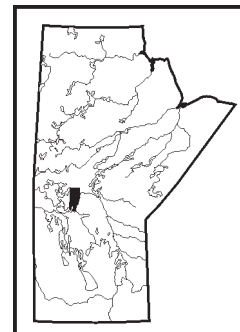


## **GS-27 Study of the surface karst and related features in the Limestone Bay Component of the proposed Manitoba Lowlands national park, Manitoba (NTS 63G6, 11 and 14) — preliminary results** by A.J. Kobylecki<sup>1</sup> and D.J. Bogdan<sup>2</sup>



Kobylecki, A.J. and Bogdan, D.J. 2004: Study of the surface karst and related features in the Limestone Bay Component of the proposed Manitoba Lowlands national park, Manitoba (NTS 63G6, 11 and 14) – preliminary results; *in* Report of Activities 2004, Manitoba Industry, Economic Development and Mines, Manitoba Geological Survey, p. 279–291.

### **Summary**

The Limestone Bay Component of the proposed Manitoba Lowlands national park site lies adjacent to the highly prospective Thompson Nickel Belt (TNB) in the Grand Rapids area. In this component, 10 karst study areas were distinguished on the basis of the occurrence of near-surface dolomitic bedrock, areas overlain by less than 3 m of overburden. Two of these areas were studied in 2003. This year's study consisted of analyzing all available data related to surface karst and related features, mainly in newly located karst areas. Additionally, field investigations were conducted in new karst areas.

Field investigations conducted this summer resulted in more than 200 karst and related features being found. Some of these features are from previously investigated karst areas. Results of this investigation are presented in four photomaps at a 1:20 000 scale. This year, the Limestone Bay Component investigation has demonstrated the enormous potential for significant karst discoveries in the proposed park area, as well as the lack of speleological research in this unique, world-class karst area.

### **Introduction**

This report presents a continuation of the 2003 study conducted by Bezys and Kobylecki (2003) to investigate karst and related features north and south of Grand Rapids, Manitoba. This year's investigation focussed on selected areas in the Limestone Bay Component of the proposed Manitoba Lowlands national park (Figure GS-27-1). The proposed boundaries of this component, as outlined in the new memorandum of understanding (Government of Manitoba, 2004), have been expanded and the component now consists of two units 'Core Lands' (previously the Limestone Bay Component) and 'Proposed Additions' (additional land west of the previously proposed park boundaries).

The short-term goal of this investigation was to determine the abundance of karst and related features in the Limestone Bay Component. The long-term goal is to prepare an inventory of the karst and related features in the Limestone Bay Component in database form. As well, maps at a scale of 1:20 000 (in selected areas) and 1:50 000 (for the whole park area) will be generated. This database and these maps will be useful for park management.

### **Karst study areas**

The Limestone Bay Component (Core Lands and Proposed Additions) includes three distinct geographical regions (Figure GS-27-2):

- the Grand Rapids Uplands, which consist of abundant surface and subsurface karst features
- the Silurian Escarpment, which includes numerous karst springs at its base
- the Coastal Plain, which is covered mostly by fens and bogs but also contains rare rock cliffs, along the shore of Lake Winnipeg, with numerous wave-cut features

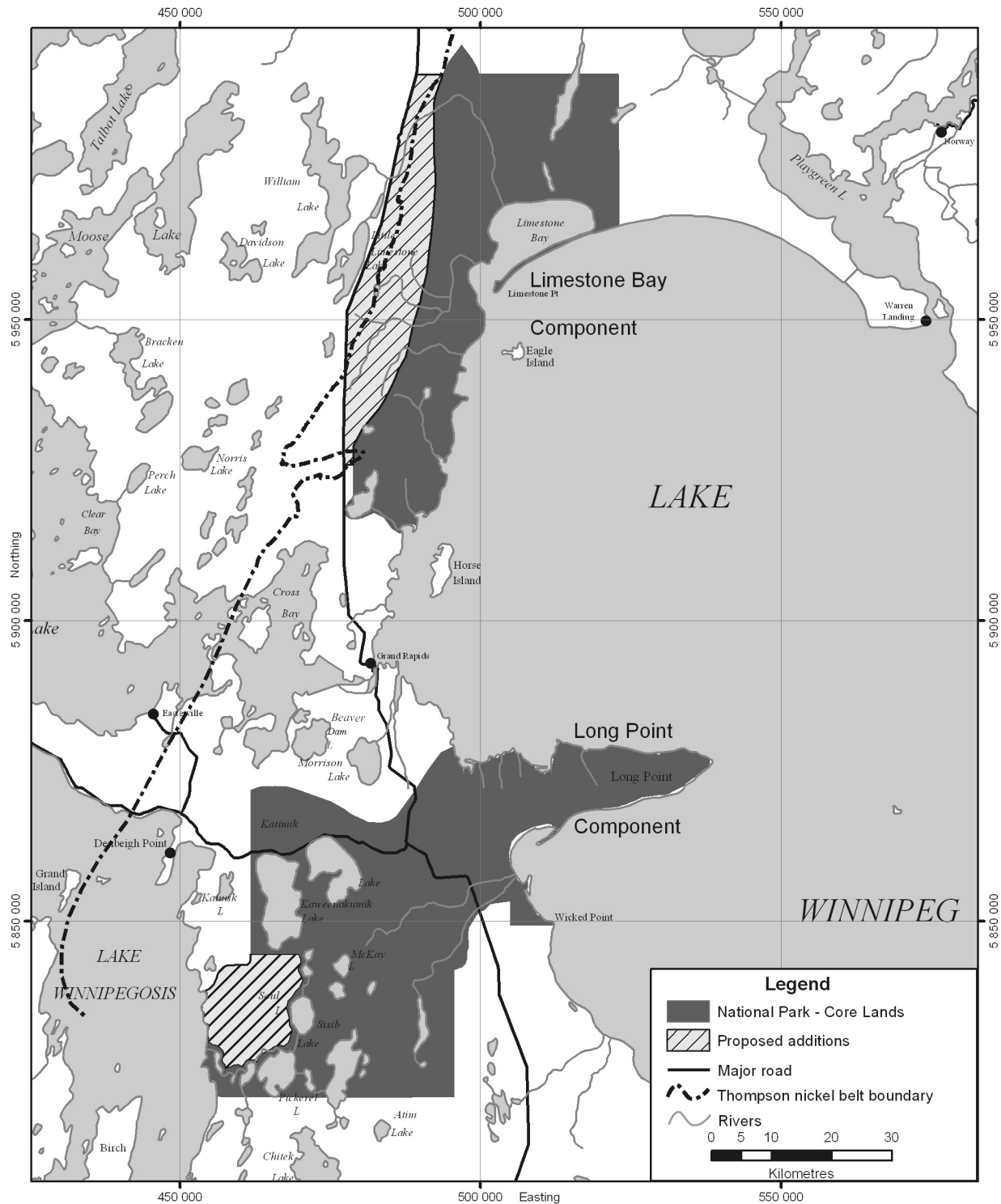
The Grand Rapids Uplands consist of plateaus with elevations locally exceeding 295 m above sea level (asl), or 70 m above Lake Winnipeg. These plateaus are underlain by Silurian dolomites with scattered perched lakes and have little, if any, surface drainage. They also have abundant surface and subsurface karst features, as well as other numerous non-karst outcrop features.

The Silurian Escarpment is a prominent northeast- and east-facing scarp overlooking a lower, relatively flat, Ordovician coastal plain. From the base of this escarpment (elevation between 240 and 270 m asl or 15 to 45 m above Lake Winnipeg) a number of karst springs emerge.

The Coastal Plain region is covered by bogs, fens, parkland, boreal forests and rare dolomite outcrops along the

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Universal Transverse Mercator Projection  
 North American Datum 1927  
 Zone 14

**Figure GS-27-1:** Proposed national park boundaries for the proposed Manitoba Lowlands national park.



Universal Transverse Mercator Projection  
 North American Datum 1927  
 Zone 14

Source:  
 NASA Shuttle Radar Topography Mission (SRTM) 90 metre  
 Digital Elevation Model.

**Figure GS-27-2:** Geographical regions in the Limestone Bay Component of the proposed Manitoba Lowlands national park.

lakeshore. Some of these outcrops form spectacular cliffs (up to 10 m high) with a number of wave-cut features.

Karst land in these geographical regions exist on dolomitic pavement or bedrock, overlain by less than 3 m of overburden, as originally mapped by Bannatyne (1988) and Manitoba Industry, Trade and Mines (2002). In the Limestone Bay Component of the proposed park there are 10 separate areas of karst land (Figure GS-27-3). These areas, and a segment of the adjacent Silurian Escarpment, constitute the karst study areas. These areas are

- 1) Baker Lake East;
- 2) Baker Lake West;
- 3) Cypress Hill;
- 4) Oskatukaw Lake East;
- 5) Honeymoon Lake North;
- 6) Honeymoon Lake South;
- 7) Buffalo Lake West;
- 8) Buffalo Lake East;
- 9) Sturgeon Gill Point; and
- 10) Robinson Point.

Two of these areas, Honeymoon Lake South and Buffalo Lake West include tiny enclaves of land not belonging to the park. The first enclave is located just north of Sturgeon Gill Road and is called Park Enclave A, and the second one is located south of Sturgeon Gill Road and is called Park Enclave B (Figure GS-27-3).

The Limestone Bay Component consists of approximately 129 km<sup>2</sup> of karst area, with more than 43 km<sup>2</sup> in the Core Lands and almost 86 km<sup>2</sup> in the Proposed Additions. In addition, almost 7 km<sup>2</sup> lie in Park Enclaves A and B. Only half of the karst area within the Limestone Bay Component has been explored, specifically the Honeymoon Lake North and South areas (a total of 63 km<sup>2</sup>). Most of the unexplored karst area exists in the Proposed Additions. The largest area of karst features is found in the Baker Lake East area (more than 36 km<sup>2</sup>), the smallest karst area is located in the Sturgeon Gill Point area (less than 2 km<sup>2</sup>). Details regarding the areas of karst is presented in Table GS-27-1.

## Inventory method

After analyzing all of the available data, two areas were targeted for this year's (primary) field investigation:

- a small plateau east and southeast of Baker Lake in the Baker Lake East karst study area, (referred to as the 'Bear Den Plateau')
- the northern part of the Oskatukaw Lake East karst study area (referred to as the 'Hyperkarst area')

The secondary field trip targets were

- Sturgeon Gill Point;
- Park Enclave A; and
- an area east of Park Enclave A (referred to as the 'Root Cellar Cave' area).

Before each field trip, the relevant airphotos were interpreted and coordinate grids were added to the airphotos. All suspected karst features and scarps were noted and traverses were planned. During the field trips, coordinates of features, such as the main traverse point, identified karst features and scarps with wave-cut features, were taken with a GPS and were marked on the airphotos. In some cases, where large clusters of small sinkholes or other karst features were found, coordinates were taken on a few representative features. Additionally, all the features were surveyed or sketched in a field book with the most significant ones photographed.

A database was created from the results of each field trip and maps for each study area were prepared at a 1:20 000 scale. These maps include the following features

- Highway 6, main roads and power lines from 1:50 000 topographic maps
- lakes and trails from airphotos
- elevation contour lines from the digital elevation model (DEM) of Manitoba from shuttle radar topographic mission (United States Geological Survey, 2003)
- scarps, karst and wave-cut features, and trails located in the field but not visible on airphotos.



Figure GS-27-3: Karst study areas in the Limestone Bay Component of the proposed Manitoba Lowlands national park.

**Table GS 27-1: Areas of karst in the Limestone Bay Component of the proposed Manitoba Lowlands national park and park enclaves.**

	Limestone Bay Component						Park Enclaves		
	Core Lands		Proposed Additions		Total		Total		
	area (km <sup>2</sup> )	% total area	area (km <sup>2</sup> )	% total area	area (km <sup>2</sup> )	% total area	area (km <sup>2</sup> )	area (km <sup>2</sup> )	% total area
Grand Rapids Uplands									
Baker Lake East			36.4	7.6	36.4	2.1		36.4	2.0
Baker Lake West			6.3	1.3	6.3	0.4		6.3	0.4
Cypress Hill			4.3	0.9	4.3	0.2		4.3	0.2
Oskatukaw Lake East			12.2	2.5	12.2	0.7		12.2	0.7
Honeymoon Lake North	8.5	0.7	23.2	4.8	31.7	1.8		31.7	1.8
Honeymoon Lake South	25.7	2.0	3.5	0.7	29.2	1.6	2.4	31.6	1.8
Buffalo Lake West	1.0	0.1			1.0	0.1	4.4	5.4	0.3
Buffalo Lake East	1.8	0.1			1.8	0.1		1.8	0.1
Subtotal	37.0	2.9	85.8	17.8	122.9	6.9	6.8	129.7	7.3
Coastal Plain									
Sturgeon Gill Point	1.6	0.1			1.6	0.1		1.6	0.1
Robinson Point	4.8	0.4			4.8	0.3		4.8	0.3
Subtotal	6.3	0.5			6.3	0.4		6.3	0.4
Total of karst areas	43.4	3.4	85.8	17.8	129.2	7.3	6.8	136.0	7.6
Total area (karst and non-karst areas)	1294	100.0	481	100.0	1775	100.0	11.2	1786	100.0

Note: The areas of the karst land have been estimated from the Grand Rapids Bedrock Geology Compilation Map (Manitoba Industry, Trade and Mines, 2002).

## Results

### *Baker Lake East and Baker Lake West areas*

No karst investigations are known to have been conducted in this area, but there are unconfirmed reports about the existence of a cave in the Baker Lake area. This information was mentioned in McRitchie (1988), Sweet et al. (1988), Speleological Society of Manitoba (1992) and McRitchie and Monson (2000). The focus of field investigations in this area was to confirm the presence of this cave.

In the Baker Lake East area, five field trips were conducted with a main goal to inventory karst and wave-cut features in the Bear Den Plateau (1.5 by 2 km) located east of Baker Lake (Figure GS-27-4). The Bear Den Plateau was chosen as a primary target for karst investigation because of positive results from airphoto analysis. In addition, the relatively short walking distance from an access road (only 1 km) was conducive in visiting this plateau. The investigation within this area was a success because several areas with karst features and cliffs were found.

The most prominent discovery was a cluster of karst features, one feature in particular is quite large (4 to 5 m wide and 1 m deep) and was named the Bear Den Cave. Another significant feature was also found in this area. A cave entrance was found within a sinkhole, which is 2 m deep. The dimensions of the cave are 0.5 to 2 m wide and 2.5 m deep and it is suspected that this may be the Baker Lake Cave. This feature has been named the Baker Lake Cave as this cave met to some extent the criteria set up by Sweet (1989) for cave descriptions in the Grand Rapids Uplands. Besides the two caves in this area, 33 karst and four wave-cut features were located. Furthermore, a 4 m high cliff face was surveyed, which is estimated to be 1.3 km long.

Two sinkholes and a few small depressions were found in the Baker Lake West area and a 2 m high cliff was

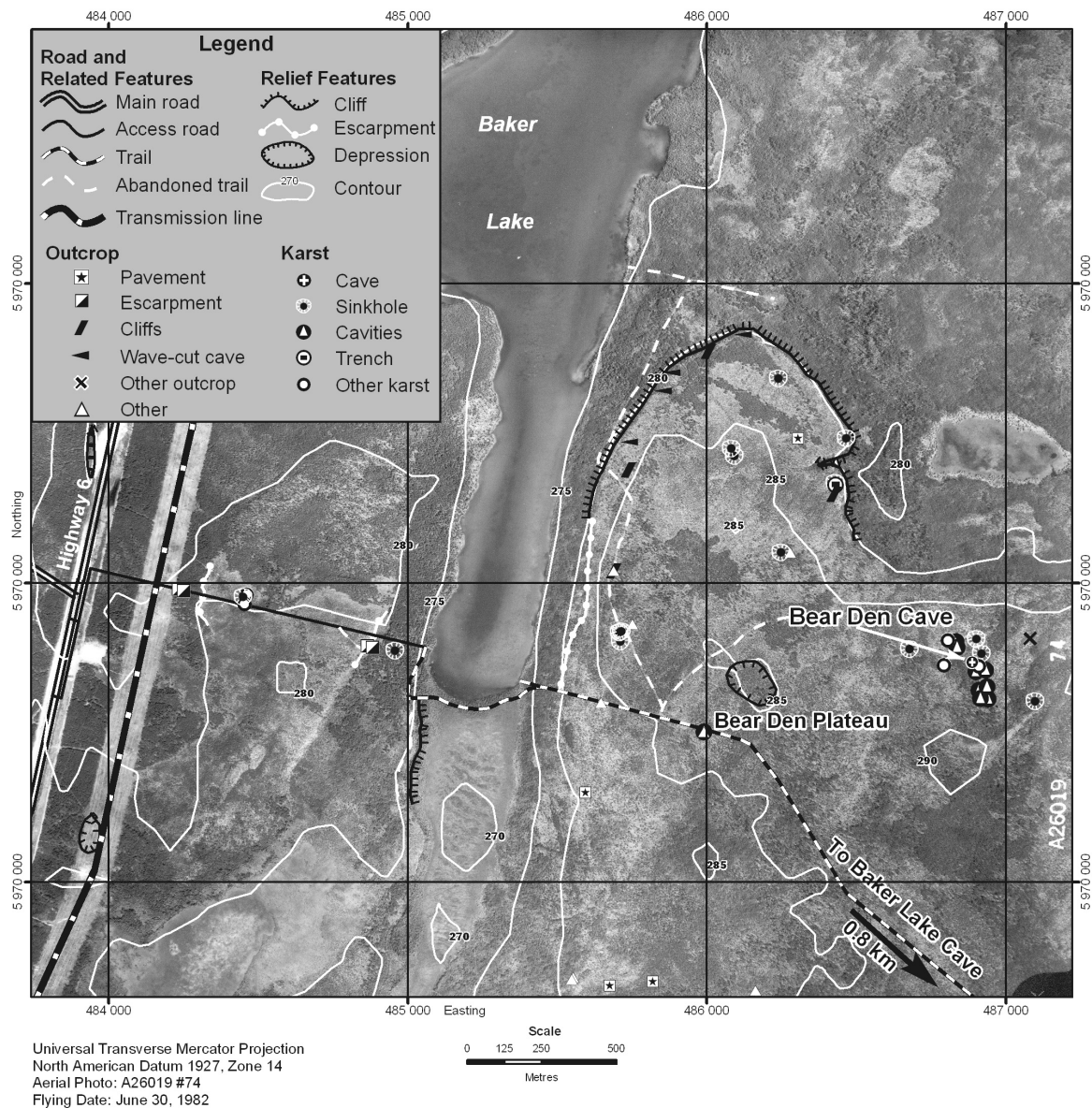
surveyed (approximately 0.6 km long).

The location of most of the surveyed cliffs, caves, karst and related features in both of these areas are shown in Figure GS-27-4.

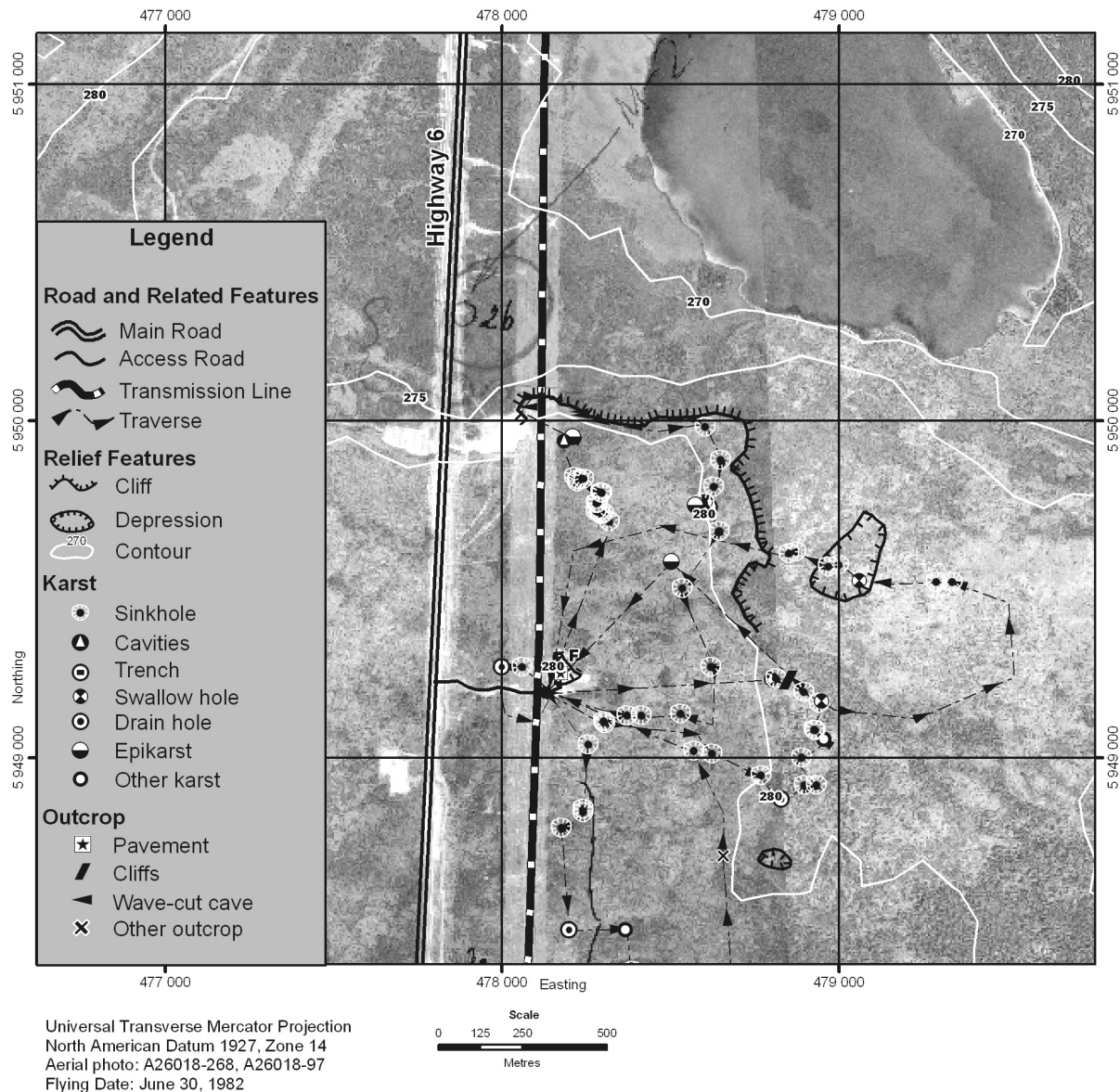
### ***Oskatukaw Lake East area - Hyperkarst area***

Investigation of the karst and related features in the south and central part of the Oskatukaw Lake East area was conducted in 1994 by the Speleological Society of Manitoba (SSM) and Manitoba Geological Survey (MGS) (McRitchie, 1995a). McRitchie (1995a) noted that one trip in the area revealed a “highly impressive intensely karstified country immediately east of the powerline” with a “high density of small collapse sinks”. Few karst features were found outside this ‘karstified country’.

McRitchie (1995a) concluded that this area “warrants further attention especially just off to the north where the hyperkarst persist for another 2-3 kilometres”. Investigation of karst in this Hyperkarst area was designed as the main goal for this year’s study. In total, 74 karst and 6 wave-cut features were located, however no caves were located. All karst features in this area are presented in Figure GS-27-5.



**Figure GS-27-4:** Main results of the 2004 field investigation in the vicinity of the Baker Lake area.



**Figure GS-27-5:** Results of the 2004 field investigation in the Hyperkarst area.

**Park Enclave A**

Park Enclave A has recently been clear-cut and information was received that one cave and a few sinkholes were found during the logging operation (J. Dubois, pers. comm., 2004). The main reason for investigating this area was to check this information.

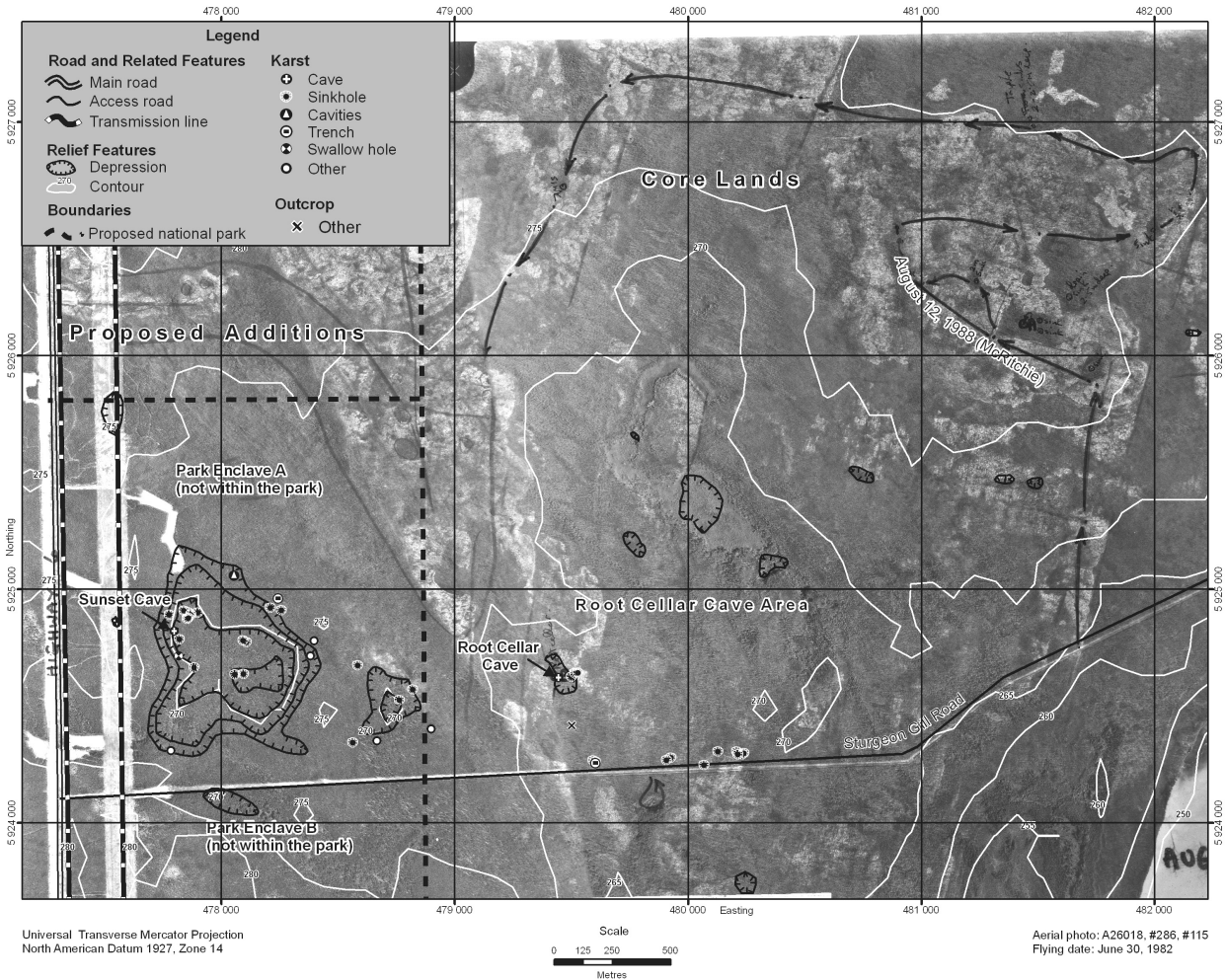
This investigation revealed 28 karst features, including the Sunset Cave (2 m long and 2.7 m deep) and Swallow Hole (4 m deep and 5 to 10 m wide) (Figure GS-27-6). These two features and most of the other karst features are located in a large closed depression, 600 to 800 m wide and 4 m deep.

Sunset Cave and Swallow Hole were visited two weeks after their initial discovery, and after two nights of heavy rain, Swallow Hole was 2 m under water and Sunset Cave was filled with water.

**Root Cellar Cave area**

The key objectives in the Root Cellar Cave area were to revisit the cave, make a surveyed plan of the cave and investigate the possibility of locating other karst features in the area.





**Figure GS-27-6:** Results of the 2004 field investigation in Park Enclave A and the Root Cellar Cave area. Note that Root Cellar Cave was found in 1988.

The cave was located and a survey plan was made. In the immediate vicinity of this cave, a large sinkhole was located. Other karst features were found adjacent to the Sturgeon Gill Road and in total 16 karst features, mostly sinkholes, were found (Figure GS-27-6).

### **Sturgeon Gill Point area**

Interpretation of the airphotos for the Sturgeon Gill Point area identified five separate outcrops on the shore of Lake Winnipeg. A goal of this summer's study was to conduct a traverse through the centre of the area of near-surface bedrock adjacent to Sturgeon Gill Point to locate karst features and to locate and survey the wave-cut features in two cliffs south of the harbour at the end of Sturgeon Gill Road.

Two active cliffs along the shoreline and one relict cliff were surveyed in this area. Several wave-cut features and one crevice were located. A map of the Sturgeon Gill Point area is shown in Figure GS-27-7.

### **Conclusions**

This year's investigations proved that there is an abundance of karst and related features that are available in the Limestone Bay Component of the proposed Manitoba Lowlands national park site.

In detail, all karst features located during this summer's field investigations are indicated by study area in Table GS-27-2.

This year's field investigations, as well as the previous inventories, revealed 829 karst and other related features in

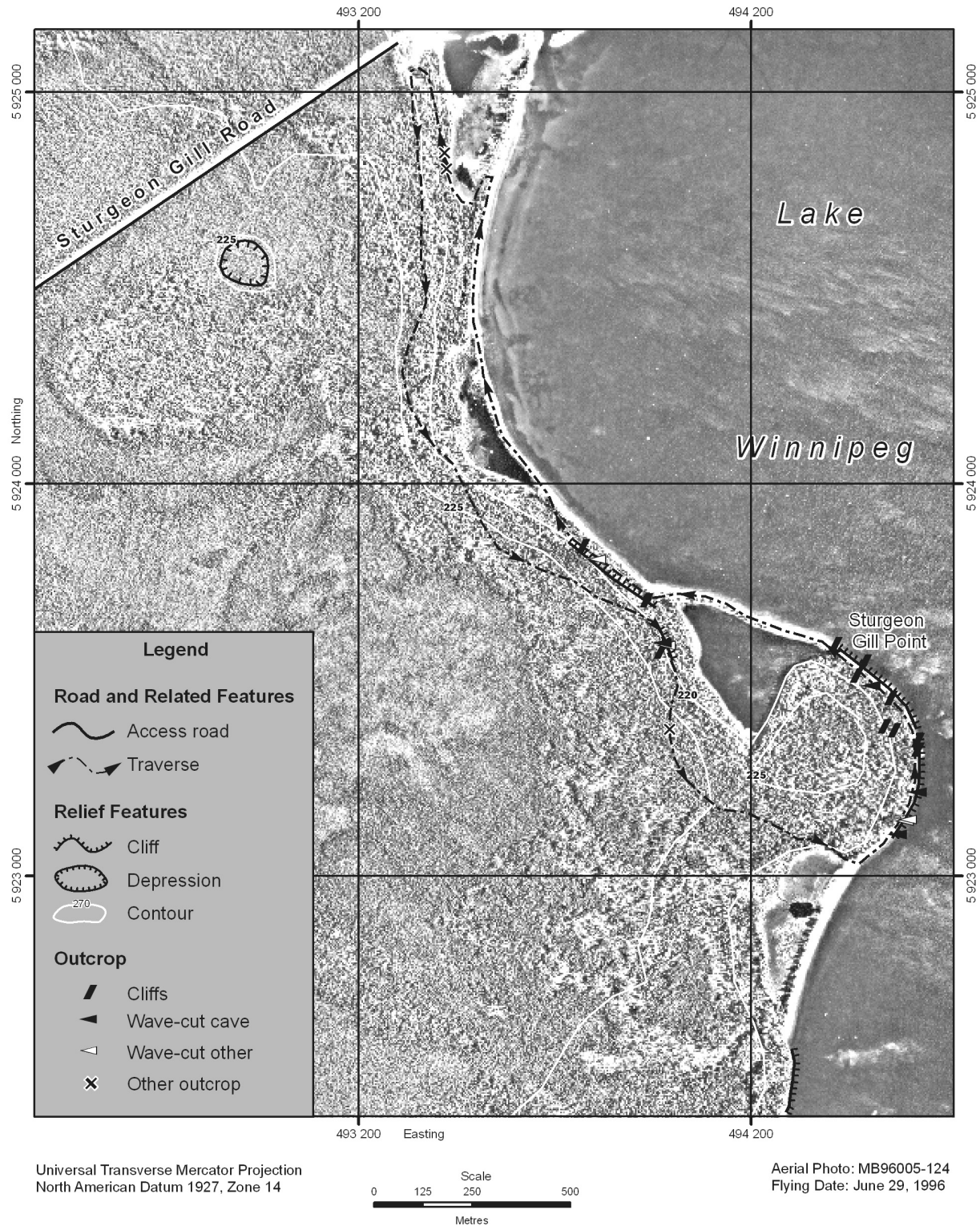


Figure GS-27-7: Results of the 2004 field investigation in the Sturgeon Gill Point area.

**Table GS-27-2: Karst and related features located in the Limestone Bay Component in the summer of 2004.**

	Karst features						Subtotal
	Solutional caves	Sinkholes	Trenches	Swallows	Cavities	Other <sup>1</sup>	
<b>Proposed Additions</b>							
Baker Lake East -							
Bear Den Plateau	2	19	2		11	1	35
Baker Lake West		2				4	6
Oskatukaw Lake East -							
Hyperkarst area		51		10	6	7	74
Subtotal	2	72	2	10	17	12	115
<b>Core Lands</b>							
Honeymoon Lake South -							
Root Cellar Cave area		15	1			1	17
Sturgeon Gill Point							
<b>Outside proposed park</b>							
Honeymoon Lake South -							
Park Enclave A		19	1	2	2	4	28
<b>Total</b>	<b>2</b>	<b>106</b>	<b>4</b>	<b>12</b>	<b>19</b>	<b>17</b>	<b>160</b>

	Outcrop features				Subtotal	Total
	Wave-cut features	Scarp	Fossils	Other <sup>2</sup>		
<b>Proposed Additions</b>						
Baker Lake East -						
Bear Den Plateau		4	6	8	18	53
Baker Lake West			2		2	8
Oskatukaw Lake East -						
Hyperkarst area		6	1	1	8	82
Subtotal		10	9	1	8	28
<b>Core Lands</b>						
Honeymoon Lake South -						
Root Cellar Cave area			1		1	17
Sturgeon Gill Point		8	5	2	15	15
<b>Outside proposed park</b>						
Honeymoon Lake South -						
Park Enclave A						28
<b>Total</b>		<b>18</b>	<b>15</b>	<b>1</b>	<b>10</b>	<b>44</b>

<sup>1</sup> Includes epikarst and small closed depressions; <sup>2</sup> Includes outcrop pavement and crevices

the proposed national park. The final total of 829 is subdivided between karst features (350) and other features (479). Of this total, 444 (53.6%) are located within the Proposed Additions and 385 (46.4%) in the Core Lands. There is nearly double the number of karst features (220) in the Proposed Additions than in the Core Lands (130).

The most promising area for future karst discoveries appears to be the Baker Lake East area. It contains 36 km<sup>2</sup> of karst area. Only one twelfth of this area was investigated for karst features this year and 35 karst features were found. This is a high density of features found in a small geographic area and warrants further study. The Honeymoon Lake area is an area that has been intensively investigated for karst and even with this year's investigations (in Park Enclave A and the Root Cellar Cave area) numerous karst features were discovered. Even though Park Enclave A is not part of the proposed park area, the Honeymoon Lake area still has great potential for karst discoveries.

## **Economic considerations**

The Limestone Bay Component of the proposed Manitoba Lowlands national park lies adjacent to the highly prospective Thompson Nickel Belt (TNB) in the Grand Rapids area. This study was conducted to demonstrate the abundance of karst features that are available within the proposed park, east of the eastern limits of the TNB. Field investigations confirmed the presence of near-surface bedrock and karst features, particularly in the Baker Lake East study area.

## **Acknowledgements**

This project was made possible with a grant from the Sustainable Development Innovation Fund from Manitoba Conservation. Ongoing support and cooperation of the Manitoba Geological Survey is appreciated. Many thanks go to the Manitoba Speleological Society (SSM) and its members for access to the SSM and private archives. G. Matile (MGS) is thanked for preparing detailed contour maps, G. Keller (MGS) for GIS consultation and P. Mann for assistance in the field. Personally, many thanks go out to R. Bezys (MGS) for assistance in obtaining the grant, ongoing logistic support and consultation.

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