MANITOBA GEOLOGICAL SURVEY

Plain Language Report Summaries 2016

Manitoba

PLAIN LANGUAGE REPORT SUMMARIES 2016

Manitoba Growth, Enterprise and Trade
Manitoba Geological Survey

Manitoba

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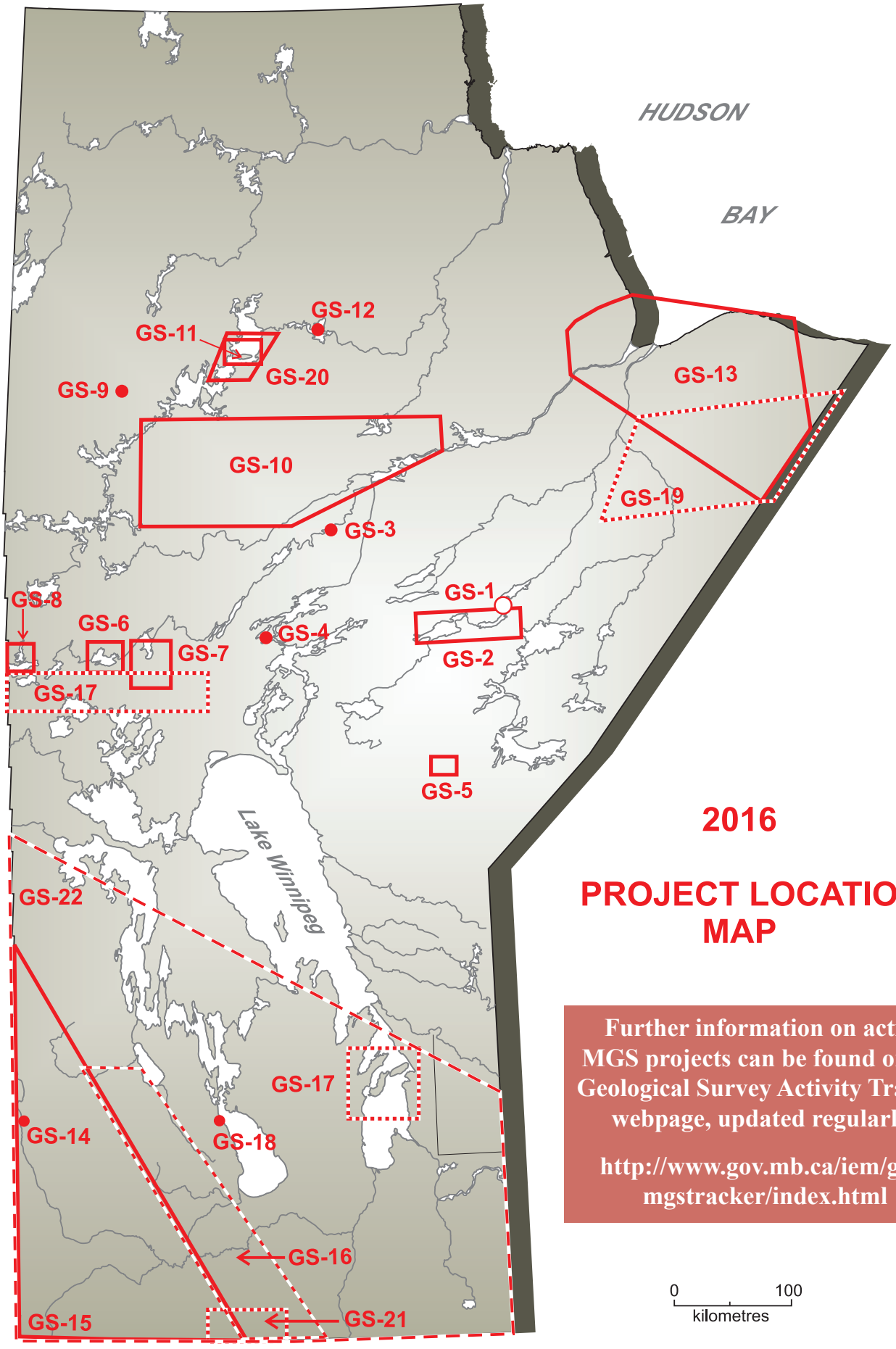

2016

PROJECT LOCATION MAP

Further information on active MGS projects can be found on the Geological Survey Activity Tracker webpage, updated regularly:

http://www.gov.mb.ca/iem/geo/mgstracker/index.html

GS-1
GS-2

Bedrock mapping at Oxford Lake and Knee Lake

by Scott D. Anderson

In 2012, the Manitoba Geological Survey (MGS) began a renewed study of the Oxford Lake–Knee Lake area, in order to improve understanding of the bedrock geology and mineral potential of this highly prospective yet underexplored region. Precambrian bedrock in this area contains known deposits of gold, silver and copper, and has potential for a number of important commodities including nickel, diamonds, and 'rare metals' such as neodymium (used in high-technology applications). Similar rocks extend to the southeast over 100 km, where they host the Monument Bay gold-tungsten deposit currently being evaluated by Yamana Gold Inc.

Building on results of previous MGS mapping and taking advantage of unprecedented bedrock exposure due to exceptionally low water levels, several important outcomes were achieved in 2016.

Outcomes:

- Identification of a distinct association and configuration of sedimentary basins, faults and alkaline (potassium-rich) intrusions at central Knee Lake, which may serve as an important guide for gold exploration, based on similarities to major gold districts elsewhere in the Canadian Shield
- Discovery of a swarm of carbonate intrusions in west-central Knee Lake, tentatively interpreted as carbonatite (primary carbonate magma derived from the mantle), with implications for rare metal prospectivity
- Improved documentation of an unusual and diverse suite of rocks that has potential to contain minerals derived from the Earth's mantle, including diamonds

Notes

Detailed information for this summary can be found in the 2016 Report of Activities:

Anderson, S.D. 2016: Preliminary results of bedrock mapping at central Knee Lake, northwestern Superior province, Manitoba (parts of NTS 53L15, 53M2); *in* Report of Activities 2016, Manitoba Growth, Enterprise and Trade, Manitoba Geological Survey, p. 1–15.

Anderson, S.D. 2016: Alkaline rocks at Oxford Lake and Knee Lake, northwestern Superior province, Manitoba (NTS 53L13, 14, 15): preliminary results of new bedrock mapping and lithogeochemistry; *in* Report of Activities 2016, Manitoba Growth, Enterprise and Trade, Manitoba Geological Survey, p. 16–27.

Bedrock mapping in the Pikwitonei granulite domain
by Chris G. Couëslan

Since 2012, the Manitoba Geological Survey has had an ongoing project to map the bedrock at Sipiwesk, Cauchon, Armstrong and Partridge Crop lakes, in a geological area known as the Pikwitonei granulite domain. Mapping continued in the summer of 2016 in the Natawahunan Lake area and Duck Lake area.

Rocks in this domain made up the roots of an ancient mountainous zone similar to the European Alps or Asian Himalayas. These rocks were buried to depths of 26–33 km and heated to temperatures of 750°C or more, causing them to recrystallize and partially melt through metamorphic processes. Mountain belts around the world host a variety of important types of mineral deposits. Deposits in the deeper portions of such belts are often obscured by the very processes that produced the mountains (such as metamorphism). Because of this, the Pikwitonei domain has historically seen little exploration spending. Although mineral exploration can be challenging in these areas, similar metamorphic domains in Australia are host to world-class mineral deposits such as Broken Hill, the largest lead-zinc mine in the world.

The goal of this project is to re-map the Pikwitonei granulite domain by interpreting what the original rocks were prior to metamorphism (*i.e.* sandstone, lava flows, etc.) and comparing the resulting maps to adjacent areas of Manitoba hosting major deposits of nickel, copper, zinc and gold in order to identify exploration targets.

Outcomes:

- Recognition of ocean-floor volcanic rocks that have potential for copper-zinc and gold mineralization
- Correlation of sedimentary and volcanic rocks with prospective rocks from adjacent areas in Manitoba
- Discovery of rocks that have potential to host rare metal mineralization (*e.g.* rare-earth elements, yttrium, niobium)

Notes

Detailed information for this summary can be found in the 2016 Report of Activities:

Couëslan, C.G. 2016: Preliminary results of bedrock mapping in the Natawahunan Lake area, western margin of the Pikwitonei granulite domain, central Manitoba (parts of NTS 63P11, 14); *in* Report of Activities 2016, Manitoba Growth, Enterprise and Trade, Manitoba Geological Survey, p. 28–39.

Couëslan, C.G. 2016: Preliminary results of bedrock mapping in the southeastern Duck Lake–Sesep Rapids area, Pikwitonei granulite domain, central Manitoba (part of NTS 63J16); *in* Report of Activities 2016, Manitoba Growth, Enterprise and Trade, Manitoba Geological Survey, p. 40–50.

Bigstone Lake bedrock mapping project
by Marc L. Rinne

The Bigstone Lake area was identified as a priority for new geological mapping in part because of its potential to contain a wide variety of mineral deposits, but also because it has not been systematically studied for many decades. Significant occurrences of zinc, copper and gold identified by previous exploration and mapping are hosted by rocks associated with ancient seafloor volcanism. The objectives of this project are to document the type, distribution, history and structure of such rocks at Bigstone Lake, with the aim of providing new information to inform land use decisions and promote investments in mineral exploration and development.

Outcomes:

- Documented large areas of volcanic rocks that show evidence of chemical modification by ancient geothermal activity, which may have produced local concentrations of zinc, copper, gold and silver
- Identified lava flows enriched in magnesium, which were likely much hotter and denser than normal when erupted on the ancient seafloor; such flows have potential for nickel, copper and platinum group elements

Notes

Detailed information for this summary can be found in the 2016 Report of Activities:

Rinne, M.L., Anderson, S.D. and Reid, K.D. 2016: Preliminary results of bedrock mapping at Bigstone Lake, northwestern Superior province, Manitoba (parts of NTS 53E12, 13); *in* Report of Activities 2016, Manitoba Growth, Enterprise and Trade, Manitoba Geological Survey, p. 51–62.

Examination of exploration drillcore from the Reed Lake area
by Simon Gagné

The Reed Lake area includes the active Reed mine, as well as several past-producing mines and undeveloped deposits. Mineral deposits in this area formed during venting of high-temperature, metal-rich fluids near sites of active volcanism on an ancient seafloor. Typically, these deposits occur along specific horizons within much thicker volcanic sequences. Explorationists identify these horizons using a variety of geological tools. However, in the Reed Lake area exploration is complicated by a number of factors, including insufficient detail at depth and a thin veneer of younger limestone, which covers the volcanic rocks south of Reed Lake.

In order to support exploration efforts in this region and to assess the mineral potential for other types of deposits, this project incorporates new bedrock mapping with examination of exploration drillcore. By combining existing data with new observation and analyses, the goal is to refine the existing geological model and provide the exploration industry with criteria that can be used to explore more efficiently for new deposits, at surface, depth and under the limestone cover.

Outcomes:

- Identification of previously unrecognized volcanic rocks with high exploration potential in eastern Reed Lake
- Southward delineation of the horizon that hosts the past-producing Dickstone mine, extending to the western shore of Reed Lake
- Recognition of favourable volcanic rocks over a large area south of Reed Lake, confirming high mineral potential in this area

Notes

Detailed information for this summary can be found in the 2016 Report of Activities:

Gagné, S. 2016: Examination of exploration drillcore from the Reed Lake area, Flin Flon belt, west-central Manitoba (parts of NTS 63K7, 8, 9, 10); *in* Report of Activities 2016, Manitoba Growth, Enterprise and Trade, Manitoba Geological Survey, p. 63–73.

Examination of drillcore from the south Wekusko Lake area
by Kyle Reid

For more than 100 years, the mining of copper, zinc, silver and gold has been a mainstay of Manitoba's northern economy. Although three mines are currently in production, declining ore reserves in the traditional mining centres of Flin Flon and Snow Lake require renewed exploration, particularly in the highly prospective rocks that extend under the cover of younger limestone south of Wekusko Lake. This project aims to document the types and distributions of prospective volcanic rocks in this poorly understood area, based on drillcores previously obtained by the exploration industry.

Re-examination of existing drillcores is a cost effective way of adding value to previous work and further informing exploration models in areas under the limestone cover, thereby reducing investment risk in a challenging market. Eighteen drillcores from a 20 km by 25 km area south-southwest of Wekusko Lake were re-examined and sampled during the 2016 field season.

Outcomes:

- Recognition of volcanic sequences prospective for copper-zinc deposits, as well as magmatic intrusions with potential for nickel-copper deposits
- Identified features characteristic of rocks that host copper-zinc mineralization, which may indicate proximity to mineralizing systems
- Acquisition of new data (e.g., whole-rock geochemistry) to further inform exploration models

Notes

Detailed information for this summary can be found in the 2016 Report of Activities:

Reid, K.D. and Gagné, S. 2016: Examination of exploration drillcore from the south Wekusko Lake area, eastern Flin Flon belt, north-central Manitoba (parts of NTS 63J5, 12, 63K8, 9); *in* Report of Activities 2016, Manitoba Growth, Enterprise and Trade, Manitoba Geological Survey, p. 74–86.

Tectonometamorphic investigations in the Athapapuskow Lake area

by Manuele Lazzarotto, Simon Gagné, and David R.M. Pattison

In 2015, the University of Calgary together with the Manitoba Geological Survey started a new project in the Athapapuskow Lake area in west-central Manitoba, which is part of a 2.0–1.8 billion year old, now eroded, mountain belt that stretched across the Precambrian Shield. Within this belt, rocks were intensely modified by processes associated with mountain-building, including recrystallization (metamorphism) and deformation.

The objective of the project is to refine the geological model of the Athapapuskow Lake area, taking into account the timing and magnitude of metamorphic and tectonic changes across various geological domains, in order to provide a better understanding of the evolution of the region. Several past and present producing copper-zinc mines are present in the region and metamorphic processes strongly controlled the transportation and concentration mechanisms of precious and base metals. Hence, improved understanding of these processes will help in the characterization of existing deposits and will inform exploration models for the discovery of new deposits in the area.

Outcomes:

- Compilation of a new metamorphic map of the Athapapuskow Lake area, which will be extended to the entire Flin Flon–Snow Lake belt
- Improved understanding of the relationships between changes in metamorphic conditions and movement across faults that locally separate distinct geological blocks or domains
- Recognition that horizontal and vertical movements of geological blocks played an important role in the tectonic evolution of the area

Notes

Detailed information for this summary can be found in the 2016 Report of Activities:

Lazzarotto, M., Gagné, S. and Pattison, D.R.M. 2016: Tectonometamorphic investigations in the Athapapuskow Lake area, west-central Manitoba (part of NTS 63K12); *in* Report of Activities 2016, Manitoba Growth, Enterprise and Trade, Manitoba Geological Survey, p. 87–98.

Bedrock mapping in the Lynn Lake region
by Xue-Ming (Eric) Yang and Chris J. Beaumont-Smith

The Lynn Lake region contains a number of important mineral deposits, which are unusual in terms of their size and diversity in comparison to other districts in Manitoba. In this region, major nickel-copper, copper-zinc and gold deposits formed by distinctly different geological processes and are hosted by distinct types or associations of rock. Since 2015, the Manitoba Geological Survey has renewed bedrock mapping in the Lynn Lake region with the objectives of understanding the diverse geology and mineral deposits, and identifying key predictive criteria for ongoing exploration efforts.

Bedrock mapping started in the area of the MacLellan gold mine last summer, and continued in the area of the Farley Lake gold mine in the 2016 field season. Both of these areas are currently the focus of a comprehensive mine feasibility study by Alamos Gold Inc.

Outcomes:

- Better documentation of the stratigraphic and structural settings of gold-silver mineralization in the areas of the MacLellan and Farley Lake mines
- Delineation of rocks with potential to host copper-zinc and nickel-copper-platinum mineralization
- Identification of previously under-appreciated potential for a variety of mineral deposit types (e.g., copper-molybdenum-gold, tin-tungsten, and rare metals such as niobium, tantalum, lithium) hosted by different types of granite intrusions

Notes

Detailed information for this summary can be found in the 2016 Report of Activities:

Yang, X.M. and Beaumont-Smith, C.J. 2016: Geological investigations in the Farley Lake area, Lynn Lake greenstone belt, northwestern Manitoba (part of NTS 64C16); *in* Report of Activities 2016, Manitoba Growth, Enterprise and Trade, Manitoba Geological Survey, p. 99–114.

Granitoid rocks in Manitoba
by Xue-Ming (Eric) Yang

Granitoid rocks, formed by slow crystallization of magma deep in the Earth, make up the vast majority of exposed bedrock in Manitoba's portion of the Precambrian Shield. These rocks provide important information on the ages, origins and tectonic environments, and different types of granitoid rocks may host several types of mineral deposits, some of which are among the largest mineral deposits on Earth. Despite this, granitoid rocks have generally not been explored to the same extent as the belts of volcanic and sedimentary rocks that host the majority of Manitoba's Precambrian mineral endowment.

The Manitoba Geological Survey initiated the Granitoid project in 2014 to investigate the nature and mineral potential of granitoid rocks throughout Manitoba, starting in southeastern Manitoba and then moving to north-central Manitoba this summer.

Outcomes:

- Identification of several different suites or types of granitoid rocks that have the same or similar characteristics to rocks hosting large deposits of rare metals, tin-tungsten, copper-gold-molybdenum in other Precambrian regions

Notes

Detailed information for this summary can be found in the 2016 Report of Activities:

Yang, X.M. 2016: Granitoid rocks in north-central Manitoba: preliminary results of reconnaissance mapping and sampling; *in* Report of Activities 2016, Manitoba Growth, Enterprise and Trade, Manitoba Geological Survey, p. 115–125.

Southern Indian Lake mapping and compilation project
by Tânia Martins

New shoreline bedrock mapping by the Manitoba Geological Survey at Southern Indian Lake is building toward a comprehensive geological compilation of a large and poorly understood region, which also includes Partridge Breast Lake, Gauer Lake and Northern Indian Lake. The rocks in this region formed in a variety of different geological settings, including ancient seafloor volcanoes and continental river systems, and were later buried to great depths beneath a mountain range that may have rivaled the Andes in South America in terms of scale. This geological diversity has resulted in an equally diverse potential for a number of different types of mineral deposits, including base metals, gold, rare metals and diamonds. Despite this potential, the region surrounding Southern Indian Lake has only seen minimal previous exploration; the major objective of this study is to update the geology in order to inform exploration decisions in the region and support the land-use planning initiatives of the O-Pipon-Na-Piwin Cree Nation.

Outcomes:

- Identified geological similarities with other areas of Manitoba, such as Lynn Lake and Snow Lake, that have demonstrated potential for gold and base metal deposits
- Documented new targets for copper, zinc, gold and diamond exploration associated with several distinct types and ages of rock

Notes

Detailed information for this summary can be found in the 2016 Report of Activities:

Martins, T. 2016: Geological investigations at central Southern Indian Lake, north-central Manitoba (parts of NTS 64G1, 2, 7, 8); *in* Report of Activities 2016, Manitoba Growth, Enterprise and Trade, Manitoba Geological Survey, p. 126–134.

Martins T. and McFarlane C.R.M. 2016: Evidence of juvenile-arc magmatism at Northern Indian Lake: implications for base-metal exploration in north-central Manitoba (parts of NTS 64H3, 5, 6); *in* Report of Activities 2016, Manitoba Growth, Enterprise and Trade, Manitoba Geological Survey, p. 135–141.

Oil potential of the Hudson Bay Basin, northeastern Manitoba

by Michelle P.B. Nicolas

The Manitoba Geological Survey has an ongoing project with the Geological Survey of Canada to map the sedimentary rocks of the Hudson Bay Basin. The southwestern edge of this basin occurs in the Hudson Bay Lowland in northeastern Manitoba. This basin is a large frontier area that currently has no oil and gas production but good potential for local economical accumulations. The purpose of this project is to build a comprehensive geological model of the basin to understand its petroleum systems and attract exploration interest.

Hundreds of samples from drill core in the Hudson Bay Lowland were taken and analysed to determine the chemical fingerprints of oxygen and carbon isotopes. These fingerprints give information on the depositional environment, sea water chemistry and climate at the time of deposition. The stratigraphic information acquired supports the work being conducted to establish the long-distance predictability of rock units, as well as the predictability of the depositional environment that formed the rocks. Geographic predictability, particularly in a large basin like the Hudson Bay Basin, helps identify focus areas for oil and gas exploration.

Outcomes:

- Understand the depositional environment of the rocks of the Hudson Bay Basin and how they change over time and space
- Determine which rock units may be source rocks
- Determine which rock units are the best potential reservoirs

Notes

Detailed information for this summary can be found in the 2016 Report of Activities:

Nicolas, M.P.B. 2016: Carbon and oxygen stable-isotope profiles of Paleozoic core from the Hudson Bay Basin, northeastern Manitoba (parts of NTS 54B7, 8, 54F8, 54G1); *in* Report of Activities 2016, Manitoba Growth, Enterprise and Trade, Manitoba Geological Survey, p. 142–149.

Shallow gas potential of the Cretaceous rocks in southwestern Manitoba
by Michelle P.B. Nicolas

The project goal is to provide potential investors and companies with the basic information needed to understand the geology and undertake exploration in the new and risky unconventional shallow gas plays in southwestern Manitoba.

This year, the Manitoba Geological Survey described and sampled all the Cretaceous units that were preserved in a core from a potash test hole drilled in 1986 near the town of Russell, Manitoba. This core was the first of its kind in Manitoba, giving a rare glimpse of these rocks in the subsurface. The information gathered in this continuous core provided a key look at the entire section where biogenic gas can occur, further narrowing the exploration horizons and understanding their geographic variability in southwestern Manitoba. The Favel Formation, Boyne Member (Carlile Formation) and Gammon Ferruginous (Pierre Shale) have been identified as the best natural gas-bearing horizons.

Outcomes:

- Understand the depositional environments of these shale beds and how they change over time and space
- Determine which shale beds have high organic contents
- Identify which shale units are the best natural gas targets
- Present a natural gas exploration model to support exploration

Notes

Detailed information for this summary can be found in the 2016 Report of Activities:

Nicolas, M.P.B. 2016: Preliminary investigation from the Cretaceous section of the Manitoba Potash Corporation core at 3-29-20-29W1, southwestern Manitoba (NTS 65K1); *in* Report of Activities 2016, Manitoba Growth, Enterprise and Trade, Manitoba Geological Survey, p. 150–156.

GS-15 Sedimentology and oil potential of the Upper Devonian Duperow Formation, southwestern Manitoba

by Kerry B. Bates, Nancy Chow and Michelle P.B. Nicolas

The Manitoba Geological Survey and the University of Manitoba are working together to understand the sedimentary rocks and the oil potential of the Duperow Formation in southwestern Manitoba. The Duperow Formation is an oil producing horizon in other parts of the Williston Basin, including Saskatchewan, North Dakota and Montana, but until recently little was known about the Duperow Formation in southwestern Manitoba, including its geology or hydrocarbon potential. Oil shows and preliminary results from this study indicate that the Duperow Formation in Manitoba does have oil potential, both as a conventional and unconventional oil target.

Outcomes

- Identify and describe the rock types that make up this unit
- Determine the depositional environment of these rocks
- Suggest where the best location is and at what depth to look for oil in this formation in southwestern Manitoba

Notes

Detailed information for this summary can be found in the 2016 Report of Activities:

Bates, K.B., Chow, N. and Nicolas, M.P.B. 2016: Preliminary results from sedimentological investigations and petroleum evaluation of the Upper Devonian Duperow Formation, southwestern Manitoba; *in* Report of Activities 2016, Manitoba Growth, Enterprise and Trade, Manitoba Geological Survey, p. 157–167.

Age dating of Late Cretaceous bentonite beds in southwestern Manitoba

by James D. Bamburak

The Manitoba Geological Survey has had a project since 2012 to date layers of altered volcanic ash known as bentonite in southwestern Manitoba. The volcanic ash beds are, in this case, between 120 and 60 million years old. The ash travelled by wind from the Elkhorn Mountains of western Montana much in the way that volcanic ash erupted from Mount St. Helens in the state of Washington a few decades ago and drifted to Manitoba forming a dusty film on cars and buildings. The volcanic ash contains tiny crystals of a datable mineral called zircon that effectively recorded the moment that the volcanic eruption took place. This age is then used to approximate the time when the volcanic ash settled in Manitoba, in a huge seaway that then covered most of what is now western Canada.

Outcomes

- To 2016, a total of five age dates from bentonite beds found in Manitoba have been determined
- Determine the absolute ages of bentonite beds to help correlate sedimentary rocks across Western Canada and the United States
- Helps in the search for Cretaceous-aged diamond-bearing kimberlites by establishing the age-range of sedimentary rocks that may contain kimberlite indicator minerals

Notes

Detailed information for this summary can be found in the 2016 Report of Activities:

Bamburak, J.D., Hamilton, M. and Heaman, L.M. 2016: Geochronology of Late Cretaceous bentonite beds in southwestern Manitoba: 2016 update; *in* Report of Activities 2016, Manitoba Growth, Enterprise and Trade, Manitoba Geological Survey, p. 168–175.

Silica sands of the Winnipeg Formation in southwestern Manitoba

by Kathryn Lapenskie

The Winnipeg Formation contains some of the purest silica (SiO_2) sands in North America. This strata occurs deeper in the subsurface throughout southwestern Manitoba, but comes to surface in a continuous band that extends northward from the Hecla-Grindstone Provincial Park area to the area southeast of Snow Lake, and then westward towards Cranberry Portage. The Winnipeg Formation sands are comprised almost entirely of very fine, round, smooth quartz grains. These sand grains have many potential industrial uses, from the manufacturing of glass to silicon metal. Currently, there is a great deal of interest around using these silica sands as a proppant for fracking. Proppants are materials that are used to "prop open" artificial fractures created in a rock containing tight oil or gas to allow for these petroleum resources to be extracted.

During the 2016 field season, reconnaissance field work was conducted on Black Island, Hecla Island, Grindstone and Little Grindstone points, and on exposures of the Winnipeg Formation between Snow Lake and Cranberry Portage areas. The silica sands were sampled and are being examined to characterize the quartz grains (i.e. size, shape, degree of roundness, etc.).

Outcomes

- Preliminary analytical results indicate that the purity of the sand in regards to silica content is highly variable across Manitoba
- The purity of the silica sands of the Winnipeg Formation will be assessed across southern Manitoba, using analytical techniques and by making qualitative observations of the quartz sand grains
- By determining where the highest quality silica sands occur, industry will be able to conduct exploration activities in areas of high economic potentia
- Based on the quality of silica sands, potential industrial applications and uses will be identified to encourage new business development opportunities in Manitoba

Notes

Detailed information for this summary can be found in the 2016 Report of Activities:

Lapenskie, K. 2016: Preliminary investigations into the high-purity silica sand of the Winnipeg Formation, southern Manitoba; *in* Report of Activities 2016, Manitoba Growth, Enterprise and Trade, Manitoba Geological Survey, p. 176–180.

Gypsum investigations in southwestern Manitoba

by Kathryn Lapenskie and James D. Bamburak

Gypsum has been quarried and mined in the province for over 115 years, and is currently used to produce all the wallboard used in Manitoba, and also in the production of concrete. In Manitoba, deposits of gypsum occur on the western side of Lake Manitoba near Harcus-Amaranth, and also near Gypsumville. Gypsum occurs in an outcrop belt through southwestern Manitoba, and is covered by a thin layer of recently deposited, unconsolidated sands, gravels, and clays.

The Manitoba Geological Survey is currently investigating this industrial mineral, as the last comprehensive report on this commodity was published over 50 years ago. To update our knowledge of this resource, field work has been undertaken in the Harcus-Amaranth and Gypsumville areas. Historical drillhole data has been compiled and used to model gypsum thickness in the Harcus-Amaranth area.

Outcomes

- Maps of the thickness of gypsum deposits and the overlying sediment assist industry in selecting future exploration targets
- Gypsum is prone to sinkhole development, therefore a better understanding of the local geology in areas where gypsum occurs close to the surface will aid land use planning
- Resolving issues around the correlation of various gypsum occurrences in Manitoba is important to furthering our understanding of the depositional history of sedimentary rocks in the province, and to aid industry in developing new exploration strategies and programs

Notes

Detailed information for this summary can be found in the 2016 Report of Activities:

Lapenskie, K. and Bamburak, J.D. 2016: Gypsum investigations in the Harcus area, southwestern Manitoba (NTS 62J10): 2016 update; *in* Report of Activities 2016, Manitoba Growth, Enterprise and Trade, Manitoba Geological Survey, p. 181–186.

Quaternary mapping of the Kaskattama highland in northeastern Manitoba

by Tyler J. Hodder and Sam E. Kelley

The Kaskattama highland region is located northeast of Shamattawa in the Hudson Bay Lowland and is a largely unexplored region of Manitoba. This region was covered by glaciers as little as 8 000 years ago, and glacially-derived sediments, which can be more than 35 m thick, are exposed along river banks in the region. These exposed sediments and the sediments present at the surface of the landscape were investigated in detail across the region. These sediments exhibit an extensive history, with some as old as the last interglacial period (~120 000 years ago). Samples were taken to understand their source and to analyze their chemical and mineral composition. This is important for prospectors and companies, who use these sediments to look for mineral resources, including diamonds.

Diamond deposits are commonly found in small, circular volcanic features referred to as kimberlite pipes, which have brought the diamonds up to the surface from deep in the earth. Kimberlite pipes have a unique group of minerals associated with them, referred to as "Kimberlite-indicator minerals". These minerals are resistant and can survive extensive transport underneath glaciers. The glacial sediments in the study area were sampled to look for kimberlite-indicator minerals to establish if diamond deposits might occur in the study area.

Outcomes

- This project included the first sampling of glacial sediments in the remote Kaskattama region of northeast Manitoba for kimberlite-indicator minerals (diamonds) and geochemistry analysis
- Investigated the sediment record of the Kaskattama highland region to understand the glacial history of the area. This has implications for using glacial sediments as a prospecting tool in the region

Notes

Detailed information for this summary can be found in the 2016 Report of Activities:

Hodder, T.J. and Kelley, S.E. 2016: Quaternary stratigraphy and till sampling in the Kaskattama highland region, northeastern Manitoba (parts of NTS 53N, O, 54B, C); *in* Report of Activities 2016, Manitoba Growth, Enterprise and Trade, Manitoba Geological Survey, p. 187–195.

Quaternary mapping of Southern Indian Lake, northern Manitoba
by Tyler J. Hodder

Based on geological similarities to adjacent areas of Manitoba and Saskatchewan, the region of northern Manitoba that includes Southern Indian Lake is thought to have potential for a number of mineral deposit types, including copper-zinc, gold, nickel, rare metals (e.g., neodymium) and diamonds.

The purpose of this study is to collect samples of till (glacial sediment) at Southern Indian Lake to look for chemical and mineralogical evidence of mineral deposits, including diamond deposits hosted by kimberlite pipes (small volcanic features sourced from deep within the Earth). Till samples were collected in the area in 1989, and some regional samples were re-analyzed in 2005. However, the samples collected in the present study area were lost at that time.

Outcomes

- Samples collected in 2016 have been submitted for geochemical and indicator mineral analysis.
- Ice-flow indicators were measured and used to reconstruct changes in paleo ice-flow direction.

Notes

Detailed information for this summary can be found in the 2016 Report of Activities:

Hodder, T.J. 2016: Till sampling and ice-flow mapping in the central area of Southern Indian Lake, north-central Manitoba (parts of NTS 64G1, 2, 7–10, 64B15); *in* Report of Activities 2016, Manitoba Growth, Enterprise and Trade, Manitoba Geological Survey, p. 196–202.

Pembina Valley Quaternary geology, southwestern Manitoba

by Tyler J. Hodder and Michelle S. Gauthier

The purpose of this study is to produce surficial geology maps that display the distribution of unconsolidated sediments in the areas around the town of Pilot Mound and the city of Winkler. Most of these surficial sediments were deposited during the last ice age that covered Manitoba between approximately 25 and 12 thousand years ago. As the glacier melted, a large lake—Lake Agassiz—formed a series of beach ridges and lake-bottom deposits that cover the northeastern portion of the study area. Drainage of smaller lakes along the margin of the melting glacier formed the Pembina Spillway. Interestingly, the glacier melted and advanced more than once, which led to complicated sediment deposits and some buried or 'hidden' beach and river terrace gravels.

The Pembina valley area is being studied because it was last mapped in 1960. While the area was updated with more detail in 1978, a final map was never published. The new published map will be a much needed modern geological map for the area.

Outcomes

- Assist with sand and gravel inventories and groundwater assessments
- Assist with infrastructure planning for future growth
- Identify landscape features and characteristics that are of geological importance or affect public health and safety

Notes

Detailed information for this summary can be found in the 2016 Report of Activities:

Hodder, T.J. and Gauthier, M.S. 2016: Quaternary geology of the Morden and Pilot Mound NTS areas (62G1, 2), south-central Manitoba; *in* Report of Activities 2016, Manitoba Growth, Enterprise and Trade, Manitoba Geological Survey, p. 203–211.

Roadside Geology of southern Manitoba
by James D. Bamburak, J. Mark Pacey, and Kathryn Lapenskie

The Manitoba Geological Survey has had a project since 2011 to make audiovisual recordings of a provincial government geologist talking about rocks, land forms and related museums/businesses in southern Manitoba for release on YouTube™.

To date audiovisual recordings were made at over 60 geolocalities across southern Manitoba, and 31 "GeoTours" have so far been released on YouTube™.

Outcomes

- Manitoba virtual GeoTours provide a legacy of unique, digitally documented geolocalities in the province for public use
- The intention is to release most of the videos by March 2017 so that they can be used as an educational tool by Manitoba Geological Survey staff, the public, or by industry to assist in the development of exploration strategies and logistics

Notes

Detailed information for this summary can be found in the 2016 Report of Activities:

Bamburak, J.D., Pacey, J.M. and Lapenskie, K. 2016: Roadside geology of southern Manitoba: 2016 update; *in* Report of Activities 2016, Manitoba Growth, Enterprise and Trade, Manitoba Geological Survey, p. 212–214.

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