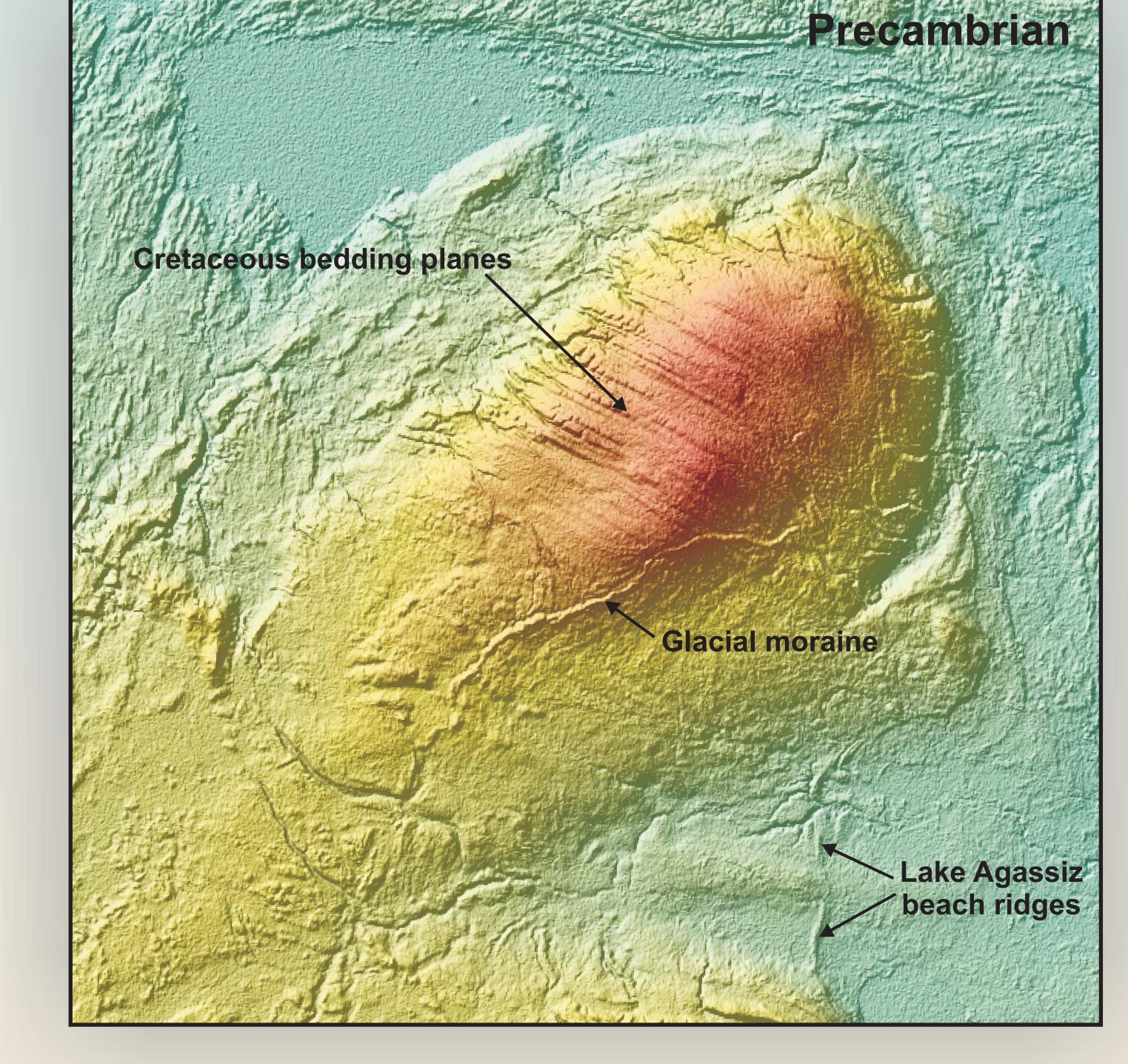


Near visible Landsat-7 composite (bands 1, 2 and 4) from the Pasquia and Porcupine hills area (straddling the Saskatchewan and Manitoba border).





Location map of seismic lines from part of the database provided by Divestco Inc. for the TGI project, showing seismic lines in SE Saskatchewan and SW Manitoba. The six lines shown in bold are being obtained and will be analyzed to calibrate the detailed structure of the Precambrian basement inferred from potential field data.



Blowup of the main DEM for the Wapawekka Hills area of Saskatchewan.

