Introduction

The Mesozoic sedimentary rocks of southwest Manitoba have had a long history of production or evaluation of a large variety of mineral commodities (**Figure 1 and Table 1**). These commodities generally fall into several categories: Construction, Energy and Miscellaneous. The histories of the development of these commodities are briefly reviewed below together with their potential for future development.

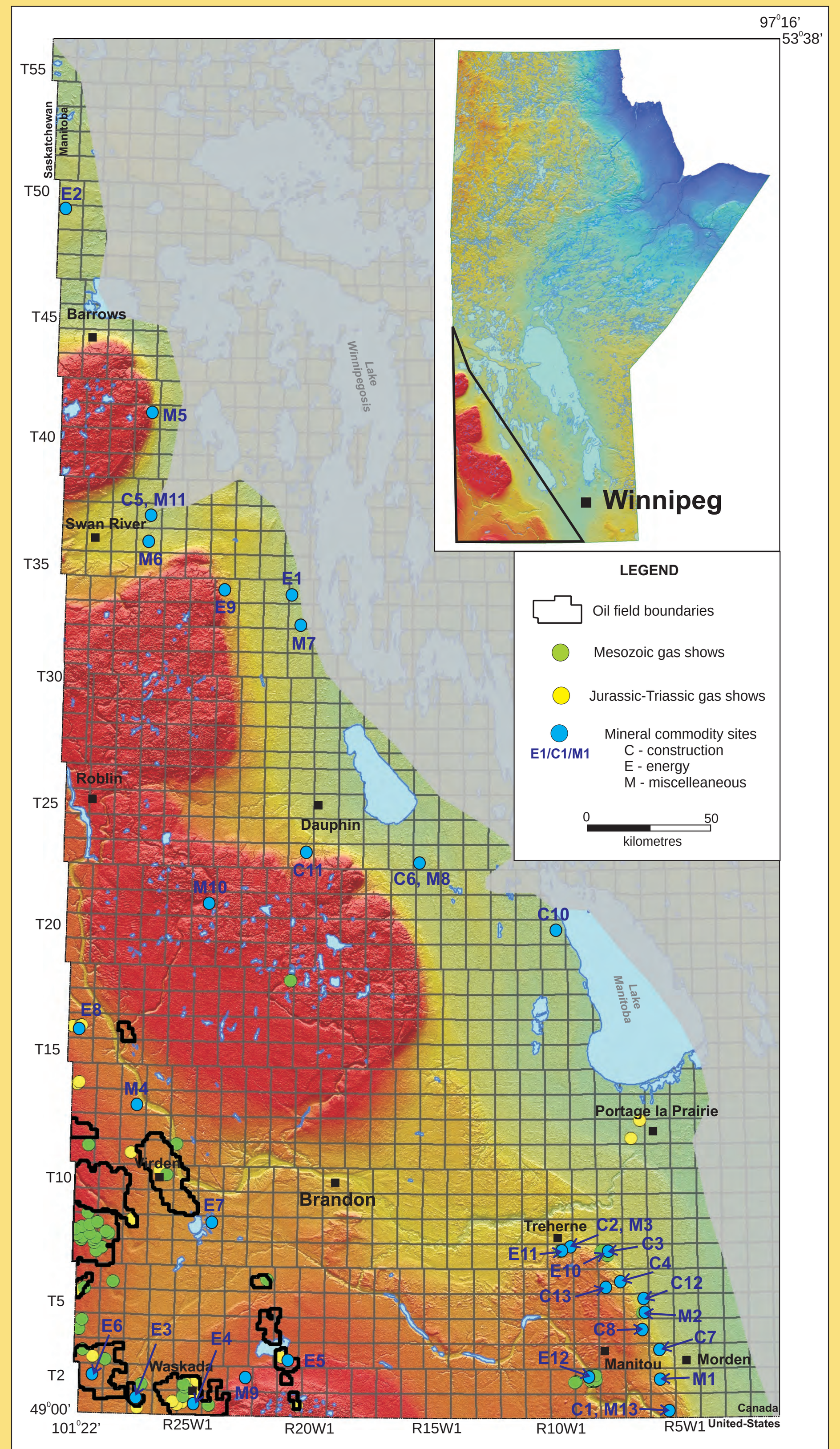

Figure 1: Digital elevation model of southwest Manitoba showing selected Mesozoic mineral commodity sites (C1-C13, E1-12 and M1-13) in relation to existing oil fields.

Table 1: Mesozoic and Cenozoic stratigraphy of the subsurface and outcrop belt of southwest Manitoba with mineral commodities.

ERA	PERIOD	Manitoba subsurface	Manitoba outcrop	Mineral commodities (commodity site as shown in Figure 1)
CENOZOIC	Quaternary	glacial drift	glacial drift	
	Tertiary	Turtle Mountain Formation: Peace Garden Member	Turtle Mountain Formation: Peace Garden Member	
		Turtle Mountain Formation: Goodlands Member	Turtle Mountain Formation: Goodlands Member	
MESOZOIC	CRETACEOUS	Boissevain Formation	Boissevain Formation	building stone (**C9**); kaolin (**M9**); silica sand (**M12**)
		Pierre Shale: Coulter Member	Pierre Shale: Coulter Member	
		Pierre Shale: Odanah Member; Belly River "marker"; "lower" Odanah Member	Pierre Shale: Odanah Member	sodium bentonite (**M3, M4**); aggregate shale (**C1, C2**); siliceous shale (M13); brick clay (**C8**); manganese (**M10**)
		Pierre Shale: Millwood Member	Pierre Shale: Millwood Member	
		Pierre Shale: Pembina Member	Pierre Shale: Pembina Member	calcium bentonite (**M1, M2**); shale gas
		Pierre Shale: Gammon Ferruginous Member	Pierre Shale: Gammon Ferruginous Member	shale gas
		Carlile Formation: Boyne Member	Carlile Formation: Boyne Member: chalky unit	aggregate shale (**C3**)
			Carlile Formation: Boyne Member: calcareous shale unit	natural cement (**C12, C13**); shale gas (**E10, E11**); oil shale
		Carlile Formation: Morden Member	Carlile Formation: Morden Member	brick clay (**C4, C7**); oil shale; shale gas
		Favel Formation: Assiniboine Member	Favel Formation: Assiniboine Member: Marco Calcarenite	shale gas (**E12**)
		Favel Formation: Keld Member	Favel Formation: Keld Member: Laurier Limestone	oil shale (**E9**)
		Ashville Formation, upper: Belle Fourche Member; Fish Scales Zone; base of Fish Scale marker	Ashville Formation, upper: Belle Fourche Member; base of Fish Scale marker	shale gas
		Ashville Formation, lower: Westgate Member; Newcastle Member	Ashville Formation, lower: Westgate Member	oil shale
		Ashville Formation, lower: Skull Creek Member; Pense "P4" marker	Ashville Formation, lower: Skull Creek Member	glauconite (**M5, M6**)
		Swan River Formation	Swan River Formation	coal (**E1, E2**); silica sand (**M11**); kaolin (**M7,M8**); brick clay (**C5, C6**)
		Success Formation (S_2)	Success Formation (S_2) equivalent	
	JURASSIC	Waskada Formation		conventional oil (**E8**)
		Melita Formation: Upper Member		
		Melita Formation: Lower Member		
		Reston Formation; Lower Gravelbourg "marker"	Reston Formation	
		Amaranth Formation: Upper (Evaporite) Member	Amaranth Formation: Upper Evaporite	gypsum (**C10**)
	TRIASSIC	Amaranth Formation: Lower (Red Beds) Member	Amaranth Formation: Lower Red Beds	brick clay (**C6**); conventional oil and gas (**E3, E4, E5, E6, E7**)
PALEOZOIC	PERMIAN		St. Martin Igneous & Metamorphic Complex	

1. Construction

Aggregate shale

Numerous quarries for shale for use as aggregate road metal and for fill have been opened in southwest Manitoba. Most of the quarries are situated within the *Odanah Member of the Pierre Shale*, but at least three are within the *Boyne Member of the Carlile Formation*. One example of the former, the Brown quarry in 15-1-1-6W1 (Commodity Site C1), is shown in **Figure 12 of Technical Poster T23**; and another (the Treherne quarry in 12-25-7-10W1, Commodity Site C2) in **Figure 2a** of this poster. The Bosc quarry in 15-19-7-8W1 (Commodity Site C3) shown in **Figure 2b** of this poster, is an example of the latter. According to the Canadian Minerals Yearbooks for 2003 and 2006, the average annual aggregate shale production in Manitoba from 2000 to 2006 was 176 000 t valued at approximately $0.60/t (based upon 2000 prices). Most of this production is believed to have originated from the *Odanah Member of the Pierre Shale*. Potential resources of this commodity in southwest Manitoba are infinite, except for landuse concerns.

Brick clay/shale

Over 40 brick plants have operated in the Province since 1871 utilizing Cretaceous, Pleistocene and Recent clays. A few of the Cretaceous operations are described below.
The *Morden Member of the Carlile Formation* (**Figure 3a**) was quarried as a brick shale beginning in 1900 southwest of Roseisle (Commodity Site C4), in SW13-6-8W1, by the Boyne Valley Brick Company. In 1914, the operations were taken over by C.E. Leary and the adjacent plant was operated until 1917. In 1947 the operations were restarted by W.A. Leary, and up to 1952, annual production comprised 30 000 to 97 000 dry-press face brick and from 3 800 to 94 000 common brick. In 1962, Tallclay Products Limited attempted to bring the plant, shown in **Figure 3b**, into production, but only one kiln-load of brick was fired (Bannatyne, 1970).

Swan River Clay Products Limited quarried kaolinitic shale at the top of the *Cretaceous Swan River Formation* (near the outcrop shown in **Figure 3 of Technical Poster T23**) northeast of Swan River (Commodity Site C5) in SW10-37-26W1 for the production of dry press face brick from 1953 to 1955. Almost 220 000 bricks were produced at the company's plant located in Swan River. Additional bricks were produced in 1959, but production ceased shortly after (Bannatyne, 1970).

The most recent brick plant to operate in the Province was I-XL Industries Ltd.'s Red River Brick and Tile plant at Lockport. From 1971 to 1992, over 16 million bricks were manufactured, in three different sizes as well as two sizes of paving brick (Gunter, 1989). Five quarries were used to produce 8 types of clays and shales from which it was possible to make face brick in colours from red to near white, including variegations and browns, blacks, buff, tans, etc. (Shayna, 1975). Red River quarried *Swan River Formation* and *Triassic Lower (Red Beds) Member of the Amaranth Formation* clays near Ste. Rose du Lac, 200 km from the plant. In 1970, Medicine Hat Brick and Tile Company Limited, a predecessor to I-XL, opened the Ste. Rose quarry in 15-4-23-15W1 (Commodity Site C6) shown in **Figure 4a**. Small quantities of *Morden Member of the Carlile Formation* (E14-33-3-6W1, Commodity Site C7, **Figure 4b**) and *Odanah Member of the Pierre Shale* (SW5-24-4-7W1, Commodity Site C8, **Figure 4c**), quarried west of Miami (160 km from the Lockport plant), were added to the Ste. Rose clay to alter its properties. Abundant resources of these brick clays are present in the vicinity of the previous operations, but detailed drilling programs would have to be carried out to outline reserves.

Building stone

Stone quarried south of Boissevain at Commodity Site C9 (9-7-3-19W1, shown in **Figure 14 of Poster T23**) for use in several buildings constructed in the vicinity of the town of Boissevain (**Figure 5**) in the late 1800s and early 1900s (Parks, 1916). The irregular blocks of sandstone from the *Cretaceous Boissevain Formation* were set in mortar to fill in the rough surfaces between the blocks. The sandstone concretions are generally widely distributed near the top of the formation and because the stone is subject to the effects of weathering; future quarrying of this building stone is unlikely.

Gypsum

Gypsum has been quarried near Harcus (in Sec. 22 and 27 of Twp. 20, Rge. 10W1) by CertainTeed Gypsum Canada Inc. (formerly, Westroc Industries Limited or BPB Canada Inc.) since 1978. Exploratory drilling revealed 3 to 9 m of high-grade gypsum (90 to 92%), within the *Jurassic Upper (Evaporite) Member of the Amaranth Formation*, beneath 3 to 8 m of glacial drift. In 1991, annual production from the Harcus Quarry was 100 000 tonnes (Bannatyne, 1984). Westroc has its wallboard plant in Winnipeg, and two haulage trucks make several trips daily from the quarry, Commodity Site C10) shown in **Figure 6** to the plant. Additional deposits of gypsum have been outlined by drilling and leased in the vicinity of the present quarries by Lehigh Cement Ltd.

High-calcium limestone

Canadian Infrastructure Corp. (a subsidiary of Infrastructure Materials Corp. of the U.S.A.) has obtained over 35 quarry leases for high-calcium limestone, 10 km southwest of Dauphin. The leases trend northwestward as a discontinuous 3 km wide band for almost 13 km northwestward across Twp. 24 from Rge. 19 W1 to Rge. 21 W1. The intervening gaps in the band probably reflecting privately held mineral rights. The high-calcium limestone is situated within relatively near-surface beds of the *Marco Calcarenite of the Assiniboine Member of the Cretaceous Favel Formation*, as shown in the Vermilion River valley in **Figure 7** (11-35-23-20W1, Commodity Site C11).

Natural cement

Cement production began with natural cement mined from the "Babcock" beds of the *Cretaceous Boyne Member of the Carlile Formation* (Commodity Site C12) at Arnold (**Figure 8a,** east of Deerwood) on the east slope of Pembina Mountain from ~1898 to 1904. This operation was followed by a second plant and adit (Commodity Site C13) at Babcock (**Figure 8b**, west of Miami), which operated from 1907 to 1924. However, the characteristics of the natural cement material were too variable to compete with Portland cement (Gunter, 1989). A few exposures of the natural cement rock occur in the southern part of the Province along the Manitoba Escarpment (See: **Figure 3 of Poster T24**).

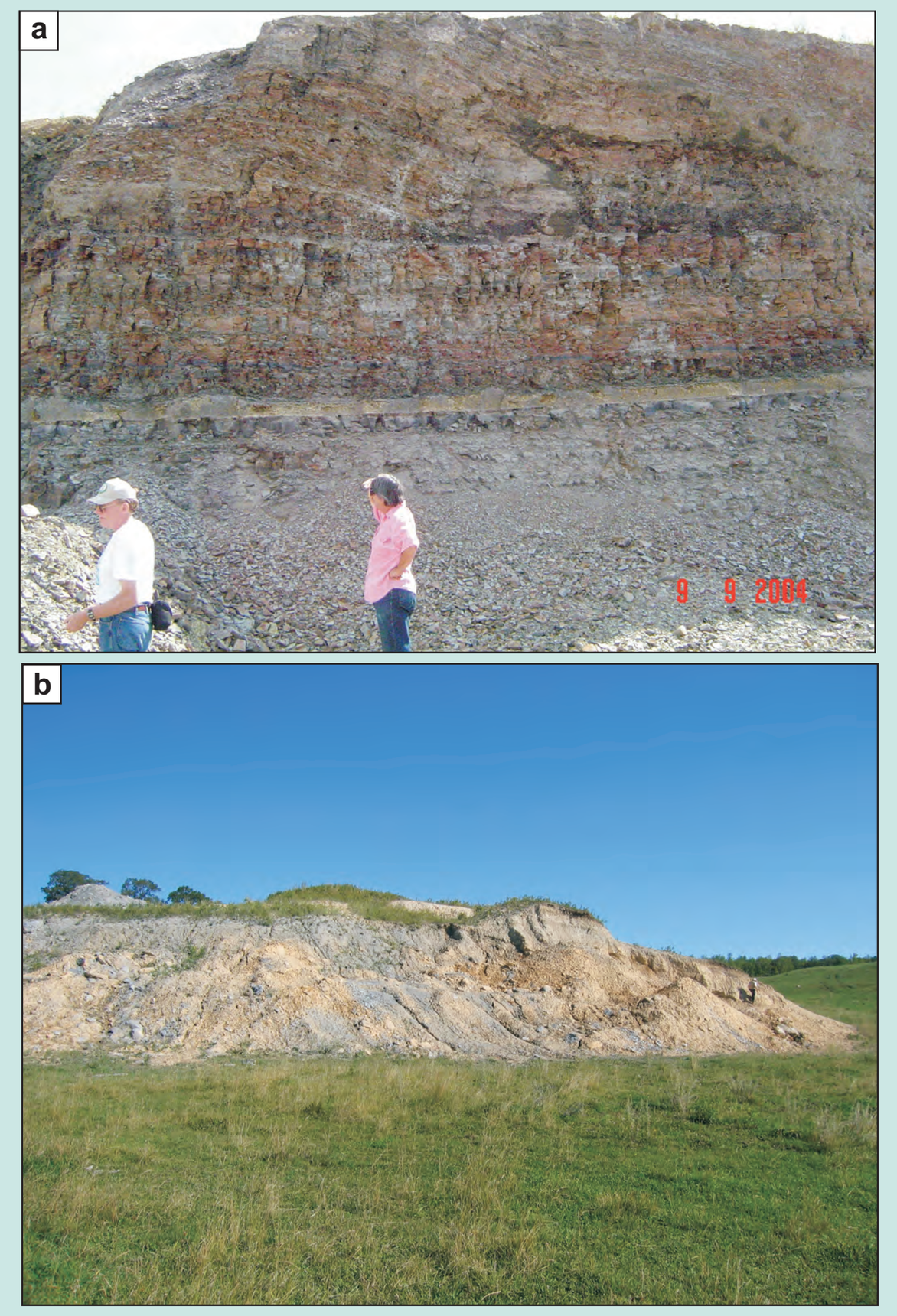

Figure 2: (a) Treherene quarry in 12-25-7-10W1, Commodity Sites C2 and M3 (2004-09-09). **(b)** Bosc quarry in 15-19-7-8W1, Commodity Site C3 (2008-08-29).

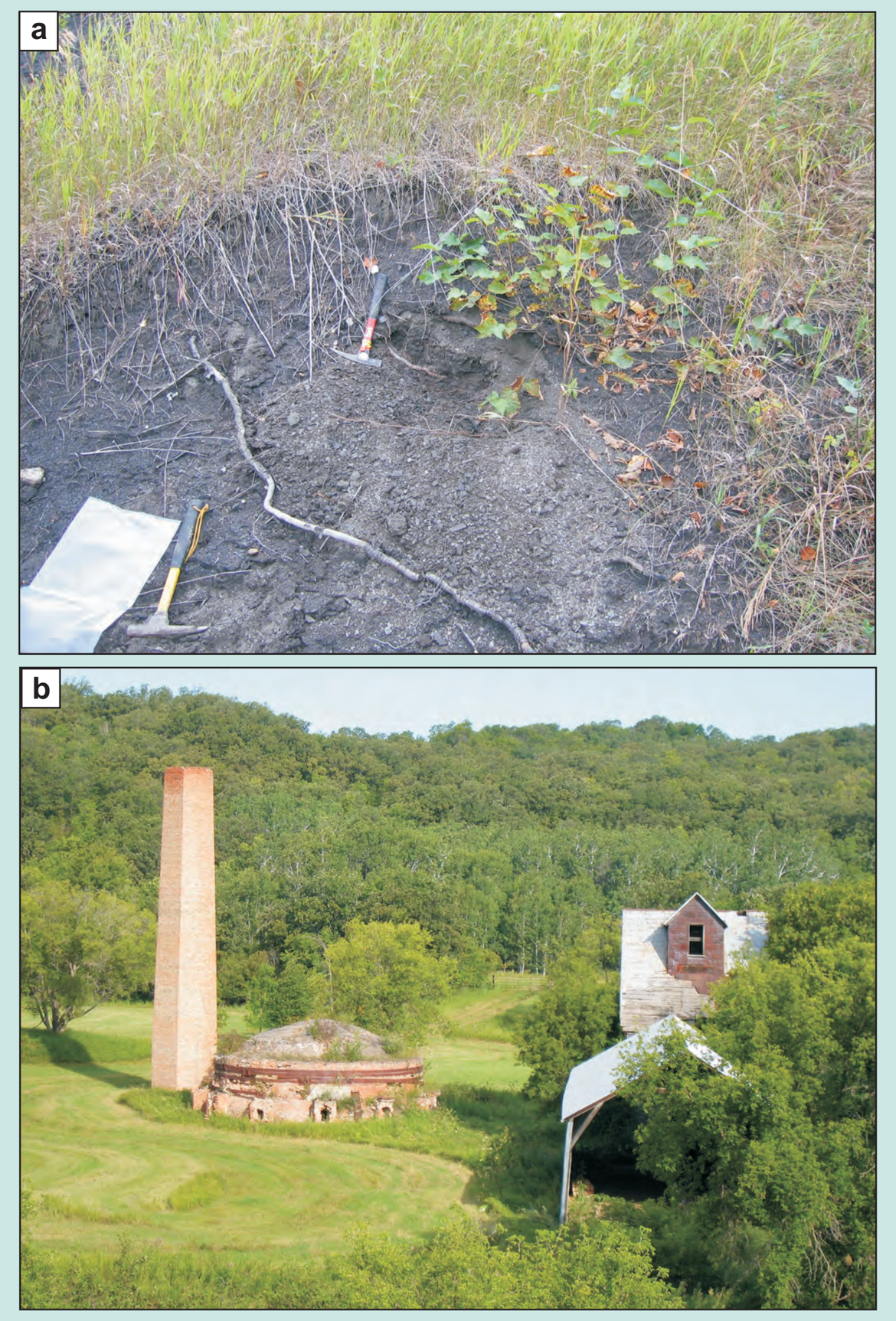

Figure 3: (a) Morden Member outcrop in SW10-37-26W1 (Commodity Site C4) (2008-08-27) and **(b)** Leary's brick plant (2008-08-27).

Figure 4: Red River Brick and Tile **(a)** Rose du Lac quarry in 15-4-23-15W1, Commodity Site C6; **(b)** Morden shale quarry in E14-33-3-6W1, Commodity Site C7; **(c)** Odanah shale quarry in SW5-24-4-7W1, Commodity Site C8.

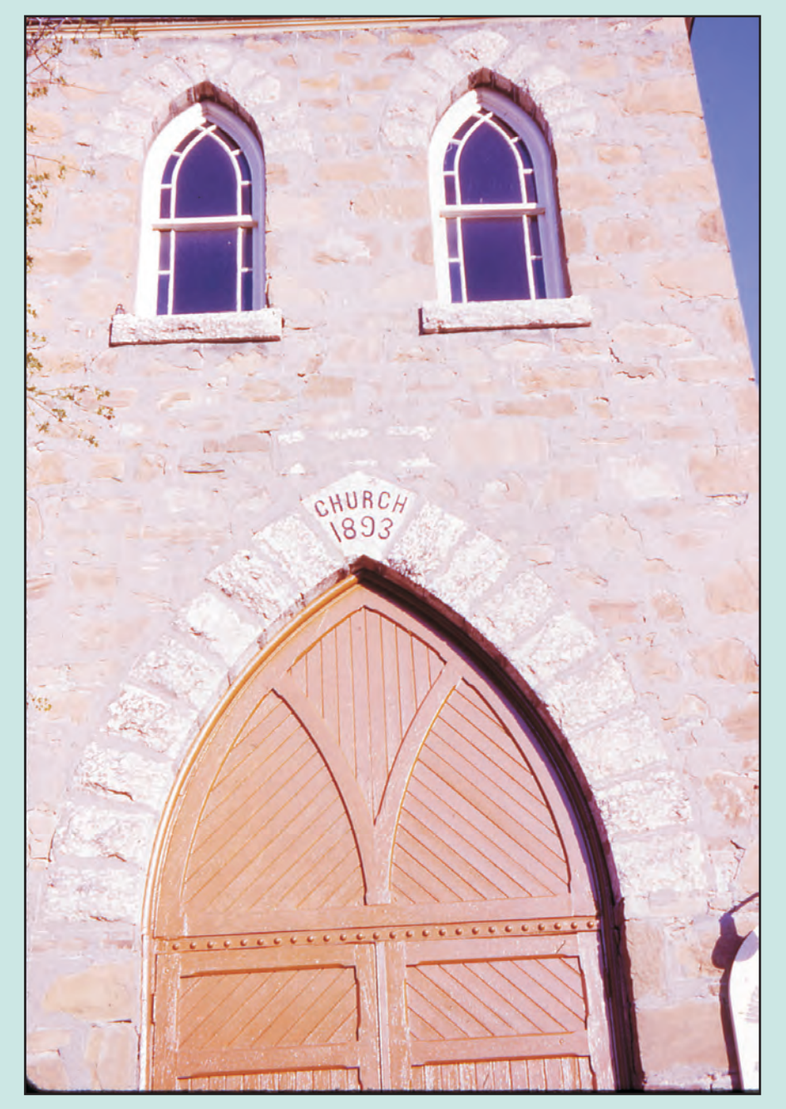

Figure 5: Church in Boissevain constructed with Boissevain Formation sandstone blocks and mortar in 1897 (May 1971).

Figure 6: CertainTeed Gypsum quarry in 22-20-10W1, Commodity Site C10 (2004-09-09).

Figure 7: Marco Calcarenite outcrop in 11-35-23-20W1, Commodity Site C12 (1999-08-11).

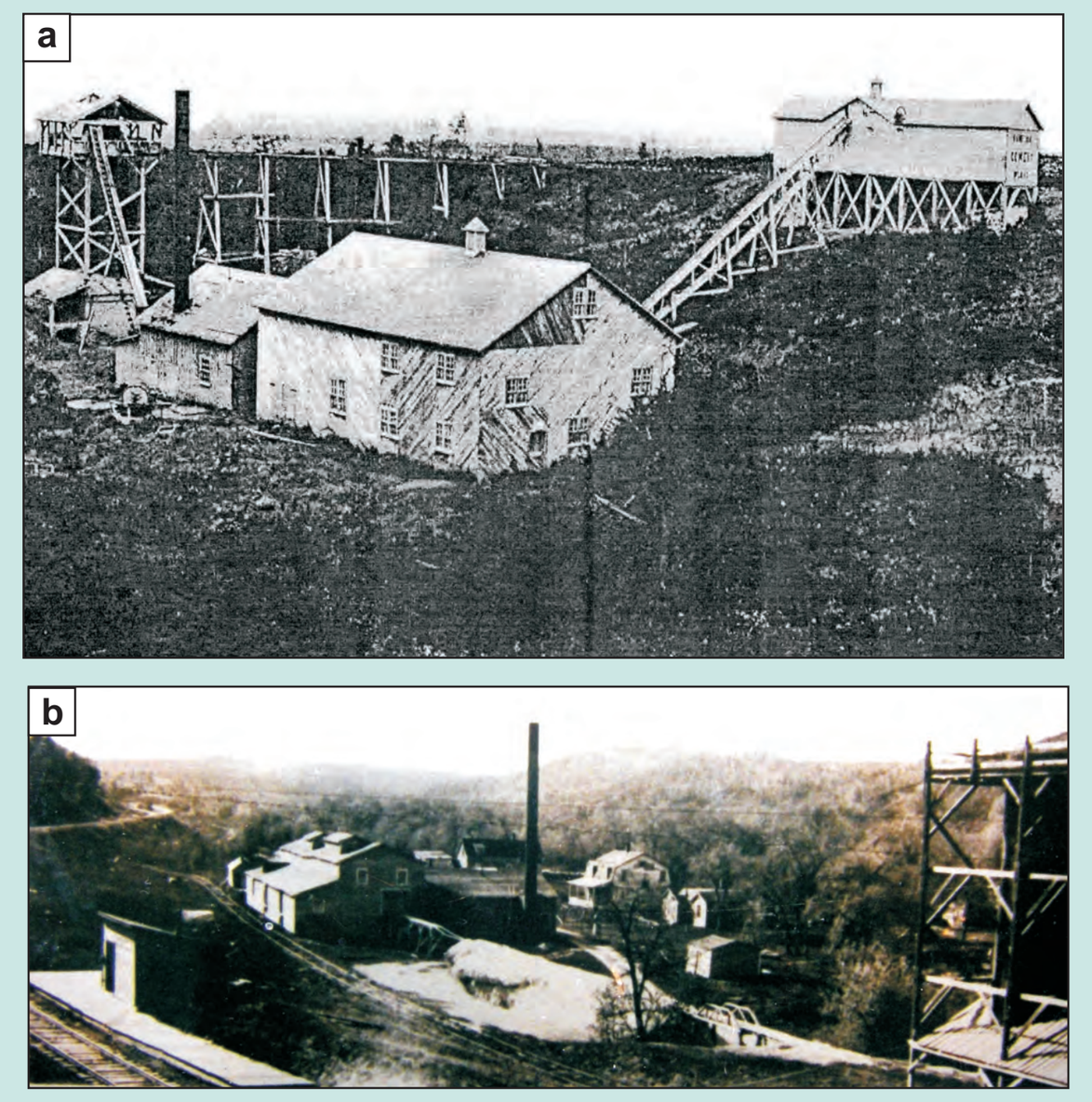

Figure 8: (a) Arnold natural cement plant, 9-16-5-7W1, ~1898-1904; **(b)** Babcock natural cement plant, 12&13-11-6-8W1, 1907-1924.

3. Miscellaneous

Bentonite

Non-swelling calcium bentonite, swelling sodium bentonite and intermediate bentonitic shales are present in southwest Manitoba. To date, only the non-swelling calcium bentonite has been produced.

Calcium bentonite

Pembina Mountain Clays Incorporated quarried the only non-swelling calcium bentonite in Canada from the *Cretaceous Pembina Member of the Pierre Shale* at 21 sites (Commodity Site M1), discovery site along Deadhorse Creek, SW-21-2-6W1, in the Morden-Miami area of southwest Manitoba from 1939 to 1990 (**Figure 12a**). Plants, located in Morden and Winnipeg, produced natural and acid-activated bentonite. From 1949 to 1961, production averaged about 8000 tonnes per year with a value of approximately C$0.4 million, bringing with it signifant economic benefits to the local communities. From 1982 to 1986, an average of 30 000 tonnes of clay was produced at an approximate mining cost of C$15.00 per tonne. Currently, all natural and acid-activated non-swelling calcium bentonite used in Manitoba is imported from the southern U.S.
Bird River Mines extracted a small stockpile of high-purity, non-swelling calcium bentonite near Deerwood, 8 km northwest of Miami, Manitoba (Commodity Site M2) in 2001 (**Figure 12b**). The quarry, shown in **Figure 12b**, in 10&11-16-5-7W1 is situated within the *Cretaceous Pembina Member of the Pierre Shale*. The bentonite is found as several thin layers of altered volcanic ash which alternate with thin layers of black shale. Over the years, the company has attempted to find markets for the bentonite, but no further work has been done on the site since 2001.

Sodium bentonite

A 30 cm thick bed of swelling green waxy bentonite is situated within the *Odanah Member of the Pierre Shale*. a short distance to the south of Treherne, within the Treherne quarry (Commodity Site C2, shown in **Figure 2a**) in 12-25-7-10W1 (Commodity Site M3). The quarry is presently being used to extract aggregate, as described earlier.

Bannatyne (1968) speculated that swelling sodium bentonite should be present to the south of the community of Miniota. Confirmation of its presence was received in November 2006, when R. Rowan (pers. comm., 2006) indicated that he had sampled a 61 cm thick bed of swelling green waxy bentonite within the *Odanah Member of the Pierre Shale*, about 5 km to the southwest of Miniota, in a dugout owned by J. Hawley (Commodity Site M4). The bentonite bed was exposed at the base of the 2 m deep dugout, situated in SE 16-13-27W1, that is currently water filled, as shown in **Figure 13**. Auger drillholes or backhoe sampling adjacent to the dugout would be necessary to obtain additional samples. The flat lying terrain in the vicinity of the Hawley dugout suggests that there is a good potential for discovery of a swelling sodium bentonite deposit in the surrounding area.

Glauconite

Watson (1985) indicated that glauconite occurrences are present at several locatliities in the Porcupine Hills (Commodity Site M5). Another occurrence has been noted along the Roaring river in 1-20-36-26W1 (Commodity Site M6).

Kaolin

Stoneware/ceramic quality kaolinitic clay was discovered in *Cretaceous Swan River Formation* situated within a channel in weathered Devonian carbonate rock , 22 km east of the town of Pine River (Commodity Site M7) in 3-2-33-20W1 in 1943. The occurrence was investigated between 1943 and 1947; and again by drilling in 1962 by Medicine Hat Brick and Tile Company, Limited. The channel is at least 61 m long, 23 m wide and 19 m deep with kaolin in its upper part, underlain by black carbonaceous clay and kaolinitic sand. Further work appears to have been limited by insufficient tonnage being outlined (Bannatyne, 1970).

Kaolinitic clay, within the *Cretaceous Swan River Formation*, is located beneath thin glacial cover, on land owned by M. Maguet. The property is situated 4 km. south of Ste. Rose du Lac (Commodity Site M8) and immediately south of the former brick clay quarry (Commodity Site C5) of Red River Brick and Tile. Ste. Rose Community Development Corporation helped to facilitate the digging of four backhoe trenches (**Figure 14a**) by Maguet in 2003. Samples of kaolinitic clay were tested as ceramic clay with satisfactory results (**Figure 14b**).

Kaolinitic sand (Commodity Site M9) with the *Cretaceous Boissevain Formation*, is located near surface southwest of Deloraine, shown in **Figure 15**. There have not been any known tests carried out on the quality of the kaolin contained at this site.

Manganese

In the spring of 1940, manganese was found, in association with the *Odanah Member of the Pierre Shale*, in the vicinity of the former community of Mears. The original discovery was made on the farm of J. Maydaniuk in NW26-21-24W (Commodity Site M10) in the R.M. of Rossburn (Spector, 1941a and b). Six other occurrences were found in the general vicinity, but attempts to locate these occurrences in 2007 were not successful (Bamburak, 2007).

Silica

Silica sand

Silica sand comprises the bulk of both the *Cretaceous Swan River and Boissevain formations*. The former, in 5-10-37-26W1, is depicted in **Figure 3 of Poster T23** (Commodity Site M11) and the latter, in 9-7-3-19W1, in **Figure 14 of the same poster** (Commodity Site M12). A continuous channel sample was collected within the *Swan River Formation* at Commodity Site M12; and Ash Associates (1996) performed a grain size analysis on the sample, which indicated that the sand is very fine with 85.44% of the material between 70 and 100 mesh. Ash Associates also tested the Swan River Formation silica sand as a source for sodium silicate production. The test determined that the material was unsuitable for this use. There are no known similar tests of the *Boissevain Formation* silica sand.

Siliceous shale

The *Odanah Member of the Riding Mountain Formation*, is typified by being about 81% SiO_2; and has been called a porcelanite by Young and Moore (1994). The best exposure demonstrating the purity of the Odanah Member is shown within the lower unoxidized beds in **Figure 12 of Poster T23** (Commodity Site M13).

Figure 12: (a) One of 21 calcium bentonite sites quarried by Pembina Mountain Clays Incorporated in the Morden-Miami area; **(b)** Bird River Mines quarry near Deerwood in 10&11-16-5-7W1 (Commodity Site M2) (2001-10-12).

Figure 13: Dugout with sodium bentonite at its base on Hawley farm, SE 16-13-27W1 (Commodity Site M4) (2008-06-28).

Figure 15: Kaolinitic sand at surface southwest of Deloraine in 4-17-2-23W1 (1971).

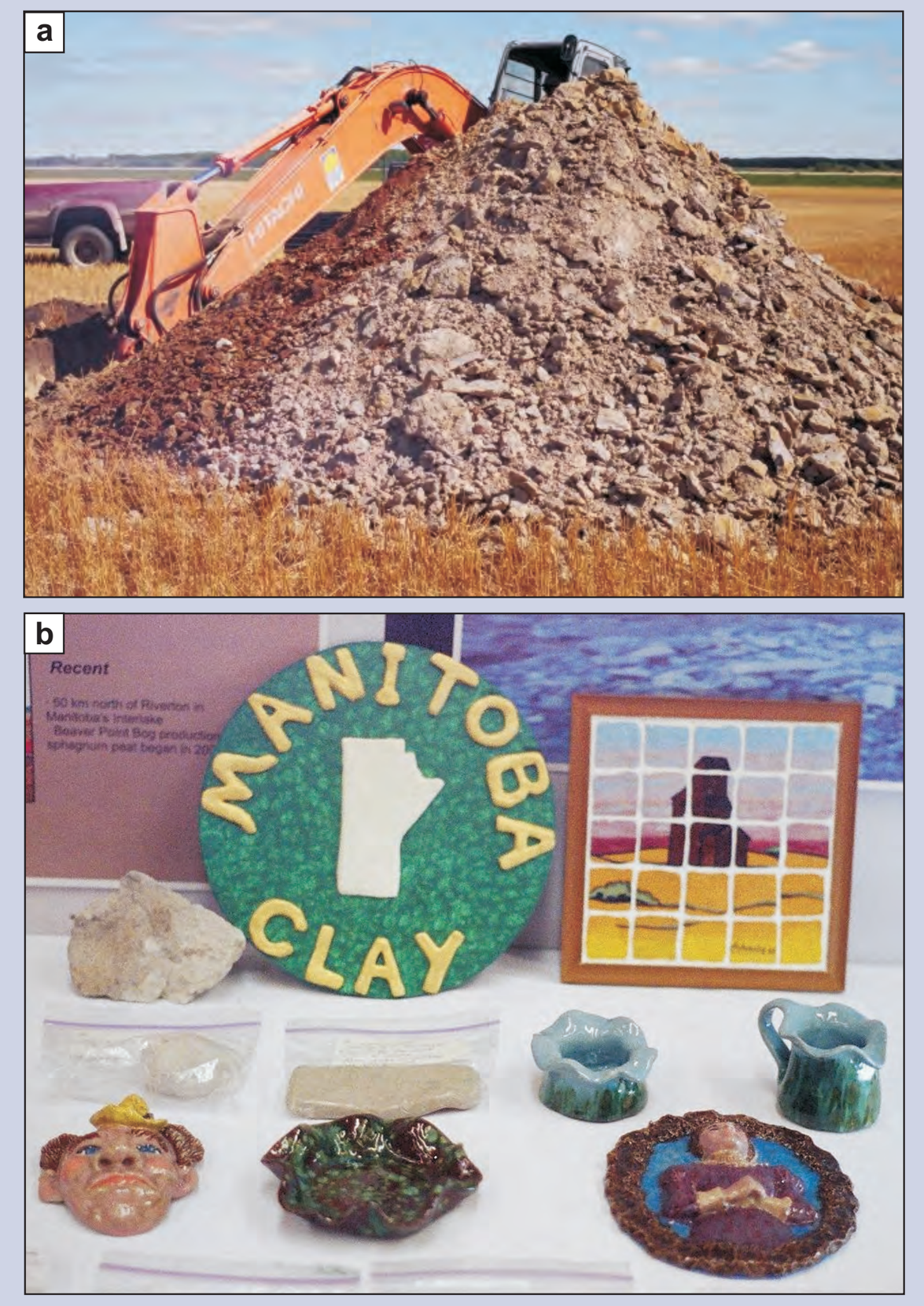

Figure 14: (a) Backhoe sampling of kaolinitic clay within Swan River Formation on the Maguet farm in 15-4-23-15W1 (2003-09-03); **(b)** Pottery samples made from kaolinitic clay (2003-11-13).

2. Energy

Coal

In 2008, Goldsource Mines Inc. announced that an average of 32.8 m sub-bituminous to bituminous coal and partings had been discovered in two drillholes, 1.6 km apart, on their Border property near the Manitoba-Saskatchewan boundary. The coal zone, beneath 79 m of overburden, was interpreted by the company to extend into west-central Manitoba, shown as the Durango coal seam trend in **Figure 9**.

Pine River area

In 1937, Manitoba Coal Mines Syndicate investigated a lignite occurrence in the vicinity of the Pine River lignite occurrence (Commodity Site E1) within the *Cretaceous Swan River Formation*. Surface and underground work was carried out by the Syndicate and by Silco Limited without much success. As a result of this work, a large pile of weathered lignite is present on the south side of the Pine River in 7-7-34-20W1, as shown in **Figure 10**. In addition, a 9 m thick lignite seam is believed to be present at a depth of 85 m near Pine River school, 22 km southwest of the Pine River occurrence. However, drilling by the MGS in 1978 was unable to confirm its presence (Bannatyne, 1978). Future drilling in the general area of the initial report could possibly prove up the lignite occurrence and this may be done by Goldsource Mines Inc., which has applied for quarry exploration permits in the Pine River area.

Porcupine Mountain, north flank

Westcore Energy Ltd. completed a 5-hole core drilling program on its 19 440 ha Black Diamond property in west-central Manitoba (Commodity Site E2), Twp. 48 & 49, Rge. 29W1, immediately east of Goldsource Mines Inc.'s Border property in Saskatchewan (**Figure 9**), in April 2009. Three of the holes intersected a coal zone comprising black to brown carbonaceous material, within the *Cretaceous-age Mannville-equivalent Swan River Formation*, beneath 22.2 to 25.9 m of overburden. The carbonaceous zone includes coal, silty/sandy coal (high-ash units) and partings of poor to moderately consolidated sedimentary units of sand, sandstone or siltstone (which contain variable amounts of coal fragments and stringers that range from minor to abundant). The coal samples ranged from Lignite A to Sub-bituminous C in rank. The company believed that the drill results and subsequent analyses confirmed the continuation of Goldsource Mines' Durango coal seam into Manitoba, as shown in **Figure 9**.

Oil

Oil has been produced from over 1000 wells from the *Triassic Lower (Red Beds) Member of the Amaranth Formation* (beginning in 1955); and from three wells in the *Jurassic Melita Formation* (starting in 1993). All of the oil production from the Lower Amaranth occurs in the Coulter (Commodity Site E3), Waskada (E4), Whitewater (E5), and Pierson (E6) fields (**Figure 1**, **Table 2**), and from three small pools outside of field boundaries. Lower Amaranth oil production from the Pierson Field is comingled with the Mississippian Mission Canyon Formation, MC-3b Member, and with the Mississippian Lodgepole Formation in a small pool near Oak Lake(Commodity Site E7) . In the vicinity of St. Lazare (Commodity Site E8), production of oil was from three wells within the Melita A and B pools intermittently since 1993.

Oil shale

Bannatyne (1970) reported that work by three oil companies in 1965 and 1966 indicated a maximum oil content of 12 Imperial gallons per ton in the *Favel Formation* in the Pembina Mountain area (depth of 345 feet in a core hole located in 16-11-8-11W1). However the average content of a 159-foot tested interval was only 3.6 Imperial gallons per ton. Additional samples taken in the *Boyne and Morden members of the Carlile Formation* indicated maximum contents of 13.0 and 4.8 gals./ton, respectively. A sample of the *Ashville Formation* from the same hole returned 11.9 gals./ton. Kovac (1985) carried out a study of the petroleum potential of Manitoba's oil shales along the Manitoba Escarpment in southwest Manitoba and eastern Saskatchewan. The Sclater River outcrop (14-15-34-23W1), shown in **Figure 5 of Poster T23**, emanates the strong odor of petroleum and shows an oil slick when fresh pieces of *Keld Member* rock fall into the water. For these reasons, the outcrop has been selected as Commodity Site E9.

Shale gas

Shallow unconventional biogenic shale gas is present in the Cretaceous shale sequences from the *Belle Fourche Member of the Ashville Formation* up to the *Pembina Member of the Pierre Shale* in southwest Manitoba (See: **Poster T24**).

Notre Dame de Lourdes-Treherne area

The shallow gas shows near Notre Dame de Lourdes are derived from the "Babcock" beds of the *Boyne Member of the Carlile Formation*. **Figure 7c and 7d of Poster T24** show a water well that produces gas on the farm of Normand and Guy Bosc in 1-30-7-8W1 (Commodity Site E10). Another well drilled in 1911, to the northwest near Treherne on the farm of E.C. Haskell in NE28-7-10W1 (Commodity Site E11), is shown in **Figure 11a**. The gas, produced for over 15 years, was sufficient for household lighting, and occasionally for a small heater.

The "Babcock" beds in the Notre Dame des Lourdes-Treherne area correlate with the gas-producing reservoir unit in the town of Kamsack, Saskatchewan (Poster T24). From 1941 to 1953, 4.7 million m^3 of shale gas was produced at Kamsack from 8 wells drilled into the Boyne sand to a depth of 60 m.

Manitou area

Capped gas wells in the Pembina Valley southwest of Manitou are producing from the *Assiniboine Member of the Favel Formation.* **Figure 7a and 7b of Poster T24** show two gas producing wells in S23-2-9W1. Drilling of the well shown in **Figure 7b of Poster T24**, in 1907, is shown in **Figure 11b** (Commodity Site E12).

Solution gas

Solution gas is produced as a result of oil production and is thermogenic in origin. In Manitoba, gas is usually flared at the battery site, but recently the extension of a new gas pipeline into the Pierson Field (Commodity Site E6) has allowed for gas to be captured and sold from this field. From July 2007 to July 2009, 38.0×10^3 m^3 of solution gas has been produced from the *Triassic Lower (Red Beds) Member of the Amaranth Formation and the Mississippian Mission Canyon Formation* pool in the Pierson Field.

Table 2: Mesozoic oil production from oil fields and select pools.

Field or pool	Producing units	Number of producing wells	Oil production (m^3)	Production date
Waskada Field	Lower Amaranth Member	770	3,301,599	1980 to present
Pierson Field	Lower Amaranth Member, and commingled Lower Amaranth Member-Mission Canyon MC-3b Member	309	1,162,435	1963 to present
Coulter Field	Lower Amaranth Member	13	12,892	1955 to present
Whitewater Field	Lower Amaranth Member	2	634	1986 to 1988
St. Lazare Pool	Melita Formation	3	6,134	1993 to 1998

Figure 9: Border property of Goldsource Mines Inc. in Saskatchewan, Durango coal seam trend extending into Manitoba, and the Pine River area (Goldsource Mines Inc. 2008).

Figure 10: Weathered lignite pile, south of Pine River, in 7-7-34-20W1 (2000-06-08).

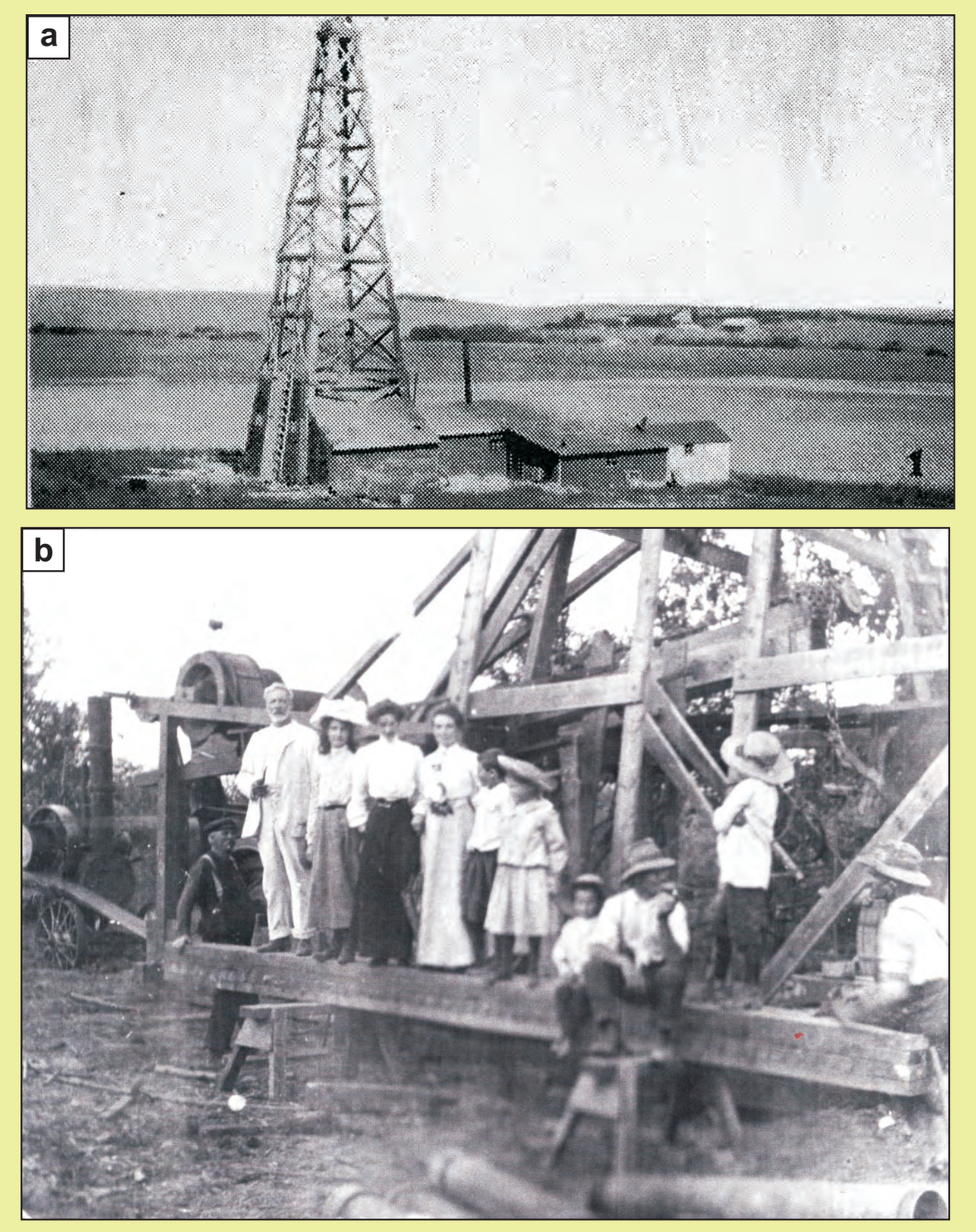

Figure 11: (a) Drill set-up on Haskell farm in NE29-7-10W1 (Commodity Site E11), circa 1911; **(b)** Lea Family at site of well being drilled in Pembina Valley in S23-2-9W1 in 1907 (Commodity Site E12).

Economic considerations

Historically, industrial mineral commodities from the Mesozoic rocks in southwest Manitoba have contributed to Manitoba's economy for over a century. Production of raw materials and value-added products have included: aggregate, brick clay/shale and bricks, sandstone building stone, gypsum and wallboard, natural cement, and non-swelling calcium bentonite.

Production of energy-related commodities in southwest Manitoba will become increasingly important in the future as prices and demand rise. Oil production from Mesozoic beds has occurred for over 50 years and solution gas has been produced since 2007. Potential new developments may include coal, oil shale and shale gas.

Base and precious metal commodities may also be produced from yet-to-be discovered sedimentary exhalative (SEDEX) deposits and evaluation of southwest Manitoba's diamond potential is awaiting discovery of kimberlite bodies. Utilization of the MGS chemo-stratigraphic database should assist industry in making these discoveries.

The discovery and/or exploitation of southwest Manitoba's Mesozoic resources will give the province a foothold in the industrial mineral, metallic and energy industries for years to come.

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