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**GEOLOGICAL SURVEY OF CANADA
OPEN FILE 8186**

**3-D surficial geological models in Canada:
an annotated bibliography**

L.M. Coffin and H.A.J. Russell

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Introduction

The need for and role of geological survey organizations in the development of 3D geological models as a modern vehicle for data delivery and mapping delivery was highlighted by Thorleifson et al. (2011). Canada in 3D is a two year proof of concept project within the Open Geoscience Program of the Geological Survey of Canada (Geological Survey of Canada, 2014a). The project was outlined in a concept paper (Canada in 3D, 2015) and initiated in January of 2015 through an internal workshop at the Geological Survey of Canada. The project is a fully collaborative initiative between the GSC and respective provincial and territorial geological surveys under the auspices of the National Geological Survey Committee (NGSC). A decision was taken to approach a proof of concept national framework model by modelling four geological surfaces coincident with: i) land surface, ii) base of surficial, iii) base of Phanerozoic, and iv) the Moho. Working groups were identified to not only work on modelling the elevation of these surfaces, but also to develop updated national syntheses of the bedrock geology and possibly the surficial geology. For the proof of concept it was decided to focus work on the terrestrial portion of the country. Compilation of a bibliography on 3D modelling of surficial geology was completed as part of Canada in 3D.

International Context

Canada in 3D is the GSC's response to the recognition that in the 21st century, following 50 years of prolific data collection and knowledge development, that the geological heritage of Canada needs to be managed, visualized and presented for analysis in a new way (Canada in 3D, 2015; Brodaric, 2015; Russell et al., 2015a,b). Similar and more advanced initiatives are underway in a number of European countries, notably the United Kingdom (Mathers et al., 2012) and the Netherlands (Meulen et al., 2013). A general overview of work being completed on 3D geological modelling at geological survey organizations, principally for water resource work, is available in Berg et al. (2011) and specifics to surficial 3D modelling at the GSC by Russell et al. (2011; 2015a). A survey of 3D work under way in Europe by geological survey organizations was compiled by Pfeleiderer and Kessler (2015). In North America parallel initiatives to Canada in 3D include Digital Crust in the USA (Fan et al., 2014). The 21st century has seen breath-taking development in geographic visualization with the development Google Earth. Subsequently One Geology was organized as a collaborative initiative of geological survey organizations around the world to provide access to digital geological mapping of

participating countries (One Geology). The vision of many geological survey organizations is to now realize a digital framework of their subsurface geology for visualization in a similar manner (e.g., Mathers et al., 2012).

Surficial Working Group.

For the proof of concept project the surficial working group is focused on a number of tasks. The primary task has been to compile regional scale modeled depth to bedrock which has been accomplished for much of southern Canada (e.g. Russell et al., 2015a). The additional step toward a terrestrial depth to bedrock surface is now focused on the Precambrian Shield and principal Phanerozoic orogenic belts using a rules-based approach based on the national surficial geological materials map (Fulton, 1993; Geological Survey of Canada, 2014b). Three additional initiatives that are underway are a compilation and reclassification of provincial surficial geological compilations, a document on the data support for 3D modelling, and this document, the annotated bibliography.

Objective

To explore the state of 3D modelling of surficial geology in Canada by public agencies a bibliography was compiled. The current document provides a value added component to the bibliography with a brief summary of the nature and content of respective publications. The intent is to provide an entry point into literature and a shortcut to the actual model publications. This bibliography lists models, conference presentations, datasets, maps, bulletins, open file reports, journal papers, summary of activity reports and theses. Each entry includes a bibliographic reference, keywords and a summary for the reference. The references are arranged by province, starting in the west and moving east; for provinces and territories that are not listed, no references relating to the development of public domain 3D models were found at the time of this compilation.

Content Analysis

Publications on 3D modelling of the surficial geology across Canada including datasets, maps and summaries of fieldwork used to create databases for the final output model have been compiled in an annotated bibliography (Annex 1). The bibliography contains 170 references on the development and creation of 3D surficial models in the public domain. With the exception of 27 references to 3D models, the remaining references document data collection and model development toward an eventual 3D model (Figure 1; Table 1).

Structure of Annotated Bibliography

For each reference in the annotated bibliography a summary has been generated and information on the size, grid size, number of layers, modelling software, database software and data sources are listed. Data sources used to create an integrated model include water well records, seismic profiles, stratigraphic sections, geotechnical analysis, surficial maps, geological maps and borehole records. In most cases, these data sources have been compiled into databases; MS Access™, MS Excel™ and ArcGIS™; which form the basis of the 3D models. There are numerous types of modelling software that were used to create these 3D models including ArcGIS™, Datamine©, FEFLOW©, GMS©, gOcad™, LeapFrog® Hydro, Manifold® GPS and MapInfo™. This highlights one of the key challenges associated with creating a 3D model for Canada; integrating data from multiple different modelling sources, databases and file types.

Table 1, there is a column titled “publicly available” which indicates if the data used to build the model is available to be downloaded online by the public. If the model is not publicly available, it can generally be obtained by contacting the person listed as the primary author for each reference. There is also a column that indicates what type of model has been published, including 3D geological, hydrostratigraphic or depth to bedrock models. 3D geological models include multiple layers and indicate differences in stratigraphy related to geology whereas hydrostratigraphic models delineate stratigraphy related to hydrology. Depth-to-bedrock models only give a single layer for the 3D surface where bedrock intersects overlying stratigraphy.

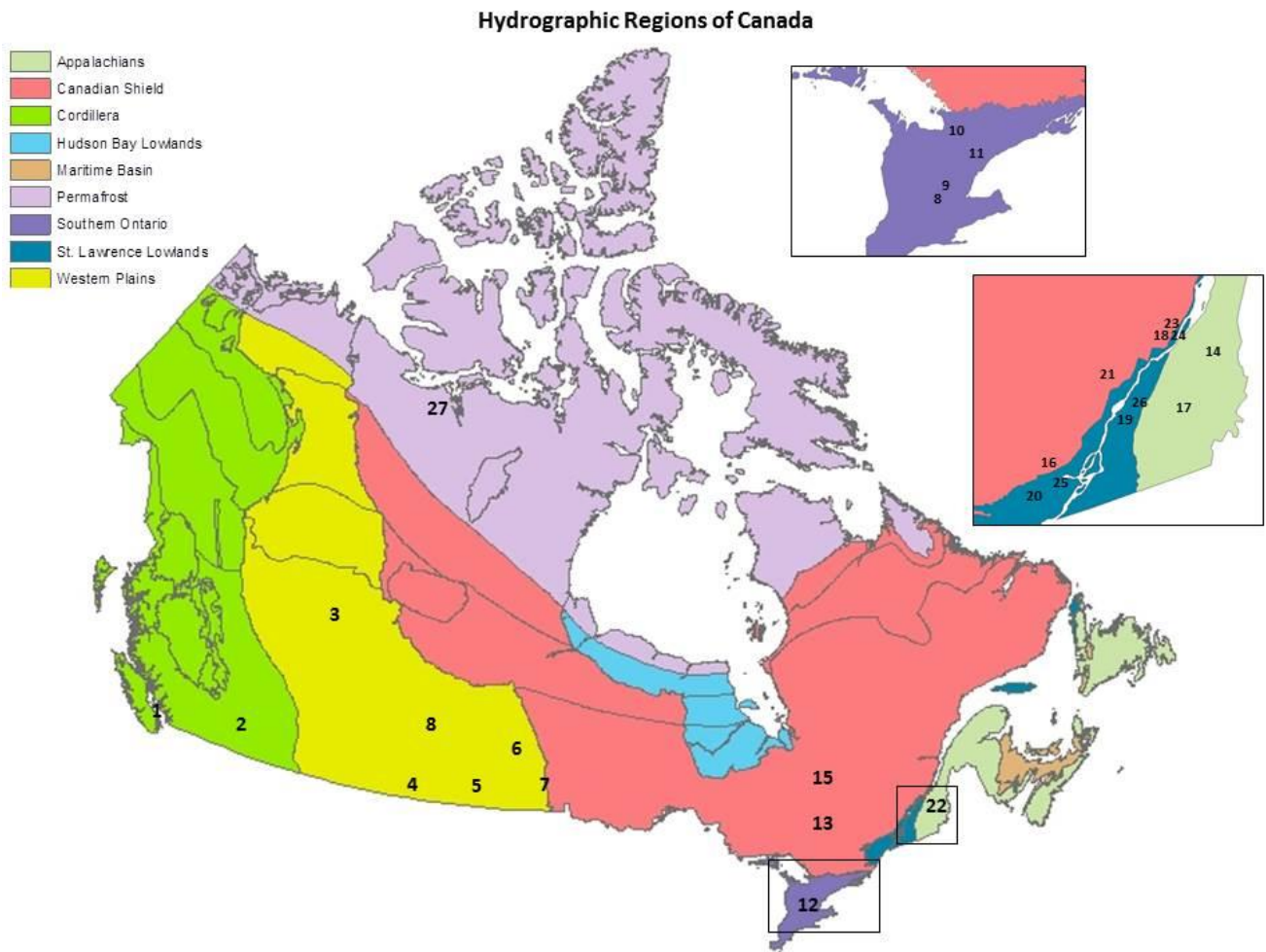


Figure 1: Map of Canada with hydrogeological regions (modified from Sharpe et al., 2008) and sites of surficial 3D geological models of one of three types, i) depth to bedrock, ii) multilayer geological model, and iii) hydrostratigraphic models. Numbers refer to ordering in Table 1.

Provincial Summary

Table 1: 3D models available as datasets

Map number	Reference	Associated Model	Model Size	Model Type	Publicly Available
1	Benoit et al., 2015	Nanaimo	580 km ²	Hydrostratigraphic	Yes
2	Paradis et al., 2010	Okanagan Valley	8 200 km ²	3D Geological	Yes
3	Lyster et al., 2016	Alberta	661 848 km ²	Depth to bedrock	Yes
4	Manitoba Geological Survey, 2009	Williston Basin	280 000 km ²	Depth to bedrock	Yes
5	Keller et al., unpublished	South of 55° Manitoba			No
6	Keller et al., unpublished	Lake Winnipeg			No
7	Logan et al., 2015	Spiritwood	12 000 km ²	Hydrostratigraphic	Yes
8	Bajc and Shirota, 2007	Waterloo	600 km ²	3D Geological	Yes
9	Burt, 2012	Orangeville	1 500 km ²	3D Geological	Yes
10	Burt and Dodge, 2011	Oro Moraine	700 km ²	3D Geological	Yes
11	Logan et al., 2005	Oak Ridges Moraine	11 000 km ²	3D Geological	Yes
12	Gao et al., 2006	Southern Ontario		3D Geological	Yes
13	Logan et al., 2009	South Nation	11 000 km ²	Hydrostratigraphic	Yes
14	Caron et al., 2014	Chaudière	17 000 km ²	3D Geological	No
15	Cloutier et al., 2015	Abitibi-Témiscamingue	10 362 km ²	Hydrostratigraphic	No
16	Comeau et al., 2013	Outaouais	13 762 km ²	3D Geological	No
17	Girard, 2001	Portneuf	400 km ²	3D Geological	No
18	Lamarche, 2011	St. Lawrence River, Québec City	1 595 km ²	3D Geological	No
19	Larocque et al., 2015	Nicolet/ St-François	4 585 km ²	3D Geological	No
20	Larocque et al., 2015	Vaudreuil- Soulanges	160 km ²	3D Geological	No
21	Leblanc et al., 2013;	Mauricie	3 350 km ²	3D Geological	No
22	Howlett and Ross, 2016	Mirabel, Portneuf, South Nation, Châteauguay, Québec City and Chaudière	72 000 km ²	3D Geological	In progress
23	Talbot-Poulin et al., 2013	Québec City	3 350 km ²	3D Geological	No
24	Ross, 2004	Southwestern Québec	1 500 km ²	3D Geological	No
25	Tremblay, 2008	Châteauguay River	2 300 km ²	3D Geological	Yes
26	Godbout et al., 2011	Bécancour	3845 km ²	3D Geological	No
27	Kerr and Knight, 2007	Slave Province	95 231 km ²	Depth to bedrock	Yes

British Columbia has five entries in the annotated bibliography with two unique 3D Models; one for the Nanaimo Lowland Region (Benoit et al., 2015) and the other is for the Okanagan Valley (Paradis et al., 2010). The other three references consist of two summary of activity reports for the BC Geological Survey (BCGS) and one journal article based on the BCGS work.

Alberta has 34 entries, most of which are associated with the large number of datasets (19) and corresponding maps (14) that have been released as two separate publications. The majority of these datasets and maps were published as part of a larger study for a regional groundwater mapping project of the Edmonton-Calgary Corridor. In Alberta there is one comprehensive 3D model that encompasses the bedrock topography of the entire province, which is publicly available (Lyster et al., 2016).

There are over 20 references for work completed in Manitoba on three distinct areas (Lake Winnipeg, Williston Basin and the Phanerozoic model of southern Manitoba). No Quaternary models for these regions have been published; the Williston Basin bedrock geology model has been released publicly and contains the depth to bedrock surface for the area (Manitoba Geological Survey, 2009). The information for the Phanerozoic terrane and Lake Winnipeg regions has not yet been published but it can be obtained by contacting the Manitoba Geological Survey.

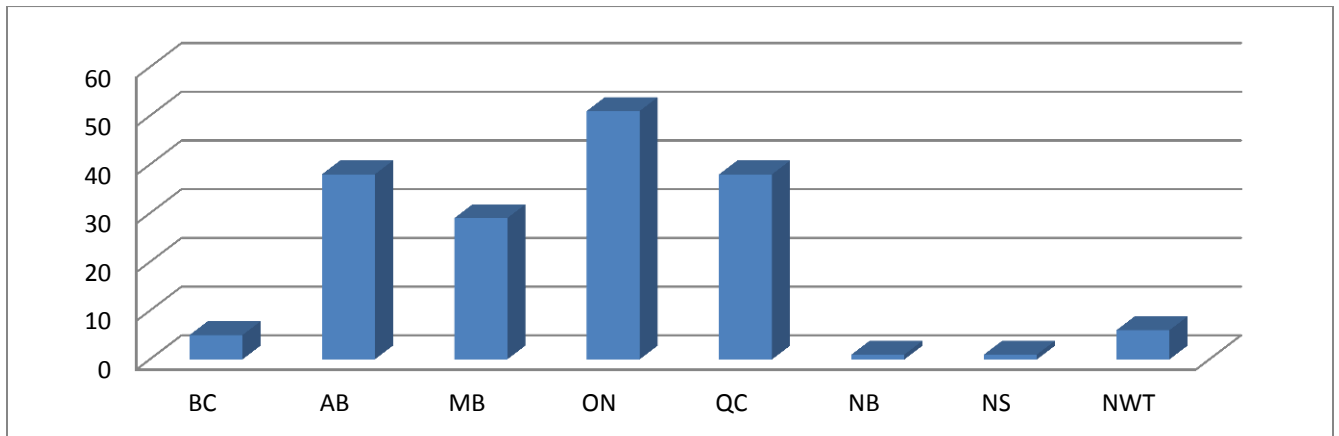


Figure 2: Distribution of bibliography entries by province. Large number of entries commonly reflects progress reporting on data collection to support model development.

Ontario with 51 publications has the highest number of references in the bibliography, which reflects the multiple large-scale groundwater-related programs that have been undertaken in the past decade by both the Ontario Geological Survey's 3D Quaternary Mapping Projects in Ontario and the Geological Survey of Canada's interest in the southern Ontario region. Most of these references come from summary of activity reports for the Ontario Geological Survey, as they have multi-year programs to collect data for respective study areas and they are required to report their activities on an annual basis. This creates a source of data duplication, as most field areas are referenced in multiple years as field work is being carried out and before the final 3D model is produced. Four stratified moraine areas have been modelled in Southern Ontario, the Oak Ridges Moraine,

(Logan et al 2005), Waterloo (Bajc and Shirota, 2007), Oro (Burt, 2012) and Orangeville (Burt, 2012). In northern Ontario one 3D dataset exists in the Timmins area (Paulen et al., 2006).

Most of the references generated for the province of Québec are associated with the “Program d’acquisition des connaissances sur les eaux souterraines” (PACES), which was a large scale project involving dozens of partners (universities, conservation authorities, government, etc.) to assess, model and characterize groundwater in Québec, particularly the St Lawrence Valley region. The final outputs for these projects are labeled PACES reports throughout this bibliography and can all be easily accessed online. In addition to the final reports, there are numerous conference papers, journal articles and theses attributed to PACES. These reports do not release all of the data associated with the models or the models but interested users should contact the primary authors.

New Brunswick has one entry, associated with a large integrated hydrogeological study by the Geological Survey of Canada (GSC) on the Maritimes Basin. It does not include a publically available model and consists only of a surficial representation of the geology map draped over a 3D surface (Rivard et al., 2008).

Similar to New Brunswick, Nova Scotia only has one entry that is associated with a GSC hydrogeological study on the Annapolis Valley designed to characterize and quantify groundwater resources (Rivard et al., 2012).

The Northwest Territories has 6 entries, most of which are associated with a large-scale collection of data from 343 989 seismic shothole driller’s logs, averaging 18.9 m in depth. This data is publicly available from Smith and Lesk-Winfield (2010) as ArcGIS layers for minimum estimates of drift and till thicknesses. Although not a 3D model it was included in this bibliography because it covered a large part of northern Canada, where data is relatively sparse. The other two references refer to the publication of an overburden thickness map for a large part of the Slave Province (Kerr and Knight, 2007; Knight and Kerr, 2007).

The entries for this bibliography come from a variety of sources including conference presentations, datasets, maps, bulletins, summary of activity reports, theses, journal papers, open file reports, PACES reports, stand-alone models and unpublished reports (Figure 3). The majority of the references come from summary of activity reports for provincial geological surveys, as they have multi-year programs to collect data for each area of interest and their activities are summarized on an annual basis, creating a source of data duplication. There are also a large number of dataset sources, which predominantly (76%) come from the Alberta

Geological Survey and are generally accompanied by a corresponding map, which has been published separately.

Many of the conference presentation sources are abstracts or extended abstracts which were included for the purpose of completion, as they do not contain additional or unique information since they are generally presented in conjunction with a journal paper or alternate source that contains the same data. The three unpublished reports refer to the two Manitoba models (Phanerozoic and Lake Winnipeg) as well as a 3D hydrostratigraphic model for the Chaudière watershed; which have been referred to in numerous references, but have not been formally published.

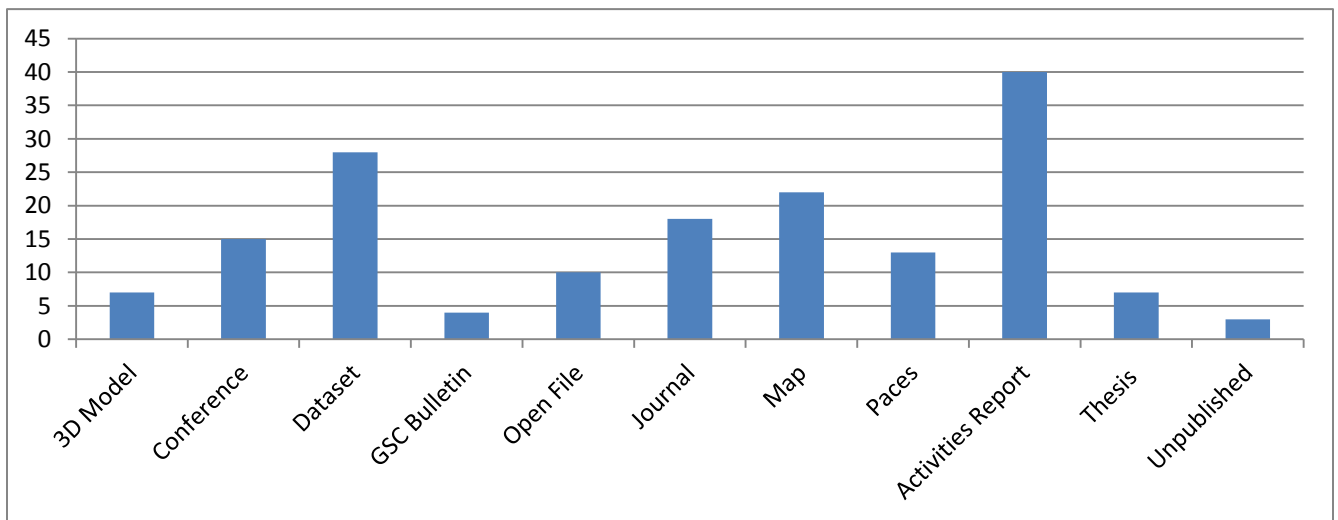


Figure 3: Distribution of data sources for the annotated bibliography

Software

There were eight different modelling software programs used to create 3D models included in this bibliography including ArcGIS, Datamine, FEFLOW, GMS, gOcad, LeapFrog Hydro, Manifold GPS and MapInfo. At first glance over 50 references use ArcGIS to create 3D surficial models (Figure 4a), when in reality, the majority of these references used ArcGIS to create inputs for the 3D models, which doesn't necessarily reflect the actual modelled surfaces. For instance, all of the references from Alberta use ArcGIS software, but none of the references would be considered a standalone 3D model; the information presented in them could be imported into a 3D modelling program where stratigraphy could be correlated to create a 3D model. Figure 4b summarizes the modelling software used to create the models outlined in Table 1 reflecting the shift from ArcGIS to gOCad and MapInfo for modelling 3D surfaces.

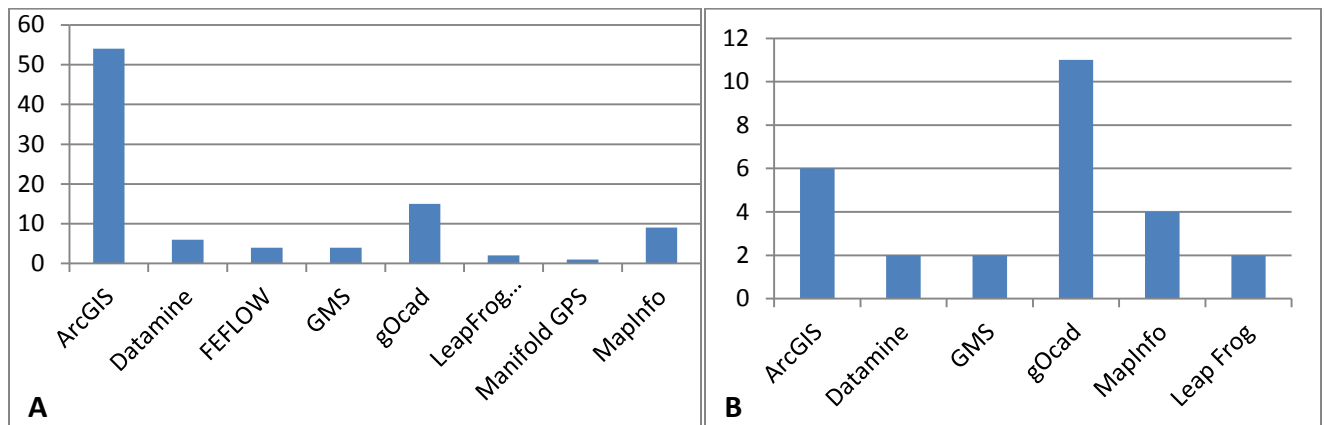


Figure 4a: Software used by references to compile data, create maps, hydrostratigraphic models and 3D models. Figure 4b: Software used to create the standalone 3D models listed in Table 1.

Acknowledgements

Input was solicited on the bibliography content to ensure completeness. The feedback from the following individuals is much appreciated; N. Atkinson, M. Hansen, G. Keller, D. Kerr, R. Knight, K. Lo, M. Pyne, M. Nastev, M. Parent, A. Plouffe, J. Shaw, R. Smith, and T. Tremblay. This publication is a contribution of the Canada in 3D project in Open Geoscience.

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Annex 1- Annotated Bibliography

British Columbia

Andrews G.D.M, Plouffe A., Ferbey T., Russell, J. K. Brown, S.R. and Anderson, R.G. (2011) The thickness of Neogene and Quaternary cover across the central Interior Plateau, British Columbia: analysis of water-well drill records and implications for mineral exploration potential *Can J Earth Sci* 48:973–986.

Keywords: Depth to bedrock, Manifold GPS, Journal Article, British Columbia

Summary: An analysis of 10486 water well records used to produce depth-to-bedrock maps using Manifold GPS v. 8 with the Surface Tools extension for five cities on the central Interior Plateau of British Columbia (100 Mile House, Prince George, Quesnel, Vanderhoof and Williams Lake). The interpretation of these new maps provides constraints on drift thickness (Neogene and Quaternary sediments) localization in pre-Wisconsinan bedrock paleovalleys.

Andrews G.D.M, Russell J.K. (2008) Cover thickness across the southern Interior Plateau, British Columbia (NTS 0920, P; 093A, B, C, F): constraints from water-well records. *Summ Act 2007 Geosci BC, Rep 2008-1* 11–20.

Keywords: Depth to bedrock, 30000 km2, MS Excel, Summary of Activities Report, British Columbia

Summary: A drift thickness model based on 1773 water wells and 6 measured sections created by entering geographic, hydrogeological and lithological data into an Excel spreadsheet. This work forms part of the Geoscience BC project 2006-003, which aims to produce a 30000 km² 3-D facies and thickness models for the Chilcotin Group basalts.

Benoit, N., Paradis, D., Bednarski, J. M., Hamblin, T., & Russell, H. A. J. (2015). Three dimensional hydrostratigraphic model of the Nanoose - Deep Bay area, Nanaimo Lowland, British Columbia. *Geological Survey of Canada, Open File 7796*, 1–26. <http://doi.org/10.4095/296302>

Keywords: Hydrostratigraphic Model, 580 km2, LeapFrog Hydro, Open File Report, British Columbia

Summary: A three-dimensional hydrostratigraphic model was developed using LeapFrog Hydro for the Nanaimo Lowland aquifer system, covering a 580 km² area on a coastal strip running from Nanoose to Deep Bay on eastern Vancouver Island. Existing data including a digital elevation model (30 x 30 m grid resolution), 708 bedrock wells and 570 surficial wells, surficial geological maps and 12 stratigraphic columns (1 cross section) was supplemented by new data collected by the GSC. This new data consisted of updated surficial geology mapping, bedrock outcrop analysis (61 outcrops), 2-D seismic reflection surveys (42 line km over 15 lines), 3 rotosonic cores and borehole geophysics in 5 wells.

Hickin AS, Kerr B (2005) Bedrock topography mapping and shallow gas in northeast BC. Summ Act 2005, BC Minist Energy, Mines Pet Resour 69–75.

Keywords: Depth to bedrock, MS Access, Summary of Activities Report , British Columbia

Summary: Part of the bedrock topography and drift thickness mapping program covering the Fontas River and the Petitot River (NTS 94I & NTS 94P) that will result in the production of 1:250 000 scale maps for the plains region of northeastern BC. The data obtained from oil and gas well petrophysical logs, drill cuttings, surficial and bedrock geology maps and water well lithology logs were entered into a MSAccess database which was used to create interpolated surfaces and stratigraphic sections in ViewLog resulting in a digital elevation model for quaternary and tertiary sediments. Paper proposes a methodology for bedrock topography mapping in northeastern BC

Paradis, S.J., Boisvert, É., Smirnoff, A., Deblonde, C., Grasby, S., Telka, A., Pugin, A., Pullan, S., Thomson, S. 2010. Surficial geology, geochemistry and 3D modeling of the Kelowna-Westbank-Mission Creek area, Geological Survey of Canada, Open File 6507, 1 CD-Rom

Keywords: 3D Geological Model, 8200 km2, gOcad, Open File Report, British Columbia

Summary: This open file is a compilation of data that was used to create a three dimensional gOcad model for the 8200 km² Kelowna/ Okanagan Lake area. New data collected consists of one 88 m deep borehole, a field survey and a geophysics campaign. New and previous work was compiled into a borehole database using over 6800 wells which was used to create stratigraphic cross sections in ArcGIS. Two 3D models, one high resolution and one low resolution, were built in gOcad by using a Support Vector Machine classification algorithm based on the geological unit classification.

Alberta

Andriashek, L.D. and Atkinson, N. 2007. Buried channels and glacial-drift aquifers in the Fort McMurray region, northeast Alberta. Alberta Geological Survey, Earth Sciences Report 2007-01. http://www.ags.gov.ab.ca/publications/abstracts/ESR_2007_01.html

Keywords: Bedrock topography, ArcGIS, Summary of Activities Report , Alberta

Summary: The construction of a three-dimensional model of the bedrock topography and subcrop, as well as the major buried aquifers contained within buried valleys and channels based on the acquisition and interpretation of more than 35000 new borehole logs from the oil sands industry. From this model, a series of maps and cross-sections have been generated depicting the subsurface distribution of previously known and newly discovered buried aquifers.

Andriashek, L.D. 2006. Quaternary geology and bedrock subcrop of the Cold Lake to Ft. McMurray area, Alberta – surface structure, Empress Formation sand and gravel. Alberta Geological Survey, DIG 2006-0052. http://www.ags.aer.ca/publications/DIG_2006_0052.html

Keywords: Quaternary Geology, ArcGIS, Dataset, Alberta

Summary: A digital grid of the top of the Empress Formation where present, or the topography of the surrounding landscape, where the formation is absent. This includes the units 1 to 3 of the Empress Formation in buried valleys, as well as undifferentiated Empress interfluvial sediments resting on the bedrock surface between buried valleys. The unit is originally modelled from borehole data and adjusted to the bedrock surface, the surfaces of units 1, 2, 3 and interfluvial units of the Empress Formation, and the present-day land surface. The grid is generated at a 250 metre cell-size resolution, based on 2003 information

Andriashek, L.D. 2006. Quaternary geology and bedrock subcrop of the Cold Lake to Ft. McMurray area, Alberta. Alberta Geological Survey, DIG 2006-0027.
http://www.ags.aer.ca/publications/DIG_2006_0027.html

Keywords: Bedrock topography, ArcGIS, Dataset, Alberta

Summary: A digital grid of the top of the bedrock surface, originally modeled from borehole data and adjusted to present-day river erosion. The grid is generated at a 250 m cell-size resolution, based on information as recent as 2003.

Andriashek, L.D. 2006. Quaternary geology and bedrock subcrop of the Cold Lake to Ft. McMurray area, Alberta – surface structure, Empress Fm. Unit 1 sand and gravel. Alberta Geological Survey, DIG 2006-0026. http://www.ags.aer.ca/publications/DIG_2006_0026.html

Keywords: Quaternary Geology, ArcGIS, Dataset, Alberta

Summary: A digital grid of the top of the Empress Fm. Unit 1 sand and gravel, (the lowermost unit in the Empress Formation), where present, or the topography of the surrounding landscape, where Unit 1 is absent. The unit is originally modeled from borehole data and adjusted to the bedrock surface and present-day land surface. The grid is generated at a 250 m cell-size resolution, based on information as recent as 2003.

Andriashek, L.D. 2006. Quaternary geology and bedrock subcrop of the Cold Lake to Ft. McMurray area, Alberta – surface structure, Empress Fm. Unit 2 sand and gravel. Alberta Geological Survey, DIG 2006-0025. http://www.ags.aer.ca/publications/DIG_2006_0025.html

Keywords: Quaternary Geology, ArcGIS, Dataset, Alberta

Summary: A digital grid of the top of the Empress Fm. Unit 2 silt and clay, (the middle unit in the Empress Formation), where present, or the topography of the surrounding landscape, where Unit 2 is absent. The unit is originally modeled from borehole data and adjusted to the bedrock surface, the surface of Unit 1, and the present-day land surface. The grid is generated at a 250 m cell-size resolution, based on information as recent as 2003.

Andriashek, L.D. 2006. Quaternary geology and bedrock subcrop of the Cold Lake to Ft. McMurray area, Alberta – Surface structure, valley interfluvial sand and gravel. Alberta Geological Survey, DIG 2006-0024. http://www.ags.aer.ca/publications/DIG_2006_0024.html

Keywords: Quaternary Geology, ArcGIS, Dataset, Alberta

Summary: A digital grid of the top of the sand and gravel deposits that lie on the interfluvial benches between major bedrock valleys. The unit is originally modeled from borehole data and adjusted to the bedrock surface and the present-day land surface. The grid is generated at a 250 m cell-size resolution, based on information as recent as 2003.

Andriashek, L.D. 2006. Quaternary geology and bedrock subcrop of the Cold Lake to Ft. McMurray area, Alberta – surface structure, Empress Fm. Unit 3 sand and gravel. Alberta Geological Survey, DIG 2006-0023. http://www.ags.aer.ca/publications/DIG_2006_0023.html

Keywords: Quaternary Geology, ArcGIS, Dataset, Alberta

Summary: Digital grid of the top of the Empress Fm. Unit 3 sand and gravel, (the uppermost unit in the Empress Formation), where present, or the topography of the surrounding landscape, where Unit 3 is absent. The unit is originally modeled from borehole data and adjusted to the bedrock surface, the surfaces of units 1 and 2 of the Empress Formation, the and present-day land surface. The grid is generated at a 250 m cell-size resolution, based on information as recent as 2003.

Andriashek, L.D. 2005. Bedrock topography of Winefred map area, Alberta (NTS 73M). Alberta Geological Survey, Map 250. http://www.ags.aer.ca/publications/MAP_250.html

Keywords: Bedrock topography, ArcGIS, Map, Alberta

Summary: Elevation contours of the bedrock surface are depicted for the Winefred map area. This map also presents rendered grids of the drift thickness and bedrock topography of the study area, as well as 3-dimensional perspective view of the subsurface.

Andriashek, L.D. 2005. Bedrock topography and valley thalwegs of the Edmonton map area. Alberta Geological Survey, Map 216. http://www.ags.aer.ca/publications/MAP_216.html

Keywords: Bedrock topography, ArcGIS, Map, Alberta

Summary: The bedrock topography of the Edmonton area can be described as a regional northeast sloping bedrock surface dissected by numerous channels of preglacial and glacial fluvial origin. The bedrock surface ranges in elevation from about 900 m in the extreme southwest corner of the map area, to as low as 560 m in the northeast corner.

Andriashek, L.D. 2005. Drift thickness of the Edmonton map area. Alberta Geological Survey, Map 215. http://www.ags.aer.ca/publications/MAP_215.html

Keywords: Drift thickness, ArcGIS, Map, Alberta

Summary: Drift thickness in the Edmonton map area ranges from less than 10 m over flat-lying bedrock surfaces, to more than 70 m within the Cooking Lake Moraine and a number of buried valleys.

Atkinson, N. and Lyster, S. 2011. Thickness and distribution of Quaternary and Neogene sediment in Alberta, Canada (gridded data, ASCII format). Alberta Geological Survey, DIG 2010-0036. http://www.ags.aer.ca/publications/abstracts/DIG_2010_0036.html

Keywords: Depth to bedrock, ArcGIS, Dataset, Alberta

Summary: Dataset depicting a geostatistical model of the thickness of sediment overlying bedrock in Alberta generated to assist in the construction of a new geological framework for Alberta. The sediment thickness surface was derived by subtracting the bedrock topography of Alberta (Map 550, Atkinson and Lyster, 2010) from the digital elevation model of Alberta. These data comprise the raster surface for Map 551 (Atkinson and Lyster, 2011).

Atkinson, N. and Lyster, S. 2011. Thickness and distribution of Quaternary and Neogene sediment in Alberta, Canada. Alberta Geological Survey, Map 551. http://www.ags.aer.ca/publications/abstracts/MAP_551.html

Keywords: Depth to bedrock, ArcGIS, Map, Alberta

Summary: Map depicting the thickness of sediment overlying bedrock in Alberta generated to assist in the construction of a new geological framework for Alberta. The sediment thickness surface was derived by subtracting the bedrock topography of Alberta (Map 550, Atkinson and Lyster, 2010) from the digital elevation model of Alberta. This map was created using gridded data (Atkinson and Lyster, 2011).

Atkinson, N. and Lyster, S. 2010. Bedrock topography of Alberta, Canada (gridded data, ASCII format). Alberta Geological Survey, DIG 2010-037. http://www.ags.aer.ca/publications/abstracts/DIG_2010_0037.html

Keywords: Bedrock topography, ArcGIS, Dataset, Alberta

Summary: Dataset depicting a geostatistical model bedrock topography in Alberta. This model is based on water-well lithology, stratigraphic picks from oil and gas petrophysical logs, data derived from digitized contour interpretations on bedrock topography and a 60 m grid-spaced digital elevation model. These data comprise the raster surface for Map 550 (Atkinson and Lyster, 2010).

Atkinson, N. and Lyster, S. 2010. Bedrock topography of Alberta, Canada. Alberta Geological Survey, Map 550. http://www.ags.aer.ca/publications/abstracts/MAP_550.html

Keywords: Bedrock topography, ArcGIS, Map, Alberta

Summary: Map depicting the bedrock topography in Alberta generated to assist in the construction of a new geological framework for Alberta. Data was collected from water-well lithology, stratigraphic picks from oil and gas petrophysical logs, data derived from digitized contour interpretations on bedrock topography and a 60 m grid-spaced digital elevation model. The map was created using gridded data (Atkinson and Lyster, 2010).

Lyster, S., MacCormack, K.E. and Atkinson, N. (2016): Pick elevations for the bedrock topography of the Alberta Plains (tabular data, tab delimited format); Alberta Energy Regulator, AER/AGS Digital Data 2016-0038.

Keywords: Bedrock topography, ArcGIS, Dataset, Alberta

Summary: This dataset consists of previously published information from Alberta Geological Survey (AGS) maps and reports, as well as new data for which the quality has been assessed in order to apply a quality-weighting approach prior to modelling the bedrock topography surface. It is the data used to produce AGS Map 602, Bedrock Topography of Alberta.

MacCormack, K.E., Thorleifson, L.H., Berg, R.C. and Russell, H.A.J. 2016. Three-Dimensional geological mapping: workshop extended abstracts. Alberta Geological Survey, Special Report 101. http://ags.aer.ca/publications/SPE_101.html

Keywords: 661848 km2, Conference Presentation, Alberta

Summary: A compilation of extended abstracts submitted for the 9th Three-Dimensional (3D) Geological Mapping Workshop held at the Geological Society of America Annual Meeting in Baltimore, Maryland on October 31, 2015.

MacCormack, K.E., Lyster, S. and Atkinson, N. (2016): Bedrock topography of Alberta (gridded data, ASCII format); Alberta Energy Regulator, AER/AGS Digital Data 2016-0039.

Keywords: Bedrock topography, Dataset, Alberta

Summary: A computer-generated geostatistical model of the bedrock topography of Alberta using previously published information from Alberta Geological Survey (AGS) maps and reports, as well as new data. The quality of this data has been assessed and then a quality-weighting approach was applied to the dataset prior to interpolation. The surface was modelled using a 500m x 500m grid cell spacing, and as such should not be used for local scale studies. This grid represents the surface portrayed in AGS Map 602, Bedrock Topography of Alberta, and this grid will continue to be updated as part of the Alberta Geological Framework project.

MacCormack, K.E., Atkinson, N. and Lyster, S. 2015. Bedrock topography of Alberta. Alberta Geological Survey, Map 602. http://ags.aer.ca/publications/MAP_602.html

Keywords: Bedrock topography, ArcGIS, Map, Alberta

Summary: Map rendering of a computer-generated geostatistical model of the bedrock topography of Alberta using previously published information from Alberta Geological Survey maps and reports, as well as new data. This map updates Alberta Geological Survey Map 550.

MacCormack, K.E., Atkinson, N. and Lyster, S. 2015. Sediment thickness of Alberta. Alberta Geological Survey, Map 603. http://ags.aer.ca/publications/MAP_603.html

Keywords: Sediment Thickness, ArcGIS, Map, Alberta

Summary: Map rendering of a computer-generated geostatistical model of the thickness and distribution of sediment overlying bedrock in Alberta using a newly revised bedrock topography model of the province (AGS Map 602), and provides refined details on an earlier reconstruction of the sediment isopach map of the province (AGS Map 551).

Pawlowicz, J.G., Fenton, M.M. and Andriashek, L.D. 2007. Bedrock thalwegs, 1: 2 000 000 scale (GIS data, thalweg line features). Alberta Geological Survey, DIG 2007-0026.
http://www.ags.aer.ca/publications/abstracts/DIG_2007_0026.html

Keywords: Quaternary Geology, ArcGIS, Dataset, Alberta

Summary: This data set is an updated, GIS version of part of the Alberta Geological Survey's published Map No. 226, which in turn is a regional synthesis of various published and unpublished maps. The data represent the locations of thalwegs (paleo-channels) incised in the bedrock surface.

Pawlowicz, J.G., Nicoll, T.J., Sciarra, J.N. 2007. Bedrock thalwegs of Bistcho Lake area, Alberta (NTS 84M)(GIS data, thalweg line features). Alberta Geological Survey, DIG 2007-0021.
http://www.ags.aer.ca/publications/abstracts/DIG_2007_0021.html

Keywords: Quaternary Geology, ArcGIS, Dataset, Alberta

Summary: ArcGIS dataset, consisting of shapefiles, depicting the locations of thalwegs incised in the bedrock surface of the Bistcho Lake area (NTS map area 84M).

Pawlowicz, J.G., Nicoll, T.J., Sciarra, J.N. 2007. Drift thickness of Bistcho Lake area, Alberta (NTS 84M)(GIS data, line features). Alberta Geological Survey, DIG 2007-0020.
http://www.ags.aer.ca/publications/abstracts/DIG_2007_0020.html

Keywords: Depth to bedrock, ArcGIS, Dataset, Alberta

Summary: ArcGIS dataset, consisting of line features, depicting the drift thickness of the Bistcho Lake area (NTS map area 84M).

Pawlowicz, J.G., Nicoll, T.J., Sciarra, J.N. 2007. Bedrock topography of Bistcho Lake area, Alberta (NTS 84M)(GIS data, line features). Alberta Geological Survey, DIG 2007-0019.
http://www.ags.aer.ca/publications/abstracts/DIG_2007_0019.html

Keywords: Bedrock topography, ArcGIS, Dataset, Alberta

Summary: ArcGIS dataset, consisting of shapefiles, depicting the bedrock topography of the Bistcho Lake area (NTS map area 84M). These data comprise the raster surface for Map 416 (Pawlowicz et al., 2007).

Pawlowicz, J.G., Nicoll, T.J., Sciarra, J.N. 2007. Bedrock topography of Bistcho Lake area, Alberta (NTS 84M). Alberta Geological Survey, Map 416. http://www.ags.aer.ca/publications/abstracts/MAP_416.html

Keywords: Bedrock topography, ArcGIS, Map, Alberta

Summary: The bedrock topography map shows contours of the elevation of the bedrock above sea level. This map is a graphical representation of bedrock topography data (Pawlowicz et al., 2007).

Pawlowicz, J.G., Fenton, M.M., Hickin, A.S., Nicoll, T.J., Paulen, R.C., Plouffe, A., Smith, I.R. 2005. Bedrock thalwegs of Zama Lake area, Alberta (NTS 84L)(GIS data, thalweg line features). Alberta Geological Survey, Digital Data 2005-0531. http://www.ags.aer.ca/publications/abstracts/DIG_2005_0531.html

Keywords: Quaternary Geology, ArcGIS, Dataset, Alberta

Summary: ArcGIS dataset, consisting of shapefiles, depicting the locations of thalwegs incised in the bedrock surface of the Zama Lake Area (NTS map area 84L).

Pawlowicz, J.G., Fenton, M.M., Hickin, A.S., Nicoll, T.J., Paulen, R.C., Plouffe, A., Smith, I.R. 2005. Drift thickness of Zama Lake area, Alberta (NTS 84L)(GIS data, line features). Alberta Geological Survey, Digital Data 2005-0530. http://www.ags.aer.ca/publications/abstracts/DIG_2005_0530.html

Keywords: Depth to bedrock, ArcGIS, Dataset, Alberta

Summary: ArcGIS dataset, consisting of line features, depicting the drift thickness of the Zama Lake area (NTS map area 84L). These data comprise the raster surface for Map 329 (Pawlowicz et al., 2005).

Pawlowicz, J.G., Fenton, M.M., Hickin, A.S., Nicoll, T.J., Paulen, R.C., Plouffe, A., Smith, I.R. 2005. Drift thickness of Zama Lake area, Alberta (NTS 84L). Alberta Geological Survey, Map 329. http://www.ags.aer.ca/publications/abstracts/MAP_329.html

Keywords: Depth to bedrock, ArcGIS, Map, Alberta

Summary: The drift thickness map shows the variation in thickness of unconsolidated sediment lying between the bedrock surface and the present-day land surface. This map is a graphical representation of drift thickness data for the Zama Lake area (Pawlowicz et al., 2005).

Pawlowicz, J.G., Fenton, M.M., Hickin, A.S., Nicoll, T.J., Paulen, R.C., Plouffe, A., Smith, I.R. 2005. Bedrock topography of Zama Lake area, Alberta (NTS 84L)(GIS data, line features). Alberta Geological Survey, Digital Data 2005-0529. http://www.ags.aer.ca/publications/abstracts/DIG_2005_0529.html

Keywords: Bedrock topography, ArcGIS, Dataset, Alberta

Summary: ArcGIS dataset, consisting of line features, depicting the bedrock topography of the Zama Lake area (NTS map area 84L). These data comprise the raster surface for Map 328 (Pawlowicz et al., 2005).

Pawlowicz, J.G., Fenton, M.M., Hickin, A.S., Nicoll, T.J., Paulen, R.C., Plouffe, A., Smith, I.R. 2005. Bedrock topography of Zama Lake area, Alberta (NTS 84L). Alberta Geological Survey, Map 328. http://www.ags.aer.ca/publications/abstracts/MAP_328.html

Keywords: Bedrock topography, ArcGIS, Map, Alberta

Summary: The bedrock topography map shows contours of the elevation of the bedrock above sea level. This map is a graphical representation of bedrock topography data for the Zama Lake area (Pawlowicz et al., 2005).

Pawlowicz, J.G. and Fenton, M.M. 2005. Bedrock thalwegs of Peerless Lake area, Alberta (NTS 84B)(GIS data, thalweg line features). Alberta Geological Survey, Digital Data 2005-0011. http://www.ags.aer.ca/publications/abstracts/DIG_2005_0011.html

Keywords: Quaternary Geology, ArcGIS, Dataset, Alberta

Summary: ArcGIS dataset, consisting of shapefiles, depicting the locations of thalwegs incised in the bedrock surface of the Peerless Lake Area (NTS map area 84B).

Pawlowicz, J.G. and Fenton, M.M. 2005. Drift thickness of Peerless Lake area, Alberta (NTS 84B)(GIS data, line features). Alberta Geological Survey, Digital Data 2005-0010. http://www.ags.aer.ca/publications/abstracts/DIG_2005_0010.html

Keywords: Depth to bedrock, ArcGIS, Dataset, Alberta

Summary: ArcGIS dataset, consisting of line features, depicting the drift thickness of the Peerless Lake area (NTS map area 84B). These data comprise the raster surface for Map 253 (Pawlowicz et al., 2005).

Pawlowicz, J.G. and Fenton, M.M. 2005. Drift thickness of Peerless Lake area, Alberta (NTS 84B). Alberta Geological Survey, Map 253. http://www.ags.aer.ca/publications/abstracts/MAP_253.html

Keywords: Depth to bedrock, ArcGIS, Map, Alberta

Summary: The drift thickness map shows the variation in thickness of unconsolidated sediment lying between the bedrock surface and the present-day land surface. This map is a graphical representation of drift thickness data for the Peerless Lake area (Pawlowicz et al., 2005).

Pawlowicz, J.G. and Fenton, M.M. 2005. Bedrock topography of Peerless Lake area, Alberta (NTS 84B)(GIS data, line features). Alberta Geological Survey, Digital Data 2005-0009. http://www.ags.aer.ca/publications/abstracts/DIG_2005_0009.html

Keywords: Bedrock topography, ArcGIS, Dataset, Alberta

Summary: ArcGIS dataset, consisting of line features, depicting the bedrock topography of the Peerless Lake area (NTS map area 84B). These data comprise the raster surface for Map 252 (Pawlowicz et al., 2005).

Pawlowicz, J.G. and Fenton, M.M. 2005. Bedrock topography of Peerless Lake area, Alberta (NTS 84B). Alberta Geological Survey, Map 252. http://www.ags.aer.ca/publications/abstracts/MAP_252.html

Keywords: Bedrock topography, ArcGIS, Map, Alberta

Summary: The bedrock topography map shows contours of the elevation of the bedrock above sea level. This map is a graphical representation of bedrock topography data for the Peerless Lake area (Pawlowicz et al., 2005).

Slattery, S.R. and Barker, A.A. 2011. Bedrock topography and the Edmonton-Calgary corridor, Canada. Alberta Geological Survey, Map 549. http://ags.aer.ca/publications/MAP_549.html

Keywords: Bedrock Topography, ArcGIS, Map, Alberta

Summary: Geostatistical model of the bedrock topography of the Edmonton-Calgary Corridor using new and published subsurface data (water-well litholog data and bedrock outcrops). Well data were sourced from an internal Edmonton-Calgary Corridor geological mapping database.

Slattery, S.R. and Barker, A.A. 2011. Thickness of Quaternary and Neogene sediments in the Edmonton-Calgary corridor (NTS 82O, 82P, 83A, 83B and 83H). Alberta Geological Survey, Map 548. http://ags.aer.ca/publications/MAP_548.html

Keywords: Sediment Thickness, ArcGIS, Map, Alberta

Summary: Geostatistical model of the sediment thickness and distribution in the Edmonton-Calgary corridor (ECC) using a new bedrock topography model. This map represents the thickness of sediments that occur between ground surface and the top of the bedrock surface.

Slattery, S.R. Lyster, S. and Barker, A.A. 2010. Bedrock topography of the Edmonton-Calgary corridor, Alberta (GIS data, ASCII grid format). Alberta Geological Survey, DIG 2010-0023. http://ags.aer.ca/publications/DIG_2010_0023.html

Keywords: Bedrock Topography, ArcGIS, Dataset, Alberta

Summary: GIS dataset of the structural bedrock top surface in the Edmonton-Calgary Corridor based on water-well litholog data, including bedrock outcrop locations. These data comprise the raster surface of Alberta Geological Survey Map 549, Bedrock Topography of the Edmonton-Calgary Corridor, Alberta.

Slattery, S.R., Barker, A.A., Andriashek, L.D., et al. 2010. Bedrock topography and sediment thickness mapping in the Edmonton-Calgary corridor, central Alberta: An overview of protocols and methodologies.

Alberta Geological Survey, Open File Report 2010-12.
http://www.ags.aer.ca/publications/OFR_2010_12.html

Keywords: Open File Report, Alberta

Summary: Alberta Geological Survey developed a series of protocols to generate regional bedrock topography and overburden-thickness maps as part of a broader groundwater-mapping project for the Edmonton-Calgary corridor (ECC). The pseudo-automated methods let us quickly integrate and analyze large geo-datasets compiled from various sources. In addition, these methods provide future investigators with a user-friendly means of map upkeep through the integration of newly acquired data. These methods allow one to delineate bedrock topography, in particular the spatial distribution of potential groundwater exploration targets, at a regional scale.

Manitoba

Keller, G., Matile, G.L.D., Thorleifson, H., Malolepszy, Z. 2006: 3D geological model of the Red River valley, central North America; in Three-dimensional geological mapping for groundwater Applications: workshop extended abstracts, Russell, H.A.J. Berg, R.C. Thorleifson, L.H. (ed.), Geological Survey of Canada, 4th three-dimensional geological mapping for groundwater applications workshop, Salt Lake City, UT, Oct. 15, 2005, Open-File report 5048, p. 35-38.

Keywords: 280000 km², Conference Presentation, Manitoba

Summary: Extended abstract that summarizes all of the 3D work completed in Manitoba, including a 400 km by 700 km 3D model of the Phanerozoic terrane of southern Manitoba, Williston Basin architecture and hydrocarbon potential and a 166 km by 228 km 3D model for groundwater bearing strata in the Fargo-Moorhead Region.

Keller, G. 2011: 3D geological mapping in Manitoba: past, present and future [abstract]; Manitoba Innovation, Energy and Mines, Manitoba Mining and Minerals Convention 2011, Winnipeg, Manitoba, November 17-19, 2011, Program, p. 61.

Keywords: Conference Presentation, Manitoba

Summary: Abstract for a presentation given at the Manitoba Mining and Minerals Convention in 2011, no presentation available online.

Keller, G.R., Matile, G.L.D. and Thorleifson, L.H. 2009: Progress in three-dimensional geological mapping in Manitoba and the eastern Prairies; in Report of Activities 2009, Manitoba Innovation, Energy and Mines, Manitoba Geological Survey, p. 207–213.

Keywords: 46000 km², Summary of Activities Report, Manitoba

Summary: Discussion of recently completed and existing 3D geological models in Manitoba (200 km by 230 km 3D hydrostratigraphic and groundwater-flow models of southern Manitoba, Williston Basin 3D model, and a region-scale model for the Western Canadian Sedimentary Basin) including a review of the methodologies and data sources used to create them and a status update for future modelling in the province.

Keller, G.R., Matile, G., Thorleifson, H. 2011: Manitoba Geological Survey: multi-scaled 3-D geological modeling with a single software solution and low costs; in Synopsis of current three-dimensional geological mapping and modeling in geological survey organizations, University of Illinois at Urbana-Champaign, Institute of Natural Resource Sustainability, Illinois State Geological Survey, Circular - Illinois State Geological Survey 578, p. 60-63.

Keywords: Conference Presentation , Manitoba

Summary: A review of the methodologies used for creating 3D models in Manitoba including the methods for using cross sections in Quaternary to Precambrian surfaces in southeastern Manitoba, direct data modelling of Phanerozoic to Precambrian surfaces and the digitization modelling of chronostratigraphic rock units to Precambrian surface.

Keller G., Matile G., Thorleifson H., Malolepszy Z. (2006) 3D geological model of the Red River Valley, central North America.

Keywords: Conference Presentation , Manitoba

Summary: Discussion of recently completed and existing 3D geological models in Manitoba (200 km by 230 km 3D hydrostratigraphic and groundwater-flow models of southern Manitoba, Williston Basin 3D model, and a region-scale model for the Western Canadian Sedimentary Basin) including a review of the methodologies and data sources used to create them.

Logan, C.E., Hinton, M.J., Sharpe, D.R., Oldenborger, G.A., Russell, H.A.J., and Pugin, A.J.M., 2015. Spiritwood Buried Valley 3D Geological Modelling – Part of a Multidisciplinary Aquifer Characterization Workflow; Geological Survey of Canada, Open File 7866, 1 .zip file. doi:10.4095/296444

Keywords: Hydrostratigraphic Model , 12000 km2, LeapFrog Hydro, Open File Report, Manitoba

Summary: The Spiritwood Valley Aquifer Study was a regional hydrogeological study covering data over 12000 km², within this area a 3360km² 3D model was created between the topographic high of Turtle Mountain and the Souris-Pembina river valleys. The main objective of this project was to map the bedrock surface and delineate various hydrostratigraphic units. Through compilation of existing data (borehole logs, surficial geological maps, helicopter a 1062km² time-domain electromagnetic survey and 63.5 line-km of seismic reflection profiles) interpretation and modelling, a general understanding of the Spiritwood Valley's aquifer system has been obtained, including its geological, hydrogeological, hydrological and geochemical characteristics. A 3-D geological model was built for the valley, including bedrock and a simplistic surficial deposit layer, using Leapfrog Hydro software

Matile, G., Keller, G.R., Thorleifson, H., Pyne, M. 2004: Digital and 3D geological mapping required for land and water managements in southern Manitoba; a review of progress and plans; Geological Association of Canada, Mineralogical Association of Canada; joint annual meeting, St. Catharines, ON, May 12, 2004, Program with Abstracts, vol. 29, p. 461.

Keywords: Conference Presentation , Manitoba

Summary: Abstract for a presentation given at the Geological Association of Canada, Mineralogical Association of Canada meeting in 2004, no presentation available online.

Matile, G.L.D. and Keller, G.R. 1999: Digital elevation model of southern Manitoba (version 1.0); Manitoba Industry, Trade and Mines, Geological Services; Manitoba Conservation, Open File Report OF99-15, 1 CD-ROM.

Keywords: Digital Elevation Model, MapInfo, Summary of Activities Report , Manitoba

Summary: A digital elevation model of southern Manitoba created using elevation data derived from 2 m Digital Ortho Images that were gridded using the rectangular interpolation method in Vertical Mapper 2.5 within MapInfo 5.5.

Matile, G.L.D., Thorleifson, L.H., Bamburak, J.D., Bezys, R.K., Nicolas, M.P.B., Conley, G.G., Keller, G.R. and Pyne, M. 2001: Construction of a three-dimensional geological model for the southern Manitoba Phanerozoic terrane; in Report of Activities 2001, Manitoba Industry, Trade and Mines, Manitoba Geological Survey, p. 152-155.

Keywords: Summary of Activities Report , Manitoba

Summary: Progress report for the creation of a 3D geological model for the southern Manitoba Phanerozoic terrane. Outlines the need to digitize existing maps, complete more mapping in areas that have not been mapped sufficiently and to 3D map all of the stratigraphic units. Datasets used for the 3D model are topography, bathymetry, quaternary stratigraphy and bedrock geology.

Matile, G.L.D., Keller, G.R., Pyne, D.M. and Thorleifson, L.H. 2002: Development of methods for 3-D geological mapping of southern Manitoba Phanerozoic terrane; in Report of Activities 2002, Manitoba Industry, Trade and Mines, Manitoba Geological Survey, p. 274-282.

Keywords: Summary of Activities Report , Manitoba

Summary: This report summarizes the development of methods for 3-D mapping including the compilation of drillhole data for the Quaternary and a revision of the Phanerozoic succession. Inputs into the model include topography (100 m grid cell DEM), bathymetry (31 607 soundings), offshore geology (high frequency seismic data with over 1000 km of survey lines), soil mapping, surficial geology, Quaternary stratigraphy (80 000 water-well database), bedrock surface, bedrock geology and Phanerozoic stratigraphy.

Matile, G.L.D., Keller, G.R., Thorleifson, L.H. and Pyne, D.M. 2003: Quaternary mapping progress in southern Manitoba Phanerozoic terrane: 2-D and 3-D; in Report of Activities 2003, Manitoba Industry, Trade and Mines, Manitoba Geological Survey, p. 231–238.

Keywords: Summary of Activities Report , Manitoba

Summary: This paper is a review of the methodology and an update on the progress of the 3-D geological model of the southern Manitoba Phanerozoic terrane and the digital surficial geology 1:250 000 compilation for the entire province. The surficial digital 1:250 000 compilation is discussed as a 3-D model input. For more information on the 3-D modelling methodology see Matile et al. (2002).

Matile, G.L.D., Keller, G., Thorleifson, L.H., Pyne, D.M. 2003: Compilation of digital and 3D geological maps required for land and water management in southern Manitoba, Canada; Geological Society of America (GSA), Geological Society of America, 2003 annual meeting, Seattle, WA, Nov. 2-5, 2003, Abstracts with Programs, Vol. 35, no 6, p. 68.

Keywords: Conference Presentation , Manitoba

Summary: Abstract for a presentation given at the Geological Society of America meeting in 2003, no presentation available online.

Matile, G.L.D. and Keller, G.R. 2004: Shaded relief topography of Manitoba; Manitoba Industry, Economic Development and Mines, Manitoba Geological Survey, Geoscientific Map MAP2004-4, scale 1:1 000 000.

Keywords: Map, Manitoba

Summary: Map depicting the shaded relief topography of Manitoba, including West-East cross sections at 50° and 51° latitude.

Matile, G.L.D., Keller, G.R. and Thorleifson, L.H. 2004: Quaternary mapping progress in southern Manitoba Phanerozoic terrane: 2-D and 3-D; in Report of Activities 2004, Manitoba Industry, Economic Development and Mines, Manitoba Geological Survey, p. 292–300.

Keywords: Summary of Activities Report , Manitoba

Summary: A progress report of work conducted by Matile et. al. (2003) regarding Quaternary mapping in southern Manitoba. This work included the compilation of digital seamless surficial geology maps, 3D mapping of the Phanerozoic succession in southern Manitoba and inputs to the 3D model including mapping, bathymetry (31,607 soundings from 22 hydrostratigraphic charts), geophysics and coring data.

Matile, G.L.D., Keller, G.R. 2005: Compilation of digital and 3D geological maps required for land and water management in southern Manitoba, Canada; Geological Society of America, Geological Society of America, 2005 annual meeting, Salt Lake City, UT, Oct. 16-19, 2005, Abstracts with Programs, Vol. 37, no. 7, p. 145.

Keywords: Conference Presentation , Manitoba

Summary: Abstract for a presentation given at the Geological Society of America meeting in 2005, no presentation available online.

Matile, G.L.D. and Keller, G.R. 2007: Surficial Geology Compilation Map Series of Manitoba Second edition; Manitoba Science, Technology, Energy and Mines, Manitoba Geological Survey, Surficial Geology Compilation Map Series SG-CMS (2nd edition), 1 DVD-ROM, scales 1:250 000, 1:500 000, 1:1 000 000.

Keywords: Map, Manitoba

Summary: This map provides seamless province-wide coverage at scales of 1:250 000 and 1:500 000 including the NTS and regional map sheets for southern Manitoba. The regional maps include surficial geology, descriptions of the Quaternary landscape, major landforms and paleogeographic reconstruction of late glacial events. The 1: 1 000 000 map contains all information above as well as map unit descriptions, an index map, diagrams depicting the effect of isostatic rebound and a 3D block diagram.

Matile, G.L.D. and Keller, G.R. 2007: Surficial geology of Manitoba; Manitoba Science, Technology, Energy and Mines, Manitoba Geological Survey, Surficial Geology Compilation Map Series, SG-MB, scale 1:1 000 000. Front, back.

Keywords: Map, Manitoba

Summary: This map provides the surficial geology of Manitoba at a 1: 1 000 000 scale, it also includes a map of major landforms and ice-flow directions. The back of the map contains the graphic description of map units, the evolution for the glacial retreat of Lake Agassiz, a paleogeographic reconstruction for isostatic rebound and a 3D block diagram for southern Manitoba.

Matile, G.L.D., Keller, G.R. and Groom H.D. 2008: Manitoba Geological Survey contributions to international initiatives: Red River Valley 3-D Model Project, North American Soil Geochemical Landscapes Project and OneGeology; in Report of Activities 2008, Manitoba Science, Technology, Energy and Mines, Manitoba Geological Survey, p. 154–158.

Keywords: Summary of Activities Report , Manitoba

Summary: Summary of Manitoba's involvement and contributions to international initiatives. Including; the Red River 3D geological model project, the North American soil geochemical landscapes project and OneGeology.

Matile, G.L.D., Keller, G.R. and Thorleifson, L.H. 2011: Three-dimensional geological mapping in Manitoba: overview and products; in Report of Activities 2011, Manitoba Innovation, Energy and Mines, Manitoba Geological Survey, p. 171–176.

Keywords: Summary of Activities Report , Manitoba

Summary: An overview of work conducted by the Manitoba Geological Survey regarding the completion of a 3D geological model of the Phanerozoic succession in southern Manitoba. Describes spin-off products (maps and datasets) that needed to be created before the 3D model could be completed.

Matile, G.L.D. and Keller, G.R. 2012: Subsurface Phanerozoic geology of southern Manitoba; Manitoba Innovation, Energy and Mines, Manitoba Geological Survey, Stratigraphic Map Series, SM2012-1, 134 colour map sheets, scale 1:600 000.

Keywords: Map, Manitoba

Summary: A set of 134 east-west cross-sections that represent the interpretation of Phanerozoic rocks and sediments in southern Manitoba. Each cross-section is mapped at 1: 600 000 and 150x vertical exaggeration.

Manitoba Geological Survey 2009: Williston Basin 3D geological model; Manitoba Geological Survey, [] p. URL <<http://www.gov.mb.ca/iem/geo/willistontgi/3dmodel.html>>.

Keywords: 3D model, Manitoba

Summary: Digital release of the Williston Basin geological model, contains a bedrock topography model.

Morin, P.J., Matile, G.L.D. and Keller, G.R. 2005: 3-D topography of Manitoba; Manitoba Industry, Economic Development and Mines, Manitoba Geological Survey, Geoscientific Map MAP2005-3, scale 1:1 000 000.

Keywords: Bedrock Topography, Map, Manitoba

Summary: Map of the 3D topography of Manitoba with data derived from the Shuttle Radar Topography Mission (SRTM) conducted by the USGS in 2002.

Nicolas, M.P.B., Matile, G.L.D., Keller, G.R. and Bamburak, J.D. 2010: Phanerozoic geology of southern Manitoba; Manitoba Innovation, Energy and Mines, Manitoba Geological Survey, Stratigraphic Map SM2010-1, 2 sheets, scale 1:600 000.

Keywords: Map, Manitoba

Summary: Set of two maps for the geology of southern Manitoba, one for the Paleozoic and the other for the Phanerozoic. Includes a cross-province profile by geologic period.

Oldenborger, G.A., Logan, C.E., Hinton, M.J., Sapia, V., Pugin, A.J.M., Sharpe, D.R., Calderhead, A.I., Russell, H.A.J., 2014. 3D Hydrogeological Model Building Using Airborne Electromagnetic Data. Eur. Assoc. Geosci. Eng. 1–5. doi:10.3997/2214-4609.20142011

Keywords: Bedrock Topography, 1060 km2, Journal Article, Manitoba

Summary: An example of how seismic reflection methods, airborne electromagnetic data and water well data can be used to create a 1060 km² bedrock topography model for a buried valley aquifer in Spiritwood Manitoba. Data used to create this model include 3000 km of AeroTEM, 63 km of high resolution seismic reflection data, borehole logs, interpreted cross-sections and surficial geology maps.

Sapia, V., Viezzoli, A., Oldenborger, G., 2015. Joining multiple AEM datasets to improve accuracy, cross calibration and derived products: The Spiritwood VTEM and AeroTEM case study. *Near Surf. Geophys.* 13, 61–72. doi:10.3997/1873-0604.2014041

Keywords: Bedrock Topography, Journal Article, Manitoba

Summary: An example of how airborne geophysics can be used to significantly improve geological and hydrogeological knowledge in a regional scale when the suggested approach is applied to any EM dataset for which a reference model has been established. In this case, the VTEM model provides a reference for the AeroTEM calibration in the Spiritwood valley and the inversions of the dataset show significant geological structures and indicate complex valley morphology.

Thorleifson, L.H., Matile, G.L.D., Pyne, D.M., Keller, G.R. 2001: Construction of a geological model of the Winnipeg region for groundwater modeling; in *Geological models for groundwater flow modeling: workshop extended abstracts*, Berg, R.C. Thorleifson, L.H. (ed.), Illinois State Geological Survey, Geological Society of America, North-Central Section, 35th annual meeting, Normal, IL, April 22, 2001, Open File 2001-1, p. 52-54.

Keywords: Conference Presentation , Manitoba

Summary: Abstract for a workshop given at the Geological Society of America meeting in 2001, no presentation available online.

Thorleifson, L.H., Matile, G.L.D., Keller, G.R., Pyne, D.M. 2001: Development of protocols for 3D geological modelling in support of regional groundwater applications in the Winnipeg/Lake Winnipeg region, Canada; Geological Society of America, 2001 annual meeting, Boston, MA, Nov. 1-10, 2001, *Abstracts with Programs*, vol. 33, no. 6, p. 268.

Keywords: Conference Presentation , Manitoba

Summary: Abstract for a presentation given at the Geological Society of America meeting in 2001, no presentation available online.

Keller and Maitille unpublished. Surficial Geological 3D model of the Phanerozoic region of Manitoba.

Keywords: Unpublished, Manitoba

Summary: Model presented in Matile et al., 2011. Available upon request through G. Keller at the Manitoba Geological Survey.

Keller and Maitille unpublished. Surficial Geological 3D model of the Lake Winnipeg region of Manitoba.

Keywords: Unpublished, Manitoba

Summary: Model presented in Matile et al., 2004. Available upon request through G. Keller at the Manitoba Geological Survey.

Ontario

Ayer, J.A. and Chartrand, J.E. 2011. Geological compilation of the Abitibi greenstone belt; Ontario Geological Survey, Miscellaneous Release—Data 282.

Keywords: Dataset, Ontario

Summary: This geological compilation of the Abitibi greenstone belt compiles 8 separate 1:100 000 scale maps and 8 GIS data sets of the Abitibi Subprovince in Ontario. Preliminary Maps (P.Map) and Miscellaneous Releases—Data (MRD) published to date include: the Timmins area (P.Map 3379, MRD 36); the Lake Abitibi area (P.Map 3398, MRD 46); the Kirkland Lake area (P.Map 3425, MRD 58); the Swayze area (P.Map 3511, MRD 93); the Matachewan area (P.Map 3527, MRD 94); the Cobalt–Temagami area (P.Map 3581, MRD 214); the Burntbush–Detour lakes area (P.Map 3609, MRD 245); and the Maple Mountain area (P.Map 3620, MRD 272).

Bajc, A.F. (2002) Project Unit 02-018. Mapping the Subsurface of Waterloo Region, Southwestern Ontario. From Summary of Field Work and Other Activities 2002, Ontario Geological Survey, Open File Report 6100, 31-1 to 31-6. p.

Keywords: Summary of Activities Report , Ontario

Summary: Summary of work conducted in the 2002 summer field season to help with the development of a 3-D geological model for the Waterloo region. This work included observing landscapes, classifying terrain, examining existing natural and man-made exposures and undertaking detailed sedimentological studies of stratified deposits. Also included logging several recently drilled cores. This report is an interim document for work in the final modelling output (Bajc and Shirota, 2007).

Bajc, A.F. (2004) Project Unit 02-18. Three Dimensional Mapping of Quaternary Deposits in Waterloo Region, Southwestern Ontario. from Summary of Field Work and Other Activities 2004, Ontario Geological Survey, Open File Report 6145, 24-1 to 24-4 p.

Keywords: Summary of Activities Report , Ontario

Summary: : A progress report of work in the Waterloo region by Bajc (2002) and Bajc et al. (2003) to support the development of a 3-D geological model using Datamine software. Contains one figure, conceptual stratigraphic x-section. The focus of the work in 2004 was data compilation and standardization, acquisition of new geologic data and data interpretation, synthesis and presentation. Reports on drilling of 13 continuous cored boreholes but has no logs or information on the drilling. Lists software being used as Viewlog, ESRI products and MSAccess. This reports is an interim document for work in the final modelling output (Bajc and Shirota, 2007).

Bajc, A.F. (2006) Project Unit 06-024. Three Dimensional Mapping of Quaternary Deposits in the Brantford Woodstock Area, Southwestern Ontario. Summary of Field Work and Other Activities 2006; Ontario Geological Survey, Open File Report 6192, 32-1 to 32-6 p.

Keywords: Summary of Activities Report , Ontario

Summary: Summary of work conducted in the 2006 summer field season to help with the development of a 3D geological model for the 2700 km² Brantford-Woodstock region. This work included observing landscapes, classifying terrain, examining existing natural and man-made exposures and undertaking detailed sedimentological studies of stratified deposits. This report is an interim document for work in the final modelling output (Bajc and Dodge, 2011).

Bajc, A.F. (2007) Project Unit 06-024. Three-Dimensional Mapping of Quaternary Deposits in the Brantford-Woodstock Area, southwestern Ontario: A Progress Report .from Summary of Field Work and Other Activities 2007; Ontario Geological Survey, Open File Report 6213, 22-1 to 22-9 p.

Keywords: 2700 km², Summary of Activities Report , Ontario

Summary: A progress report of work conducted in the 2007 summer field season by Bajc (2006) to support the development of a 3D geological model using Datamine software for the 2700 km² Brantford-Woodstock region. This work included overburden drilling of 21 boreholes to fill in the holes discovered after compiling 13000 water well records, 381 petroleum wells, 201 boring and foundation records and 100 sediment logs from gravel pits. This report is an interim document for work in the final modelling output (Bajc and Dodge, 2011).

Bajc, A.F. (2008) Project Unit 06-024. An Update in Three-Dimensional Mapping of Aquifers in the Brantford-Woodstock Area, southwestern Ontario. From Summary of Field Work and Other Activities 2008; Ontario Geological Survey, Open File Report 6226, 29-1 to 29-7 p.

Keywords: 2700 km², Summary of Activities Report , Ontario

Summary: A progress report of work conducted in the 2008 summer field season by Bajc (2006, 2007) to support the development of a 3-D geological model for the 2700 km² Brantford-Woodstock region. This work included overburden drilling of an additional 15 boreholes to fill data gaps within significant geomorphic features and landscapes. This report is an interim document for work in the final modelling output (Bajc and Dodge, 2011).

Bajc, A.F. (2009) Project Unit 06-024. A Progress Report on Subsurface Mapping in the Brantford-Woodstock Area, Southwestern Ontario. From Summary of Field Work and Other Activities 2009; Ontario Geological Survey, Open File Report 6240, 21-1 to 21-4 p.

Keywords: 2700 km², Summary of Activities Report , Ontario

Summary: A progress report of work conducted in the 2009 summer field season by Bajc (2006, 2007, 2008) to support the development of a 3-D geological model using Datamine software for the 2700 km² Brantford-

Woodstock region. This work included overburden drilling of an additional 4 boreholes as a part of the Dundas buried valley project. This report is an interim document for work in the final modelling output (Bajc and Dodge, 2011).

Bajc, A.F, Endure, A.L., Hunter, J.A. and Pullan, S.E. (2003) Project Unit 02-18. An Update on Three-Dimensional Mapping of Quaternary Deposits in Waterloo Region, Southwestern Ontario. from Summary of Field Work and Other Activities 2003, Ontario Geological Survey, Open File Report 6120, 24-1 to 24-6. p.

Keywords: Summary of Activities Report , Ontario

Summary: : A progress report of work in the Waterloo region by Bajc (2002) to support the development of a 3-D geological model using Datamine software. The focus of the work in 2003 was dedicated to the acquisition of high resolution geophysical data sets (16 km of ground-penetrating radar and 12 km of seismic reflection surveys). This report is an interim document for work in the final modelling output (Bajc and Shirota, 2007).

Bajc, A.F. and Hunter, J.A. 2006. Results of 2003-2004 overburden drilling programs in the Region of Waterloo, southwestern Ontario; Ontario Geological Survey, Miscellaneous Release—Data 205.

Keywords: Dataset, Ontario

Summary: Data resulting from the 2003 and 2004 overburden drilling programs in the Waterloo area of southwestern Ontario (Bajc et al, 2003; Bajc, 2004). The data consist if written logs (with unit descriptions and photographs), visual logs (lithology, grain size and carbonate results) and a map of drilling locations. This data release is an interim document for work in the final modelling output (Bajc and Shirota, 2007).

Bajc, A.F. and Karrow, P.F. 2004. 3-dimensional mapping of Quaternary deposits in the Regional Municipality of Waterloo, southwestern Ontario; Geological Association of Canada Fieldtrip Guidebook FT-7, 72p.

Keywords: Conference Presentation , Ontario

Summary: A guide for a fieldtrip that was run in conjunction with the Geological Association of Canada conference in 2004. It provides an overview of the key stratigraphic and hydrostratigraphic features of the Waterloo area as well as the important elements of the glacial geology. Emphasis is placed on the outcrop and field areas that contributed to the development of 3D geological models.

Bajc, A.F. and Newton, M.J. (2005) Project Unit 02-018. Three-Dimensional Modelling of Quaternary Deposits in Waterloo Region, Ontario: A case Study using Datamine Software. from Summary of Field Work and Other Activities 2005, Ontario Geological Survey, Open File Report 6172, 25-1 to 25-8 p.

Keywords: Summary of Activities Report , Ontario

Summary: A progress report of work in the Waterloo region by Bajc (2002, 2004) and Bajc et al. (2003) as well as a guidebook for a Geological Association of Canada field trip (Bajc and Karrow, 2004) to support the development of a 3-D geological model using Datamine software. This article briefly describes the protocols developed for the construction of a three-dimensional model of the Quaternary sediments overlying bedrock

in the Waterloo Region. This report is an interim document for work in the final modelling output (Bajc and Shirota, 2007).

Bajc, A.F. and Rainsford, D.R.B. (2010) Project Unit 10-026. Three-Dimensional Mapping of the Quaternary Deposits in the Southern Part of the County of Simcoe, Southern Ontario. From Summary of Field Work and Other Activities 2010; Ontario Geological Survey, Open File Report 6260, 30-1 to 30-10 p.

Keywords: Summary of Activities Report , Ontario

Summary: Summary of work in the southern part of the county of Simcoe to support the development of a 3-D geological model using Datamine software. The focus of the work in 2010 was a six week reconnaissance program to become familiar with the surficial geology of the region and a pilot gravity survey to refine the bedrock topography in the region. This report is an interim document for work in the final modelling output (in progress).

Bajc, A.F. and Rainsford, D.R.B. (2011) Project Unit 10-026. Three-Dimensional Mapping of the Quaternary Deposits in the Southern Part of the County of Simcoe, Southern Ontario: A Progress Report. From Summary of Field Work and Other Activities 2011; Ontario Geological Survey, Open File Report 6270, 29-1 to 29-8 p.

Keywords: 1500 km2, Summary of Activities Report , Ontario

Summary: A progress report of work in the southern part of the county of Simcoe by Bajc and Rainsford (2010) to support the development of a 3-D geological model using Datamine software. The focus of the work in 2011 was a 3104 station gravity survey, conducted along 19 road traverses, covering an area of approximately 1500 km². This report is an interim document for work in the final modelling output (in progress).

Bajc, A.F, Rainsford, D.R.B. and Mulligan, R.P.M. (2012) Project Unit 10-026. An Update on Three-Dimensional Mapping of Quaternary Deposits in the Southern Part of the County of Simcoe, Southern Ontario. From Summary of Field Work and Other Activities 2012; Ontario Geological Survey, Open File Report 6280, 31-1 to 31-13 p.

Keywords: Summary of Activities Report , Ontario

Summary: A progress report of work in the southern part of the county of Simcoe by Bajc and Rainsford (2010, 2011) to support the development of a 3-D geological model using Datamine software. The focus of the work in 2012 was an airborne electromagnetic survey over the south central part of the study area and 7 continuously cored boreholes, totalling 813.65 m. This report is an interim document for work in the final modelling output (in progress).

Bajc, A.F. and Dodge, J.E.P. 2011. Three-dimensional mapping of surficial deposits in the Brantford–Woodstock area, southwestern Ontario; Ontario Geological Survey, Groundwater Resources Study 10.

Keywords: 3D Geological Model, 2700 km2, ArcGIS, 3D Model, Ontario

Summary: The final modelling output for work conducted in the 2009 summer field season by Bajc (2006, 2007, 2008, and 2009) to support the development of a 3-D geological model using Datamine software for the 2700 km² Brantford-Woodstock region. This digital data release contains 1) a summary report (.pdf); 2) ESRI® ArcInfo® grids and comma-delimited (.csv) files of modelled surfaces; 3) Google Earth™ mapping service (.kml, .kmz) files depicting borehole location and stratigraphic information as well as isopach and structural contour maps of modelled units; 4) graphic (.htm, .jpg, .tif) and written (.doc, .htm) borehole logs, high-resolution (.jpg) photographs of core and analytical data (.xls) for samples collected, all presented in a hyperlinked .htm format; 5) high-resolution plates (.pdf) depicting north-south and east-west cross sections and aquifer recharge and vulnerability maps; 6) a section viewer (.exe) for slicing the block model along user-defined lines; and 7) an abbreviated version of the subsurface data (.mdb) used for the construction of the three-dimensional block model which includes borehole collar and stratigraphic information, picks data, and screen depth and water level information.

Bajc, A.F., Mulligan, R.P.M., Pugin, A.J.-M. and Rainsford, D.R.B. (2014) Project Unit 10-026. An Update on the Final Phase of Subsurface Data Collection in the Southern Part of the County of Simcoe, Southern Ontario. From Summary of Field Work and Other Activities 2014; Ontario Geological Survey, Open File Report 6300, 33-1 to 33-14 p.

Keywords: Summary of Activities Report , Ontario

Summary: A progress report of work in the southern part of the county of Simcoe by Bajc and Rainsford (2010, 2011, and 2012) to support the development of a 3-D geological model using Datamine software. The third and final phase of overburden drilling was conducted in the fall of 2013 with the completion of 8 holes to bedrock, which continued to support the conceptual geologic model developed previously (Bajc, Rainsford and Mulligan, 2012). This report is an interim document for work in the final modelling output (in progress).

Bajc, A. J., Russell, H. A. J., & Sharpe, D. R. (2014). A Three-Dimensional Hydrostratigraphic Model of the Waterloo Moraine Area, Southern Ontario, Canada. *Canadian Water Resources Journal*, 39(2), 95–119. <http://doi.org/10.1080/07011784.2014.914794>

Keywords: 3D Geological Model, Datamine, Journal Article, Ontario

Summary: A three-dimensional geological model for the Waterloo area based on 17 000 records with 73 000 descriptive entries including 110 continuously-cored boreholes, 344 boreholes with downhole geophysics, 17.5 km of seismic reflection data and 16 km of ground penetrating radar data. Modelling of the seven lithostratigraphic units was done using Datamine software at 100 x 100 m grid spacing. This work is an extension of the final modelling output (Bajc and Shirota, 2007) for work conducted in the Waterloo region by Bajc (2002, 2004) and Bajc et al. (2003) as well as a guidebook for a Geological Association of Canada field trip (Bajc and Karrow, 2004)

Bajc A.F. and Shirota, J. (2007). Three-dimensional mapping of surficial deposits in the Regional Municipality of Waterloo, southwestern Ontario; Ontario Geological Survey, Groundwater Resources Study 3.

Keywords: 3D Geological Model, Datamine, 3D Model, Ontario

Summary: The final modelling output for work conducted in the Waterloo region by Bajc (2002, 2004) and Bajc et al. (2003) as well as a guidebook for a Geological Association of Canada field trip (Bajc and Karrow, 2004) to support the development of a 3-D geological model using Datamine software. This digital data release contains information regarding the three dimensional distribution and character of surficial aquifers and aquitards organized into a series of folders, each containing information of varying type and format.

Burt, A.K. (2004) Project Unit 03-21. Three Dimensional Mapping of Quaternary (Surficial) Deposits in the Barrie Area, Central Ontario. from Summary of Field Work and Other Activities 2004, Ontario Geological Survey, Open File Report 6145, 35-1 to 35-5 p.

Keywords: Summary of Activities Report , Ontario

Summary: A progress report of work conducted in the Barrie area by Slattery (2003) to support the development of a 3-D geological model using Datamine software. This work included drilling, geophysical surveys and the description of pits and natural exposures. Fourteen sonic boreholes, totalling 1185 m were drilled, logged in the field and sampled for carbonate content and grain size analysis which were released as a Miscellaneous Release- Data (Burt and Russell, 2006). This report is an interim document for work in the final modelling output (Burt and Dodge, 2011).

Burt, A.K. (2006) Project Unit 03-21. Three-Dimensional Geological Modelling of Thick Quaternary Deposits in the Barrie Area. from Summary of Field Work and Other Activities 2006; Ontario Geological Survey, Open File Report 6192, 33-1 to 33-18 p.

Keywords: Summary of Activities Report , Ontario

Summary: A progress report of work conducted in the Barrie area by Slattery (2003), Burt (2004) and Burt and Russell (2005) to support the development of a 3-D geological model using Datamine software. The final drilling program for this project was completed in the fall of 2006 and the resulting data from both the 2005 and 2006 field seasons were released together as a Miscellaneous Release- Data (Burt, 2007). This report is an interim document for work in the final modelling output (Burt and Dodge, 2011).

Burt, A.K. 2007. Results of 2005 and 2006 Oro moraine drilling program in the Barrie area, central Ontario; Ontario Geological Survey, Miscellaneous Release–Data 227.

Keywords: Dataset, Ontario

Summary: Data resulting from the 2005 and 2006 Oro Moraine drilling programs in the Barrie area of Central Ontario (Burt and Russell 2005; Burt, 2006). The data consist if written logs (with unit descriptions and photographs), visual logs (lithology, grain size and carbonate results) and a map of drilling locations. This data release is an interim document for work in the final modelling output (Burt and Dodge, 2011).

Burt, A.K. (2007) Project Unit 03-021. Three-Dimensional Geological Modelling of Thick Quaternary Deposits in the Barrie-Oro Area, Central Ontario: New Modelling Techniques .from Summary of Field Work and Other Activities 2007; Ontario Geological Survey, Open File Report 6213, 21-1 to 21-9 p.

Keywords: Summary of Activities Report , Ontario

Summary: A progress report of work conducted in the Barrie area by Slattery (2003), Burt (2004; 2006) and Burt and Russell (2005) to support the development of a 3-D geological model using Datamine software. The primary focus of this report is focused on changes to the data interpolation process as well as a possible solution for modelling tunnel-valley fills. This report is an interim document for work in the final modelling output (Burt and Dodge, 2011).

Burt, A.K. (2008) Project Unit 08-003. The Orangeville Moraine Study: A New Three-Dimensional Quaternary Mapping Project. From Summary of Field Work and Other Activities 2008; Ontario Geological Survey, Open File Report 6226, 30-1 to 30-5 p.

Keywords: Summary of Activities Report , Ontario

Summary: Summary of work conducted in the 2008 summer field season to help with the development of a 3-D geological model using Datamine software for the 1550 km² Orangeville area. This work included compilation and examination of existing data sets from archival borehole records held by private consultants and municipal, provincial and federal governments that contain subsurface geological information as well as reconnaissance for a continuous core drilling program targeting the overburden and upper 3 m of competent bedrock. This report is an interim document for work in the final modelling output (Burt, 2012).

Burt, A.K. (2009) Project Unit 08-003. The Orangeville Moraine Project: An Update of Field Activities. From Summary of Field Work and Other Activities 2009; Ontario Geological Survey, Open File Report 6240, 22-1 to 22-3 p.

Keywords: Summary of Activities Report , Ontario

Summary: A progress report of work conducted in the Orangeville area by Burt (2008) to support the development of a 3-D geological model using Datamine software. A total of 16 boreholes totalling 735 m were drilled in the fall and early winter of 2008 with a second phase of drilling for a similar number of holes underway. This report is an interim document for work in the final modelling output (Burt, 2012)

Burt, A.K. (2011) Project Unit 08-003. The Orangeville Moraine Project: Preliminary Results of Drilling and Section Work. From Summary of Field Work and Other Activities 2011; Ontario Geological Survey, Open File Report 6270, 28-1 to 28-34 p.

Keywords: Summary of Activities Report , Ontario

Summary: A progress report of work conducted in the Orangeville area by Burt (2008; 2009) and Burt and Rainsford (2010) to support the development of a 3-D geological model using Datamine software. The 2011 field season focussed on the investigation of natural and man-made exposures within the Orangeville moraine. This report is an interim document for work in the final modelling output (Burt, 2012)

Burt, A.K. (2012) Project Unit 12-005. The Mount Forest-Elmira Study: A New Three-Dimensional Quaternary Mapping Project. From Summary of Field Work and Other Activities 2012; Ontario Geological Survey, Open File Report 6280, 33-1 to 33-6 p.

Keywords: Summary of Activities Report , Ontario

Summary: Summary of work conducted in 2012 to help with the development of a 3-D geological model using Datamine software for the Mount Forest-Elmira area. This work included compilation and examination of existing data sets from archival borehole records held by private consultants and municipal, provincial and federal governments that contain subsurface geological information as well as reconnaissance ground gravity survey for a continuous core drilling program targeting the overburden and upper 3 m of competent bedrock. This report is an interim document for work in the final modelling output (in progress). .

Burt, A.K. (2012) Project Unit 08-003. Conceptual Geological Model for the Orangeville Moraine Three-Dimensional Project. From Summary of Field Work and Other Activities 2012; Ontario Geological Survey, Open File Report 6280, 32-1 to 32-6 p.

Keywords: 3D Geological Model, Datamine, 3D Model, Ontario

Summary: A conceptual geological model has been developed for the Orangeville moraine 3-D project area based on previous work by Burt (2008; 2009; 2011) and Burt and Rainsford (2010). This report is the final 3-D modelling output created using Datamine software.

Burt, A.K. (2013) Project Unit 13-018. The Niagara Peninsula Study: A New Three-Dimensional Quaternary Geology Mapping Project. From Summary of Field Work and Other Activities 2013; Ontario Geological Survey, Open File Report 6290, 38-1 to 38-21 p.

Keywords: Summary of Activities Report , Ontario

Summary: Summary of work conducted in the 2013 field season to help with the development of a 3-D geological model using Datamine software for the Niagara Peninsula. Field work included investigating 130 sites, including 5 surface observation sites, 3 shallow test pits, 24 soil probe sites, 64 hand auger sites and 34 sections. This work also included compilation and examination of existing data sets from archival borehole records held by private consultants and municipal, provincial and federal governments that contain subsurface geological information as well as reconnaissance ground gravity survey for a continuous core drilling program targeting the overburden and upper 3 m of competent bedrock. This report is an interim document for work in the final modelling output (in progress).

Burt, A.K. (2014) Project Unit 13-018. Penetrating Niagara with Three-Dimensional Mapping. From Summary of Field Work and Other Activities 2014; Ontario Geological Survey, Open File Report 6300, 32-1 to 32-8 p.

Keywords: Summary of Activities Report , Ontario

Summary: A progress report of work conducted in the Niagara Peninsula by Burt (2013) to support the development of a 3-D geological model using Datamine software. Twenty-six continuously-cored, mud-rotary

boreholes totalling 788.26 m were drilled, logged, photographed and sampled in the 2014 season. This report is an interim document for work in the final modelling output (in progress).

Burt, A.K. and Dodge, J.E.P. 2011. Three-dimensional modelling of surficial deposits in the Barrie–Oro Moraine area of southern Ontario; Ontario Geological Survey, Groundwater Resources Study 11.

Keywords: 3D Geological Model, Datamine, 3D Model, Ontario

Summary: The final modelling output of work conducted in the Barrie area by Slattery (2003), Burt (2004; 2006; 2007) and Burt and Russell (2005) to support the development of a 3-D geological model using Datamine software. This digital data release contains information regarding the three dimensional distribution and character of surficial aquifers and aquitards organized into a series of folders, each containing information of varying type and format.

Burt, A.K. and Rainsford, D.R.B. (2010) Project Unit 08-003. The Orangeville Moraine Project: Buried Valley Targetted Gravity Study. From Summary of Field Work and Other Activities 2010; Ontario Geological Survey, Open File Report 6260, 31-1 to 31-6 p.

Keywords: Summary of Activities Report , Ontario

Summary: A progress report of work conducted in the Orangeville area by Burt (2008; 2009) to support the development of a 3-D geological model using Datamine software. In the 2010 field season 87 line km of ground gravity surveys were completed over 12 lines and one 87 m deep borehole was drilled in the Orangeville moraine area. This report is an interim document for work in the final modelling output (Burt, 2012).

Burt, A.K. and Russell, D.F. (2005) Project Unit 03-21. Three-Dimensional Modelling of Thick Quaternary Deposits in the Barrie Area, Central Ontario. from Summary of Field Work and Other Activities 2005, Ontario Geological Survey, Open File Report 6172, 26-1 to 26-9 p

Keywords: 1200 km2, Summary of Activities Report , Ontario

Summary: A progress report of work conducted in the 1200 km² Barrie area by Slattery (2003) and Burt (2004) to support the development of a 3-D geological model using Datamine software. This work included six seismic surveys (totalling 7.5 line km), downhole geophysics and sonic drilling to be completed in the fall. This report is an interim document for work in the final modelling output (Burt and Dodge, 2011).

Burt, A.K. and Russell, D.F. 2006. Results of 2004 Oro Moraine drilling program in the Barrie area, central Ontario; Ontario Geological Survey, Miscellaneous Release-Data 198.

Keywords: Dataset, Ontario

Summary: Data resulting from the 2004 Oro Moraine drilling programs in the Barrie area of Central Ontario (Burt, 2004). The data consist of written logs (with unit descriptions and photographs), visual logs (lithology,

grain size and carbonate results) and a map of the 14 drilling locations. This data release is an interim document for work in the final modelling output (Burt and Dodge, 2011).

Gao, C., Shirota, J., Kelly, R.I., Brunton, F.R. and van Haaften, S. (2006) Project Unit 05-13. Bedrock Topography and Overburden Thickness Mapping, Southern Ontario. from Summary of Field Work and Other Activities 2006; Ontario Geological Survey, Open File Report 6192, 34-1 to 34-10 p.

Keywords: Summary of Activities Report , Ontario

Summary: This report outlines protocols and a methodology developed by the Ontario Geological Survey to generate digital regional bedrock elevation and overburden thickness maps for Southern Ontario using ArcGIS. Data sources used include water wells, geotechnical boreholes, oil and gas wells, bedrock elevation points (from geological maps, geophysical picks and bedrock outcrops), drilling records and borings from unpublished groundwater studies.

Gao, C., Shirota, J., Kelly, R.I., Brunton, F.R. and Van Haaften, S. 2006. Bedrock Topography and Overburden Thickness Mapping, Southern Ontario; Ontario Geological Survey, Miscellaneous Release—Data 207.

Keywords: Bedrock Topography, ArcGIS, Dataset, Ontario

Summary: The digital release of data associated with the bedrock topography and overburden thickness maps of southern Ontario.

Logan, C; Cummings, D I; Pullan, S; Pugin, A; Russell, H A J; Sharpe, D R. 2009. Hydrostratigraphic model of the South Nation watershed region, south-eastern Ontario; Geological Survey of Canada, Open File 6206, 2009, ; 17 pages; 1 DVD, doi:10.4095/248203

Keywords: 3D Geological Model, MapInfo, 3D Model, Ontario

Summary: The digital release of the hydrostratigraphic model of the South Nation watershed region, south-eastern Ontario. The MapInfo model consists of a series of gridded surfaces that define the top surfaces of seven Quaternary stratigraphic units plus bedrock. Files for viewing the surfaces are also available for ArcGIS and GeoTIFF.

Logan, C., Russell, H.A.J., and Sharpe, D.R. 2005: Regional 3-D Structural Model of the Oak Ridges Moraine and Greater Toronto Area, southern Ontario: Version 2.1; Geological Survey of Canada, Open File 5062, 1 CD-ROM.

Keywords: 3D Geological Model, MapInfo, 3D Model, Ontario

Summary: The digital release of the regional 3-D structural model of the Oak Ridges Moraine and Greater Toronto Area, southern Ontario. The MapInfo model consists of a series of gridded surfaces that define the top and bottom surfaces of five Quaternary stratigraphic units plus bedrock. Files for viewing the surfaces are also available for ArcInfo and a standard ASCII grid version is also provided.

McClenaghan, M.B., and DiLabio, R.N.W., 1995, Overburden database compilation, Timmins, Ontario (NTS 42A/11, 12, 13, 14): Geological Survey of Canada, Open File Report 3086.

Keywords: Map , Ontario

Summary: Set of four maps of the overburden drill hole locations for the Timmins area, compiled from private company records and from records on file in the Timmins Resident Geologist's Office.

Merry, A.G., Nicks, L.P. and Meyer, P. (2004) Project Unit 04-029. Three-Dimensional Groundwater Flow Modelling in the Watersheds of Southwestern Ontario. from Summary of Field Work and Other Activities 2004, Ontario Geological Survey, Open File Report 6145, 35-1 to 35-5 p.

Keywords: Groundwater Flow Model, 20 000 km2, FEFLOW, Summary of Activities Report , Ontario

Summary: This project involves the development of three-dimensional conceptual geologic and hydrogeologic models and the development, calibration and application of a FEFLOW groundwater flow model for the watersheds covering 20 000 km² of southwestern Ontario. Data sources used include over 100 000 water wells, digital elevation models, geotechnical boreholes, oil and gas wells, bedrock elevation points (from geological maps, geophysical picks and bedrock outcrops), drilling records, numerical models from smaller-scale projects, maps (bedrock, Quaternary, GIS, land use), groundwater levels and borings from unpublished groundwater studies.

Merry, A.G. and Nicks, L.P. (2005) Project 04-29. Conceptualization and Calibration of a Three-Dimensional Groundwater Flow Model for the Watersheds in Southwestern Ontario. from Summary of Field Work and Other Activities 2005, Ontario Geological Survey, Open File Report 6172, 26-1 to 26-9 p.

Keywords: Groundwater Flow Model, 20 000 km2, FEFLOW, Summary of Activities Report , Ontario

Summary: A progress report of work conducted on the development of three-dimensional conceptual geologic and hydrogeologic models and the development, calibration and application of a FEFLOW groundwater flow model for the watersheds covering 20 000 km² of southwestern Ontario (Merry et al., 2004). Data sources used include over 100 000 water wells, digital elevation models, geotechnical boreholes, oil and gas wells, bedrock elevation points (from geological maps, geophysical picks and bedrock outcrops), drilling records, numerical models from smaller-scale projects, maps (bedrock, Quaternary, GIS, land use), groundwater levels and borings from unpublished groundwater studies.

Mulligan, R.P.M. (2014) Project Unit Project Unit 14-015. Three-Dimensional Mapping of Quaternary Deposits in the Central Part of the County of Simcoe, Southern Ontario. From Summary of Field Work and Other Activities 2014; Ontario Geological Survey, Open File Report 6300, 26-1 to 26-19 p.

Keywords: 1440 km2, Datamine, Summary of Activities Report , Ontario

Summary: Summary of work conducted in the 2014 field season to help with the development of a 3-D geological model using Datamine software for the 1440 km² central part of the County of Simcoe, southern Ontario. Field work included a surficial sediment reconnaissance investigation to develop a better

understanding of the late glacial history of the area by assessing the character and geometry of sediment-landform associations that comprise the shallow subsurface stratigraphy. This report is an interim document for work in the final modelling output (in progress).

Mulligan, R.P.M. (2015) Project Unit Project Unit 14-015. An Update on Three-Dimensional Mapping of Quaternary Deposits in the Central Part of the County of Simcoe, Southern Ontario. From Summary of Field Work and Other Activities 2015; Ontario Geological Survey, Open File Report 6313, 28-1 to 28-14 p.

Keywords: 1440 km2, Datamine, Summary of Activities Report , Ontario

Summary: Summary of work conducted in the 2015 field season to help with the development of a 3-D geological model using Datamine software for the 1440 km² Central part of the County of Simcoe, southern Ontario. Field work included a continuation of the surficial mapping started by Mulligan (2014), a seismic reflection survey and a drilling program. This report is an interim document for work in the final modelling output (in progress).

Ontario Geological Survey 2005. Three dimensional modeling of overburden in the Timmins–Kirkland Lake region: Discover Abitibi Initiative; Ontario Geological Survey, Miscellaneous Release--Data 148.

Keywords: ArcGIS, MS Excel, Dataset, Ontario

Summary: Digital data release providing datasets that model the three dimensional distribution and thickness of the surficial sediments in an area north of Timmins created using overburden drill hole records. A 1:100 000 scale, GIS based surficial geology map (ArcMap), three dimensional surfaces and cross sections (ESRI grid) and updates to the overburden drill hole database (MS Excel) are also included in this data release.

Paulen, R.C., n.d. Depth to bedrock database for the Timmins area (NTS 42A/NW). Researchgate. online.

Keywords: MS Excel, Dataset, Ontario

Summary: Digital data release providing an Excel spreadsheet for the bedrock topography and drift thickness models from the Timmins area. Data was compiled from McClenaghan and DiLabio (1995).

Paulen, R.C., McClenaghan, M.B., Harris, J.R., 2006. Bedrock Topography and Drift Thickness Models from the Timmins Area, Northeastern Ontario: An Application of GIS to the Timmins Overburden Drillhole Database, in: Harris, J.R. (Ed.), GIS for the Earth Sciences. Geological Association of Canada Special Publication, St John's, NL., p. 413-434.

Keywords: 4200 km2, ArcGIS, Journal Article, Ontario

Summary: A collection of 2.5 D models created from 6423 data points (4332 overburden boreholes, 1753 diamond drillholes and 712 data points from surficial maps).

Russell, H. A. J., Pullan, S. E., Hunter, J. A., Sharpe, D. R., & Holysh, S. (2004). Buried valley aquifers: Delineation and characterization from seismic and core data at Caledon East, Ontario. Illinois State Geological Survey, Open File Series, 2004-8. <http://doi.org/10.4095/215441>

Keywords: Depth to bedrock, ArcGIS, Open File Report, Ontario

Summary: An investigation of the architecture of a bedrock valley in the Caledon East area. Data used to create this delineation are 10 km of seismic lines, downhole geophysics, 180m of continuously-cored drilling and borehole data from previous studies. Includes a digital elevation model, surficial geology maps, depth to bedrock and sediment thickness maps.

Russell, H.A. ., Boisvert, E., Logan, C., Paradis, S.J., Ross, M., Sharpe, D.R., 2011. Chapter 7 : Geological Survey of Canada : Three-dimensional Geological Mapping for Groundwater Applications, in: Berg, R., Mathers, S., Kessler, H., Keefer, D.A. (Eds.), Synopsis of Current Three-Dimensional Geological Mapping and Modeling in Geological Survey Organization. Illinois State Geological Survey, Circular 578, Champaign, Illinois, pp. 31–41.

Keywords: Conference Presentation , Ontario

Summary: This paper highlights the work completed at the GSC's Groundwater Geoscience Program toward mapping key Canadian aquifers, specifically 3D subsurface geological model construction. Includes three case studies; Mirabel (1400 km²), Oak Ridges Moraine (11000 km²) and the Okanagan Valley (8200 km²).

Sharpe, D.R., Russell, H.A.J., Logan, C., 2007. A 3-dimensional geological model of the Oak Ridges Moraine area, Ontario, Canada. J. Maps 2007, 239–253.

Keywords: 3D Geological Model, 11000 km², MapInfo, MS Access, Journal Article, Ontario

Summary: Paper presenting a 11 000 km² 3D model with four surficial layers for the Oak Ridges Moraine area created using MapInfo Pro and Microsoft Visual Basic . Data used in the model includes geological maps, continuously cored borehole, stratigraphic sections, seismic data, about 5000 geotechnical/hydrogeological boreholes and approximately 22000 water well records.

Sharpe, D.R., Russell, H.A.J., Logan, C.E., 2007. A 3-Dimensional Geological Model of the Oak Ridges Moraine Area, Ontario, Canada. Geol. Survey Canada, Open File 5524 2007, 1. doi:10.4095/223765

Keywords: 3D Geological Model, 11000 km², MapInfo, MS Access, Map, Ontario

Summary: Poster presenting the results of a regional hydrogeological study for the Oak Ridge Moraine area including a 11 000 km² 3D model created using MapInfo Pro and Microsoft Visual Basic . Includes four isopach maps and sediment descriptions for each of the 4 surficial layers.

Sharpe, D. R., Pugin, a, Pullan, S. E., & Gorrell, G. (2003). Application of seismic stratigraphy and sedimentology to regional hydrogeological investigations: an example from Oak Ridges Moraine,

southern Ontario, Canada. Canadian Geotechnical Journal, 40(4), 711–730.
<http://doi.org/10.1139/t03-020>

Keywords: Journal Article, Ontario

Summary: An example of how seismic reflection methods plus seismic stratigraphy and a well constrained three-dimensional geological framework have helped to (i) identify regional hydrostratigraphic units, (ii) define properties and trends in these units-facies, (iii) improve depositional models that assist hydrogeological analysis, and (iv) establish a hydrostratigraphic framework within a watershed. The study area is situated within a 3 km long valley of Bowmanville creek on the south flank of an Oak Ridge Moraine sediment wedge.

Slattery, S.R. (2003) Project Unit 03-21. Subsurface Mapping of the Barrie Area, Central Ontario. from Summary of Field Work and Other Activities 2003, Ontario Geological Survey, Open File Report 6120, 24-1 to 24-6. p.

Keywords: Summary of Activities Report , Ontario

Summary: Summary of work conducted in the 2003 summer field season to help with the development of a 3-D geological model for the Barrie area. This work included compilation and examination of existing data sets from archival borehole records held by private consultants and municipal, provincial and federal governments that contain subsurface geological information. This report is an interim document for work in the final modelling output (Burt and Dodge, 2011).

Québec

Benoit, N., Forest, G., Nastev, M., Roy, N., Blanchette, D., & Fréchette, A. (2013). Hydrogeology of the Chaudière River Watershed, Quebec, 293152. <http://doi.org/10.4095/293152>

Keywords: 6700 km2, Conference Presentation , Québec

Summary: Poster presenting the results of a regional hydrogeological study for the 6700 km² Chaudière river watershed. Data presented includes bedrock geology, surficial geology, a conceptual flow model, the hydrogeological context of the area and information related to groundwater (chemistry, type, vulnerability, recharge).

Buffin-Bélanger, T., Chaillou, G., Cloutier, C-A., Touchette, M., Héту, B. et McCormack, R. 2015. Programme d'acquisition de connaissance sur les eaux souterraines du nord-est du Bas-Saint-Laurent (PACES-NEBSL) : Rapport final. 199p.

Keywords: Hydrostratigraphic Model , 4000 km2, ArcGIS, PACES report, Québec

Summary: Final Programme d'acquisition des connaissances sur les eaux souterraines (PACES) report for the 4000 km² St. Lawrence Basin including a 3D hydrogeological model in ArcGIS with 4 unique layers. Data for the model was created using seismic surveys and borehole data from 4616 holes. Report includes five cross-

sections, sediment thickness maps and information related to groundwater (chemistry, type, vulnerability, recharge).

Caron, O., Tremblay, T., et Lamothe, M. (2007) 3D hydrostratigraphic modelization using relative calculation method, Chaudière watershed, Québec, unpublished

Keywords: Unpublished, Québec

Summary: No copy accessed.

Caron, O. (2012) Synthèse et modèle cartographique 3D des formations quaternaires pour les bassins versants des rivières Chaudière et Saint-François: géochronologie, stratigraphie et paléogéographie wisconsinienne du sud du Québec. UQAM, Thèse de doctorat, 389 p.

Keywords: Quaternary Geology, 17 000 km², gOcad, Thesis, Québec

Summary: : Ph.D. thesis completed as part of the Programme d'acquisition des connaissances sur les eaux souterraines (PACES) which includes a 17 000 km² Quaternary 3D model for the Chaudière and St.-François rivers created in gOcad. This model has a grid size of 250m x 250m and 12 different quaternary layers and was based on information from geological maps, digital elevation models, data from 3361 cores, 147 stratigraphic columns from previous academic studies, geophysical data and outcrop data.

Caron, O., Lamothe, M., Benoit, N. et Nastev, M., 2014. Modélisation géologique 3D des sédiments quaternaires du bassin versant de la rivière Chaudière, Québec; Commission géologique du Canada, Dossier public 7515, 1 fichier .zip. doi:10.4095/295183

Keywords: 3D Geological Model, 17 000 km², gOcad, Open File Report, Québec

Summary: A 250m x 250m 3D geological model with 9 stratigraphic layers created in gOcad for the Chaudière rivershed area. Data used to create this model included previously drilled core, historical hydrogeological surveys, theses, outcrops, digital elevation models and geological maps. Includes conceptual models for Quaternary geology. Includes 11 maps and digital access to the 3D model.

Carrier, M.-A., Lefebvre, R., Rivard, C., Parent, M., Ballard, J.M., Benoît, N., Vigneault, H., Beaudry, C., Malet, X., Laurencelle, M., Gosselin, J.-S., Ladeveze, P., Thériault, R., Beaudin, I., Michaud, A., Pugin, A., Morin, R., Crow, H., Gloaguen, E., Bleser, J., Martin, A., and Lavoie, D. (2013). Portrait des ressources en eau souterraine en Montérégie Est, Québec, Canada. Rapport INRS ETE, R-1412.

Keywords: 16500 km², PACES report, Québec

Summary: Final Programme d'acquisition des connaissances sur les eaux souterraines (PACES) report for the 16500 km² Montérégie area including data that can be used to create a 3D model, which is suggested in the

future work. Data collected included information from 271 reports, 33829 water wells, 1716 geotechnical holes, 655 holes drilled by industry, 105 km of seismic, 175 km of TDEM and 7 km of electric resistivity. This paper does NOT contain a 3D model.

CERM-PACES, 2015 – Résultats du programme d'acquisition de connaissances sur les eaux souterraines du territoire de Charlevoix, Charlevoix-Est et La Haute-Côte-Nord. Centre d'études sur les ressources minérales, Université du Québec à Chicoutimi.

Keywords: Hydrostratigraphic Model , 4500 km2, ArcGIS, PACES report, Québec

Summary: Final Programme d'acquisition des connaissances sur les eaux souterraines (PACES) report for the 4500 km² Charlevoix, Charlevoix-Est and La Haute-Côte-Nord area including a 3D hydrogeological model in ArcGIS with a grid size of 100m x 100m. Data for the model was created using 46 stratigraphic sections, 649 water well records, surficial geology maps, seismic surveys and hydrogeochemical surveys.

Chesnaux R, Lambert M, Fillastre U, Walter J, Hay M, Rouleau A, Daigneault R, Germaneau D, Moisan A (2011b) Building a geodatabase for mapping hydrogeological features and 3D modeling of groundwater systems: application to the Saguenay-Lac-St-Jean region, Canada. *Comput Geosci* 37:1870–1882

Keywords: Hydrostratigraphic Model , 13 210 km2, ArcGIS, Journal Article, Québec

Summary: A description of how the Arc Hydro Groundwater geodatabase and associated 3D hydrostructural model was built for the 13210 km² Saguenay-Lac-St.-Jean region. Data sources include over 8000 boreholes, geological maps, pumping test results and geophysical investigations.

Cloutier, V., Blanchette, D., Dallaire, P.-L., Nadeau, S., Rosa, E., et Roy, M. 2013. Projet d'acquisition de connaissances sur les eaux souterraines de l'Abitibi-Témiscamingue (partie 1). Rapport final déposé au Ministère du Développement durable, de l'Environnement, de la Faune et des Parcs dans le cadre du Programme d'acquisition de connaissances sur les eaux souterraines du Québec. Rapport de recherche P001. Groupe de recherche sur l'eau souterraine, Institut de recherche en mines et en environnement, Université du Québec en Abitibi-Témiscamingue, 135 p., 26 annexes, 25 cartes thématiques (1:100 000).

Keywords: Hydrostratigraphic Model , 9187 km2, ArcGIS, PACES report, Québec

Summary: : Final Programme d'acquisition des connaissances sur les eaux souterraines (PACES) report for the 9187 km² Abitibi-Témiscamingue area including 3D hydrogeological model in ArcGIS 10.0 with a 100m x 100m grid and 11 surficial layers. Data sources for this model include 45.2 line-km of Time-domain electromagnetic surveys, geological maps, water well records and previous hydrogeological studies for a total of 7022 data points.

Cloutier V, Rosa E, Nadeau S, et al (2015) d'acquisition de connaissances sur les eaux souterraines de l'Abitibi-Témiscamingue (partie 2). Rapp. Final déposé au Ministère du Développement durable, l'Environnement la Lutte contre les Chang. Clim. dans le cadre du Program. d'acquisition connaissances sur les eaux Souterr. du Québec. Rapp. Rech. P002.R3. 313 p., 15 annexes, 24 cartes thématiques (1:100 000).

Keywords: 3D Geological Model, 10 362 km2, GMS, PACES report, Québec

Summary: Final Programme d'acquisition des connaissances sur les eaux souterraines (PACES) report for the 10 362 km2 Abitibi-Témiscamingue including 91 m thick 3D geological model created using GMS 9.2 Aquaveo LLC with a 100m by 100m grid and 5 surficial layers. Data sources for this model include seismic surveys, historical drilling (3061 water wells, 989 cores and 199 geotechnical holes), geological maps, elevation data and previous hydrogeological studies. This study also includes smaller 3D models for 6 regions; Rivière Portage, Rivière Dagenais, Rivière à la Loutre, Rivière Maine, Duparquet-Kinojèvis and the Secteur du Lac Devlin.

Comeau, G., Talbot Poulin, M.C., Tremblay, Y., Ayotte, S., Molson, J., Lemieux, J.M., Montcoudiol, N., Therrien, R., Fortier, R., Therrien, P., Fabien-Ouellet, G. (2013). Projet d'acquisition de connaissances sur les eaux souterraines en Outaouais, Rapport final. Département de géologie et de génie géologique, Université Laval, juillet 2013, 148 pages, 24 annexes, 25 cartes.

Keywords: 3D Geological Model, 13 762 km2, ArcGIS, PACES report, Québec

Summary: Final Programme d'acquisition des connaissances sur les eaux souterraines (PACES) report for the 13762 km2 Outaouais region including a 3D geological model created using Arc GIS with a 250m by 250m grid and 7 layers (4 surficial). Data sources for this model include seismic surveys, historical drilling (21688 water wells, and 334 geotechnical holes), geological maps, elevation data, 955 stratigraphic sections and previous hydrogeological studies. This study also includes 8 new stratigraphic cross sections.

Ferland, O., M. Larocque et M. Lamothe. 2013. Hydrostratigraphy and groundwater flow modeling in the Nicolet river and lower Saint-François river watershed (southern Quebec). Congrès GEO Montréal 2013 (AIH) 29 septembre au 3 octobre 2013. UQAM.

Keywords: Conference Presentation , Québec

Summary: Abstract for a presentation given at the GeoMontréal conference in 2013, no presentation available online.

Girard, F. (2001). Architecture et hydrostratigraphie d'un complexe morainique et deltaïque dans la région de Saint-Raymond de Portneuf, Québec. Mémoire de M.Sc., 2001, 185 p.

Keywords: 3D Geological Model, 400 km2, gOcad, ArcGIS, Thesis, Québec

Summary: M.Sc. Thesis completed at INRS. Includes a 400 km² model using gOcad that has been used to produce 41 east-west cross sections for the Saint-Raymond region of Portneuf. Data is based on historical reports and drilling as well as four new stratigraphic sections and data from drilling four supplementary holes.

Godbout, P.M., M. Lamothe et M. Larocque. 2011a. Hydrostratigraphy and Quaternary geology on the Bécancour area watersheds, Québec. Comptes-rendus de conférence, colloque GéoHydro2011, août 2011, Québec, 7 p.

Keywords: Hydrostratigraphic Model , 3847 km², ArcGIS, Conference Presentation , Québec

Summary: Preliminary data used in the Programme d'acquisition des connaissances sur les eaux souterraines (PACES) report for the 3847 km² Bécancour region including the methodology for creating a 3D hydrostratigraphic model in ArcGIS. Includes resistivity data, surficial maps, geophysics and luminescence dating data. Does not contain a 3D model.

Godbout, P.M., M. Lamothe, V. Horoi et O. Caron. 2011b. Synthèse stratigraphique, cartographie des dépôts quaternaires et modèle hydrostratigraphique régional, secteur de Bécancour, Québec. Rapport final. Montréal, Québec, 37 p.

Keywords: Hydrostratigraphic Model , 3845 km², GMS, PACES report, Québec

Summary: Final Programme d'acquisition des connaissances sur les eaux souterraines (PACES) report for the 3845 km² Bécancour area including a 3D hydrogeological model in GMS 9.0 with a 250m x 250m grid and 25 unique layers (although the first 13 are all 2.5m thick). Data for the model was created using 4222 water well records, 60 stratigraphic sections, geological and surficial maps. The model thickness ranges from 880 m in the Appalachians to 307m in the St. Lawrence Basin.

Godbout, P.M. 2013. Géologie du Quaternaire et hydrostratigraphie sur les bassins de la zone Bécancour, Québec. Mémoire de maîtrise en Sciences de la Terre, UQAM, 217 p.

Keywords: Hydrostratigraphic Model , 2924 km², gOcad, Thesis, Québec

Summary: M.Sc. thesis completed as part of the Programme d'acquisition des connaissances sur les eaux souterraines (PACES) which includes a 2924 km² 3D hydrostratigraphic gOcad model for the Bécancour area in Québec. The 3D model was created using over 1000 cores and 170 cross-sections, resulting in 12 hydrostratigraphic layers. Includes 3D figures for the extent of each of the 12 hydrostratigraphic units as well as 6 cross-sections.

Hudon-Gagnon E, Chesnaux R, Cousineau PA, Rouleau A (2011) A methodology to adequately simplify aquifer models of quaternary deposits: preliminary results. In: Proceedings of GeoHydro 2011, joint meeting

of the Canadian Quaternary Association and the Canadian Chapter of the International Association of Hydrogeologists, August 28–31, 2011, Quebec City, Canada, p 7

Keywords: Hydrostratigraphic Model , 232 km2, FEFLOW, PACES report, Québec

Summary: Preliminary data used in the Programme d'acquisition des connaissances sur les eaux souterraines (PACES) report for the 232 km² Mistouk River watershed including a 3D hydrostratigraphic model in FEFLOW with 4 stratigraphic layers. Data sources include surficial mapping, borehole data, digital elevation models and hydrogeological reports.

Hudon-Gagnon, E., Chesnaux, R., Cousineau, P.A., Rouleau, A., 2015. hydrostratigraphic simplification approach to build 3D groundwater flow numerical models: example of a Quaternary deltaic deposit aquifer. Environ. Earth Sci. doi:10.1007/s12665-015-4439-y

Keywords: Hydrostratigraphic Model , 210 km2, FEFLOW, Journal Article, Québec

Summary: Preliminary data used in the Programme d'acquisition des connaissances sur les eaux souterraines (PACES) report for the 210 km² Mistouk River watershed including a 3D hydrostratigraphic model in FEFLOW. Data sources include 247 stratigraphic records, 8 cone penetrating tests, 64 m of core sediments and 12 km of georadar. This paper tested 5 different numerical models to see the effects of simplifying the number of layers in a model.

Lamarche, L. (2008). 3D geological model of a deltaic aquifer system formed in a buried channel of the St . Lawrence River in Quebec City , Canada, 427–433.

Keywords: 3D Geological Model, gOcad, Journal Article, Québec

Summary: A 3D framework geological model of a deltaic aquifer system in Quebec City created in gOcad using geological survey data (borehole records, sedimentary structures, etc.), engineering reports and geophysical surveys. New data collected includes 11 boreholes, 40 seismic profiles and 300 ambient noise (HSVR) measurements. This model consists of 5 layers, each representing a different depositional unit.

Lamarche, L., Parent, M., Lefebvre, R., Perret, D. (2008). 3D geological model of a deltaic aquifer system formed in a buried channel of the St. Lawrence River in Quebec City, Canada. Joint Canadian Geotechnical Conference – International Association of Hydrogeologists Groundwater Conference (GeoEdmonton'08), Conference Proceedings, p. 427-433

Keywords: 3D Geological Model, gOcad, Conference Presentation , Québec

Summary: A preliminary 3D model for the Québec City area created using gOcad which was presented at the GeoEdmonton Conference in 2008. Data used to create the model consisted of over 5000 archived boreholes, 11 new boreholes, 40 seismic profiles and 300 ambient noise measurements.

Lamarche, L. (2011). Évolution paléoenvironnementale de la dynamique quaternaire dans la région de Québec: Application en modélisation tridimensionnelle et hydrogéologique. Thèse de Ph.D complétée, 2011, 221 p. plus CD

Keywords: 3D Geological Model, 1595 km2, gOcad, Thesis, Québec

Summary: Ph.D. these completed at INRS that includes a 1591 km² geological model for the Québec City area created using gOcad with a 250m x 250m grid and 14 surficial layers. Data sources included 8990 well records, 3.5 km of seismic survey, geological and surficial maps. .

Larocque, M., Gagné, S., Barnetche, D., Meyzonnat, G, Graveline, M. H. et Ouellet, M. A. 2015. Projet de connaissance des eaux souterraines du bassin versant de la zone Nicolet et de la partie basse de la zone Saint-François - Rapport final. Rapport déposé au Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques. 258 p.

Keywords: 3D Geological Model, 4585 km2, GMS, PACES report, Québec

Summary: Final Programme d'acquisition des connaissances sur les eaux souterraines (PACES) report for the 4585 km² Nicolet/St-François region including a 170 m thick 3D geological model created using GMS 10.0 with a 250m by 250m grid and 15 layers. Data sources for this model include 10300 water well records, surficial geology maps, and resistivity data.

Larocque, M., Meyzonnat, G., Ouellet, M. A., Graveline, M. H., Gagné, S., Barnetche, D. et Dorner, S. 2015. Projet de connaissance des eaux souterraines de la zone de Vaudreuil- Soulanges - Rapport scientifique. Rapport déposé au ministère du Développement durable, de l'Environnement et de la Lutte contre les Changements Climatiques. 202 p.

Keywords: 3D Geological Model, 160 km2, GMS, PACES report, Québec

Summary: Final Programme d'acquisition des connaissances sur les eaux souterraines (PACES) report for the 814 km² Vaudreuil-Soulanges region including a partial (160km²) 3D geological model created using GMS 10.0 with a 100m by 100m grid and 10 layers. Data sources for this model include 14 409 stratigraphic observations, surficial geology maps, and resistivity data.

Leblanc, Y., Légaré, G., Lacasse, K., Parent, M. et Campeau, S. (2013). Caractérisation hydrogéologique du sud-ouest de la Mauricie. Rapport déposé au ministère du Développement durable, de l'Environnement, de la Faune et des Parcs dans le cadre du Programme d'acquisition de connaissances sur les eaux souterraines du Québec. Département des sciences de l'environnement, Université du Québec à Trois-Rivières, 134 p., 15 annexes et 30 documents cartographiques (1:100 000).

Keywords: 3D Geological Model, 3350 km2, gOcad, PACES report, Québec

Summary: Final Programme d'acquisition des connaissances sur les eaux souterraines (PACES) report for the 3350 km² southwest Mauricie region including a 150 m thick 3D geological model created using gOcad with a 250m by 250m grid and 7 layers (6 surficial). Data sources for this model include 6856 water well records, 2 cores, 12 electromagnetic studies, and 63 line-km of high resolution 2D seismic surveys.

Lefebvre, R., Ballard, J.-M., Carrier, M.-A., Vigneault, H., Beaudry, C., Berthot, L., Légaré-Couture, G., Parent, M., Laurencelle, M., Malet, X., Therrien, A., Michaud, A., Desjardins, J., Drouin, A., Cloutier, M.H., Grenier, J., Bourgault, M.-A., Larocque, M., Pellerin, S., Graveline, M.-H., Janos, D. et Molson, J. (2015) Portrait des ressources en eau souterraine en Chaudière-Appalaches, Québec, Canada. Projet réalisé conjointement par l'Institut national de la recherche scientifique (INRS), l'Institut de recherche et développement en agroenvironnement (IRDA) et le Regroupement des organismes de bassins versants de la Chaudière-Appalaches (OBV-CA) dans le cadre du Programme d'acquisition de connaissances sur les eaux souterraines (PACES), Rapport final INRS R-1580, soumis au MDDELCC en mars 2015.

Keywords: Hydrostratigraphic Model , 14 600 km², ArcGIS, PACES report, Québec

Summary: Final Programme d'acquisition des connaissances sur les eaux souterraines (PACES) report for the 14 600 km² Chaudière-Appalaches region including a 2D hydrostratigraphic model for the area. Data sources for this model include 30189 water well records, 1271 geotechnical studies, 11 piezometer records, 2641 stratigraphic sections and surficial geology maps.

Lefebvre, R., Rivard, C., Carrier, M.-A., Gloaguen, E., Parent, M., Pugin, A. J.-M., ... Morin, R. H. (2011). Integrated regional characterization of the Montérégie Est aquifer system, Quebec, Canada. GeoHydro Proceedings Papers, 2011, 1–8. Retrieved from <http://geoscan.nrcan.gc.ca/starweb/geoscan/servlet.starweb?path=geoscan/fulle.web&search1=R=292005>

Keywords: 9000 km², Journal Article, Québec

Summary: This paper provides an overview of the compilation and characterization work carried out as a part of the Programme d'acquisition des connaissances sur les eaux souterraines (PACES) for the 9000 km² Montérégie Est region. Data used for this project include information from boreholes, weather, river gauging stations, topographic maps, elevation models, bedrock geology maps, quaternary geology maps, and hydrography.

Légaré, G. (2013). Hydrostratigraphie et modélisation géologique 3D du sud-ouest de la Mauricie. Mémoire de maîtrise en sciences de l'environnement, Université du Québec à Trois-Rivières, 100 p.

Keywords: 3D Geological Model, 3350 km², gOcad, Thesis, Québec

Summary: M.Sc. thesis completed as part of the Programme d'acquisition des connaissances sur les eaux souterraines (PACES) which includes a 150 m thick 3D geological model created using gOcad with a 250m by

250m grid and 7 layers (6 surficial). Data sources for this model include 6856 water well records, 2 cores, 12 electromagnetic studies, and 63 line-km of high resolution 2D seismic surveys.

Nastev, M., Parent, M., Ross, M., Howlett, D., Benoit, N. (2016). Geospatial modelling of shear-wave velocity and fundamental site period of Quaternary marine and glacial sediments in the Ottawa and St. Lawrence Valleys, Canada. *Soil Dynamics and Earthquake Engineering*, v. 85 (2016), p. 103–116

Keywords: 3D Geological model, 72000 km2, gOcad, Journal Article, Québec

Summary: Journal paper discussing the geospatial modeling of shear-wave velocity. Included the creation of a 3D geological model combining the data from simplified models for the Mirabel, Portneuf, South Nation, Châteauguay, Québec City and Chaudière regions.

Talbot Poulin, M.C., Comeau, G., Tremblay, Y., Therrien, R., Nadeau, M.M., Lemieux, J.M., Molson, J., Fortier, R., Therrien, P., Lamarche, L., Donati-Daoust, F., Bérubé, S. (2013). *Projet d'acquisition de connaissances sur les eaux souterraines du territoire de la Communauté métropolitaine de Québec, Rapport final*. Département de géologie et de génie géologique, Université Laval, mars 2013, 172 pages, 19 annexes, 28 cartes.

Keywords: 3D Geological Model, 3350 km2, ArcGIS, PACES report, Québec

Summary: Final Programme d'acquisition des connaissances sur les eaux souterraines (PACES) report for the 3350 km² Québec city region including a 3D geological model created using ArcGIS and Surfer with a 250m by 250m grid and 11 layers (4 surficial). Data sources for this model include 20918 water well records, 10 geotechnical studies, 546 piezometer records and high resolution 2D seismic surveys.

Ross, M., Parent, M., Lefebvre, R. and Martel, R. (2002). 3D geologic framework for regional hydrogeology and land-use management; a case study from southwestern Québec, Canada. in: L.H. Thorleifson and R.C. Berg (eds.), *Three-Dimensional Geological Mapping for Groundwater Applications*, Workshop Extended Abstracts (Denver, CO, October 26, 2002) Geological Survey of Canada, Open File 1449, pp. 52-55.

Keywords: 3D Geological Model, 1500 km2, gOcad, MS Access, Journal Article, Québec

Summary: Journal paper describing the creation of a 1500 km² geological model in southwestern Québec using gOcad. Data consisted of 5143 historical wells, surficial mapping, geological section analysis and ground penetrating radar surveys which was compiled in a MSAccess database. Included as a chapter in Ross's thesis (2004).

Ross, M. (2004). *Stratigraphie et architecture des formations quaternaires au nord-ouest de Montréal – Applications en hydrogéologie régionale*. Thèse Ph.D. complétée, 2004, 319 p. plus CD

Keywords: 3D Geological Model, 1500 km², gOcad, MS Access, Thesis, Québec

Summary: Ph.D thesis describing the creation of a 1500 km² geological model in southwestern Québec using gOcad. Data consisted of 5143 historical wells, surficial mapping, geological section analysis and ground penetrating radar surveys which was compiled in a MSAccess database. Includes the Journal paper by Ross et al. from 2002.

Ross, M., Parent, M., Lefebvre, R., 2005. 3D geologic framework models for regional hydrogeology and land-use management: a case study from a Quaternary basin of southwestern Quebec, Canada. *Hydrogeol. J.* 13, 690–707.

Keywords: 3350 km², Journal Article, Québec

Summary: This paper provides an overview of the compilation and characterization work carried out as a part of the Programme d'acquisition des connaissances sur les eaux souterraines (PACES) for the 3350 km² Québec City region. This paper includes a 1400 km² 3D geologic framework model with 6 layers. Data sources used for this project include information from 5148 boreholes, surficial mapping, stratigraphic drilling and shallow seismic reflection surveys.

Savard, M. M. (2013). Inventaire canadien des ressources en eau souterraine : Caractérisation hydrogéologique régionale et intégrée du système aquifère fracturé du sud-ouest du Québec.

Keywords: GSC Bulletin, Québec

Summary: Inventory of Canadian groundwater resources for the Lower Laurentians region of southwestern Québec including 39 thematic maps (1:200 000), five vertical sections for Paleozoic rocks, five sections showing surficial deposits, a 3D block diagram of the Quaternary geology as well as a graphic, spatial synthesis of water use in the study area. This report is presented in two parts; the regional hydrogeology of the fractured aquifer system and the quantitative analysis of groundwater resources.

Savard, M. M., Nastev, M., Paradis, D., Lefebvre, R., Martel, R., Cloutier, V., Murat, V., Bourque, E., Ross, M., Lauzière, K., Parent, M., Hamel, A., Lemieux, J.-M., Therrien, R., Bolduc, A., Rocher, M., Salad Hersi, O., Kirkwood, D., Castonguay, S., Gélinas, P. (2013). Regional hydrogeology of the fractured aquifer system. In: Canadian inventory of groundwater resources: integrated regional hydrogeological characterization of the fractured aquifer system of southwestern Quebec; Savard, M M (éd.); Geological Survey of Canada, Bulletin no. 587, 2013; p. 9-78

Keywords: GSC Bulletin, Québec

Summary: Inventory of Canadian groundwater resources for the Lower Laurentians region of southwestern Québec including 39 thematic maps (1:200 000), five vertical sections for Paleozoic rocks, five sections showing surficial deposits, a 3D block diagram of the Quaternary geology as well as a graphic, spatial synthesis

of water use in the study area. This report is presented in two parts; the regional hydrogeology of the fractured aquifer system and the quantitative analysis of groundwater resources.

Tremblay, T. 2008. Hydrostratigraphie et géologie du quaternaire dans le bassin-versant de la rivière Châteauguay, Québec. Mémoire. Montréal (Québec, Canada), Université du Québec à Montréal, Maîtrise en sciences de la terre. 233 p.

Keywords: 3D Geological Model, 2300 km2, MapInfo, Thesis, Québec

Summary: M.Sc. thesis completed as part of the Programme d'acquisition des connaissances sur les eaux souterraines (PACES) for the 2300 km² Châteauguay River basin including a 3D geological model created using Vertical Mapper 3.0 and MapInfo 7.5 with a 30m by 30m grid and 10 layers. Data sources for this model include over 5000 water well records, surficial geology maps, ground-penetrating radar, seismic reflection surveys and digital elevation models. Thesis contains the Tremblay et al. (2010) paper listed below.

Tremblay, T., Nastev, M., and Lamothe, M. 2010. Grid-based Hydrostratigraphic 3D Modelling of the Quaternary Sequence in the Chateauguay River Watershed, Quebec; Journal: Canadian Water Resources Journal, 35, 4, 377-398.

Keywords: 3D Geological Model, 2300 km2, MapInfo, Journal Article, Québec

Summary: Journal paper written as part of the Programme d'acquisition des connaissances sur les eaux souterraines (PACES) for the 2300 km² Châteauguay River basin including a 3D geological model created using Vertical Mapper 3.0 and MapInfo 7.5 with a 30m by 30m grid and 10 layers. Data sources for this model include over 5000 water well records, surficial geology maps, ground-penetrating radar, seismic reflection surveys and digital elevation models. This paper is included in the Tremblay (2008) M.Sc. thesis listed above.

Nastev, M., Parent, M., Benoit, N., Ross, M. and Howlett, D. (2016). Regional VS30 model for the St. Lawrence Lowlands, Eastern Canada. Georisk - Taylor and Francis. published online: doi: 10.1080/17499518.2016.1149869

Keywords: 3D Geological Model, 72000 km2, gOcad, Journal Article, Québec

Summary: Journal paper outlining the use of a 72000 km² simplified regional 3D geological model for the St. Lawrence lowlands area to assess the vulnerability of the area to seismic activity. Existing models in the study area were compiled and three simplified layers were created; a sand unit, a clay unit and a till unit.

Ross, M, Martel, R., Lefebvre, R., Parent, M., Savard, M.M. (2003). The use of a 3D geologic framework of surficial sediments to define bedrock aquifer vulnerability in the St. Lawrence Lowlands, Quebec, Canada. in: R. Rodriguez, M. Civita, M. de Maio (eds.), Proceedings of First International Workshop on Aquifer Vulnerability and Risk (Salamanca, Mexico, May 28-30, 2003), Vol 1, p. 157-168

Summary: unable to obtain a copy

Howlett, D., and Ross, M. 2016. Regional-Scale Three dimensional geological modeling of the St. Lawrence and Ottawa Valleys for Geohazard Assessment. Geological Survey of Canada, Open File (in review)

Keywords: 3D Geological Model, 72000 km², gOcad, Open File Report, Québec

Summary: unable to obtain a copy

New Brunswick

Rivard, C., Michaud, Y., Deblonde, C., Boisvert, V., Carrier, C., Morin, R.H., Calvert, T., Vigneault, H., Conohan, D., Castonguay, S., Lefebvre, R., Rivera, A., and Parent, M. 2008: Canadian Groundwater Inventory: Regional hydrogeological characterization of the south-central part of the Maritimes Basin; Geological Survey of Canada, Bulletin 589, 96 p.

Keywords: Hydrostratigraphic Model , 10 500 km², ArcGIS, GSC Bulletin, New Brunswick

Summary: A large integrated hydrogeological study focusing on a 10500 km² representative area of the Maritimes Basin, including parts of New Brunswick, Nova Scotia and Prince Edward Island. For the development of the numerical model in ArcGIS, the geology had to be greatly simplified in many areas due to the lenticular nature of permeable bodies and strong heterogeneity in the Maritimes Basin. The 3-D geological model presented in this paper is the surficial representation of the geology map draped over the digital elevation model in ArcGIS.

Nova Scotia

Rivard, C; Paradis, D; Paradis, S J; Bolduc, A; Morin, R H; Liao, S; Pullan, S; Gauthier, M -J; Trépanier, S; Blackmore, A; Spooner, I; Deblonde, C; Boivin, R; Fernandes, R A; Castonguay, S; Hamblin, T; Michaud, Y; Drage, J; Paniconi, C. 2012. Canadian groundwater inventory: regional hydrogeological characterization of the Annapolis Valley aquifers; . Geological Survey of Canada, Bulletin 598, 161 pages; 1 CD-ROM, doi:10.4095/288107

Keywords: Hydrostratigraphic Model , 2100 km², ArcGIS, GSC Bulletin, Nova Scotia

Summary: The Annapolis-Cornwallis Valley Aquifer Study was a regional hydrogeological study covering 2100 km². The main objective of this project was to characterize and quantify the groundwater resources within granular and fractured aquifers of the valley. Through compilation of existing data, fieldwork, analyses, interpretation and modelling, a general understanding of the Annapolis Valley's aquifer system has been obtained, including its geological, hydrogeological, hydrological and geochemical characteristics. A 3-D geological model was built for the valley, including bedrock and a simplistic surficial deposit layer, using ArcGIS with a 500 x 500 grid.

Northwest Territories

Kerr, D.E. and Knight, R.D. Overburden thickness models: examples from the Slave Province, Northwest Territories, NTS 76C, D, E, M, O, 77A, 86A, H, I, O, and P. Geological Survey of Canada, Open File 5522, 2007; 11 pages; 1 DVD, doi:10.4095/223763.

Keywords: Depth to bedrock, MapInfo, Map, Northwest Territories

Summary: Set of 11 1:250 000 overburden thickness models (map sheets) from the Slave Province. Data analysis and modelling of 11 surficial layers were carried out with MapInfo and Vertical Mapper software. Development of an overburden thickness model comprises five steps: (1) surficial geology map polygon preparation, (2) file buffering, (3) acquire and trim DEM data, (4) bedrock surface modelling, and (5) drift thickness modelling.

Knight, R. D. and Kerr, D. E. (2007) An overburden thickness model for Lac de Gras and Aylmer Lake, Northwest Territories, Canada. *Journal of Maps* vol. 2007; p. 296-310

Keywords: Depth to bedrock , 95231 km2, MapInfo, Open File Report, Northwest Territories

Summary: An overburden thickness model for the Lac de Gras and Aylmer Lake areas in the Slave Province, NWT. These models were created by subtracting the elevation data from a digital elevation model to provide an overburden thickness model. In the Lac de Gras area, this model was compared to data from over 500 drill holes from diamond exploration programs.

Smith IR (2012) The application of seismic shothole drillers' log data to petroleum exploration and development. *Bull Can Pet Geol* 60:59–68.

Keywords: Depth to bedrock, ArcGIS, MS Access, Journal Article, Northwest Territories

Summary: A large new source of lithostratigraphic data derived from the compilation of 343 989 seismic shothole driller's logs, averaging 18.6 m in depth, from northern Yukon and the continental Northwest Territories. This information has been compiled into MSAccess database and GIS formats to enable reconstructions and models of potential granular aggregate resources, ice occurrences (both massive and ground) and drift thicknesses. This paper describes how shothole data was obtained and validated as well as possible uses for the information but does not contain a 3D model. The data is available for download from Smith and Lesk-Winfield (2010).

Smith IR (2015) Seismic shothole drillers' lithostratigraphic logs: unearthing a wealth of regional geoscience information in northwestern Canada. *GeoRes J* 6:21–29. doi: org/10.1016/j.grj.2015.01.005

Keywords: Depth to bedrock, ArcGIS, MS Access, Journal Article, Northwest Territories

Summary: The final database of 343 989 records from northern Yukon and the continental Northwest Territories provides the largest source of geoscience information of its kind in northwestern Canada. In many cases it contains unique and original records on a host of subjects including, surficial-, bedrock-, and hydro-geology, permafrost and geohazards. The drillers' log records, averaging 18.6 m in depth, have been used to

create geospatial models of drift, till, muskeg, massive ice and ground ice thicknesses, and continue to be applied to new avenues of research such as temporal variations of bottomfast ice extents in offshore shallow marine environments. This database provides a basis for construction of predictive models but does not contain a 3D model. The data is available for download from Smith and Lesk-Winfield (2010).

Smith IR, Duong L (2012) An assessment of surficial geology, massive ice, and ground ice, Tuktoyaktuk Peninsula, Northwest Territories: application to the proposed Inuvik to Tuktoyaktuk all-weather highway. Geol Surv Canada, Open File 7106. doi: 10.4095/292017

Keywords: Depth to bedrock, ArcGIS, MS Access, Open File Report, Northwest Territories

Summary: This report reviews recent compilations of 343 989 seismic shothole drillers' litholog records (averaging 18.6 m depth) and related research that pertain to issues of surficial geology, retrogressive thaw slumps, massive ice, and ground ice in the region of the proposed Inuvik to Tuktoyaktuk all-weather highway in the continental Northwest Territories. Presented as both a regional GIS and thematic figures and tables that were created in ArcGIS v. 9.3 based on the data presented in Smith and Lesk-Winfield (2010).

Smith IR, Lesk-Winfield K (2010) Drift isopach, till isopach, and till facies reconstructions for Northwest Territories and northern Yukon. Geol Surv Canada, Open File 6324. doi: 10.4095/261783

Keywords: Depth to bedrock, ArcGIS, MS Access, Open File Report, Northwest Territories

Summary: This Open file publication presents a model of interpolated and minimum estimates of drift and till thicknesses, as well as an indication of different till facies in northern Yukon and the continental Northwest Territories. This file contains ArcGIS shapefiles of the interpreted thicknesses based on the collection of 343 989~275 000 records averaging 18.6m in depth. The data available herein reflects the version 2 seismic shothole database of Smith and Lesk-Winfield (2010). This database was subsequently updated to the final version (Smith, 2011), containing 343 989 records, the majority of new records in which were from the Parsons Lake and Mackenzie Delta region. The final (version 3) database of Smith (2011) was used in Smith (2012, 2015) and Smith and Duong (2012).