MARGINAL NOTES

INTRODUCTION

Mapping of glacial deposits in Toronto and Chinguacousy townships was first undertaken by A.K. Watt in 1950 for water resource studies, however, the work was not published. Watt (1957, 1969) undertook additional mapping in the townships of Etobicoke and York (previously North York). The industrial mineral potential of the Brampton area, which included glacial deposits, was reported on by Hewitt (1969). Now mapping was started by Sharpe although only a progress report was published (Sharpe 1980). The current mapping began in 1984 and continued to 1987 with progress reports each year (Karrow 1984, 1985, 1986, 1987a). A preliminary map of the Quaternary geology of the western portion of the Brampton area has been published (Karrow 1987b).

Field assistance was provided by D.S. Turnbull and Eric Wright. Field work was conducted by examination of road and railway cuts, building excavations, quarry and gravel pit exposures, and by hand-operated soil probe. During the winter of 1986, several boreholes were drilled to provide additional stratigraphic information. Extensive urbanized areas in the south near Lake Ontario and in the east greatly inhibited identification of materials. Map unit boundaries in urban areas are thus commonly less reliable than those in rural areas. Subsurface data have been compiled by the Ontario Geological Survey (Roumbanis and White 1986, 1988).

PHYSIOGRAPHY

Regional physiographic features have been described by Chapman and Putnam (1984). Soils have been described by Hoffman and Richards (1953, 1955) and Gillespie et al. (1971).

The principle topographic feature in the area is the Niagara Escarpment, which trends approximately north-south through the area and separates a western upland from an eastern lowland. The upland, with elevations of 300 m in the south and 330 m in the north, is dominated by an irregular dolostone bedrock surface a few kilometres in width. The lowland area is of generally low relief, with the main relief created by stream dissection. The valleys of the Credit and Humber rivers are up to 30 m deep. Over large parts of the lowland area local relief is less than 3 m. Most streams follow the natural slope of the land southeast to Lake Ontario. In places, the surface has been modified by westward ice movement which fluted the till surface and imprinted that direction on some minor drainages. Principle streams draining the area are, from southwest to northeast, Sixteen Mile Creek, the Credit River, Etobicoke Creek, Mimico Creek, and the Humber River.

Below the Niagara Escarpment the surface of the area slopes southeastward from 280 m in the northwest to 75 m above sea level at Lake Ontario. The glacial Lake Iroquois shoreline separates a flat coastal plain from the undulating till plain to the north.

BEDROCK GEOLOGY

The map area is underlain by Paleozoic bedrock of Ordovician and Silurian age (Telford et al. 1976). The eastern third of the lowland is underlain by grey to olive shale and siltstone of the Georgian Bay Formation while red shale of the overlying Ordovician Queenston Formation underlies the western portion. Outcrops of shale are common along the Credit River, west of Erindale, along Etobicoke Creek and the Humber River, and in parts of the Lake Iroquois plain.

Silurian age sandstone (Whirlpool Formation), shale (Cabot Head Formation), and dolostone (Manitoulin, Reynales, and Amabel Formations) are exposed along the slopes of the Niagara Escarpment and in the western upland. Amabel Formation dolostones form the caprock of the Escarpment.

BEDROCK TOPOGRAPHY AND STRUCTURE

The general slope of the Ordovician bedrock surface is to the southeast, decreasing from approximately 250 m at Terra Cotta to 75 m at the Lake Ontario shoreline. Several bedrock valleys have been incised into the rock with their positions reflected in the major modern drainage courses. The most notable bedrock valley, 30 m or more deep, is marked by the course of the Credit River.

The Amabel Formation forms a rough and irregular surface in the western upland, attributable to its reefy internal structure and the erosion effects of glaciation and glacial meltwaters. The rough surface fostered plucking and quarrying of blocks and boulders, giving rise to a boulder-strewn surface with knobs of bedrock projecting through coarse and discontinuous glacial deposits. This assemblage has been termed as "bedrock drift complex" on the map and comprises most of the upland area between Milton and Limehouse along the western edge of the area. Potholes and gorges eroded by meltwater occur there as well.

In the eastern portion of the map area two classes of structural features, which are believed to be stress-relief pop-ups, have been noted. At a few exposures along stream banks and in quarries, small anticlinal structures have been seen in cross section without any ground surface manifestation. Linear features visible on 1954 air photos, but seldom evident today because of urban disturbance, are also believed to be pop-ups; locations of these are shown on the map. No exposures were available in these features to determine their internal structure. The grouping of these structures, in the lower Queenston and upper Georgian Bay Formations, is an extension of those noted in the Hamilton area to the south (Karrow 1987c).

GLACIAL DEPOSITS

The stony sand Wentworth Till is the oldest surface glacial deposit in the area. It has very limited exposure along the western edge of the map area. Wentworth Till is expected to extend eastward under younger surface till, but as yet there is not consistent stratigraphic record of its presence.

Halton Till forms the surface material of large portions of the lowland as well as some patches of the upland. Over additional areas, particularly north of Malton, it is at shallow depth below glaciolacustrine silt and clay.

Halton Till is typically a gritty silt to clayey silt till, but more clayey or sandy facies occur locally. Its colour closely reflects the underlying bedrock, with a drab grey buff to olive colour over Georgian Bay Formation and a red-brown colour over Queenston Formation. Red till along Eglinton Ave. West near Mavis Rd. indicates the presence of Queenston Formation at shallow depth and implies the presence of an outlier or southward extension of the formation beyond that shown on the bedrock map (Telford et al. 1976).

Multiple layers of Halton Till are known from borings and river bank exposures. Along the Credit River valley it is known to overlie, and be interbedded with, older glaciofluvial sand and gravel and glaciolacustrine clay and silt. This till forms small moraine ridges along the Escarpment between Milton and Georgetown. An extension of this ice-margin trend has been recognized northeast of Georgetown. A slightly older ice-margin position is apparently marked by the Cheltenham Moraine northeast of Terra Cotta. This moraine is very subdued and has no well defined crest; small depressions infilled with glaciolacustrine sediment mark its position. The youngest ice-marginal position is marked by the Trafalgar Moraine, a low undulating till ridge prominently fluted on its proximal (southeast) side. The moraine trends northward to Streetsville, is interrupted near the Credit River valley, and continues in subdued form northeast to Toronto International Airport, beyond which it is lost in the urban area.

GLACIOFLUVIAL DEPOSITS

Ice-contact glaciofluvial sediments occur at the surface principally near or west of the Escarpment between Limehouse and the northern edge of the area. They consists of hummocky, poorly sorted sand and gravel with a high proportion of the clastic sedimentary rocks, principally siltstone. Red mud coatings derived from the Queenston Formation commonly gives them a reddish colour. Much of this material originated during the retreat of Wentworth ice. One small esker ridge trends northwest at the western edge of the area west of Terra Cotta. Some ill-defined, esker-like ridges of sand occur in the Credit River valley near Huttonville.

The Brampton Esker is a large mass of sand and gravel capped by Halton Till. A 7 km portion of this deposit in the north-central part of the map area contains several gravel pits and is associated with numerous kettle holes filled with organic deposits. The sedimentology of the deposit has been described by Saunderson (1975) who concluded that the deposit was formed by an ice re-entrant into a glacial lake to the northwest. The esker is palimpsest, probably formed by Wentworth ice and is overridden by Halton ice, leaving a surface ridge about 15 m high.

Outwash sand and gravel is of limited extent, occurring under Halton Till along the Credit River north of Georgetown, and at the surface west and southwest of Georgetown. The sedimentology of the Credit River valley outwash has been described by Costello and Walker (1972).

Fine sand is frequently encountered under the Halton Till, particularly in a belt from Streetsville to Weston, where it joins thick sand along the Humber River valley (Watt 1969). At one site near Erin Mills sparse organic streaks were sampled in these sediments at a depth of 4 m. The surface morphology of the sub-till sand is concealed and for mapping purposes the sand has been classed as ice-contact sand.

GLACIOLACUSTRINE DEPOSITS

Along the Credit River valley near Cheltenham fine-grained glaciolacustrine sediments several metres thick underlie Halton Till. These deposits apparently were deposited in a glacial lake formed along an earlier Credit River valley prior to an advance of the Halton ice.

As the Halton ice front retreated eastward into the Lake Ontario basin, a shallow meltwater body, Lake Peel, was dammed to the northwest. Mappable deposits of glacial lake sediments are concentrated in broad shallow depressions along Sixteen Mile Creek, the Credit and Humber River valleys. Glaciolacustrine sediments consisting of silt and clay are sometimes laminated, and commonly interstratified with grits and pebbles (dropstones) and diamicton layers. Indeed, separation from till is often difficult. Extensive areas of the mapped deposits are only 1 to 2 m in depth, and their distribution can only be shown in general at the present mapping scale. Areas shown as till often have patches of silt and clay on top, and areas mapped as lacustrine include small till knolls.

Shallow water deposits, up to 3 m thick, include sand and gravel deposited in nearshore positions as deltaic deposits and, in the Sixteen Mile Creek valley east of Milton, as beach sand bars. The largest delta formed in the Credit River valley, near Huttonville, with several water plane elevations of about 216, 207, and 201 m; a smaller and lower Credit River valley delta occurs at about 180 m near Meadowvale Village. The principal delta along Sixteen Mile Creek occurs at about 189 m elevation near Drumquin.

The Lake Iroquois shoreline is marked by: shore-cliffs up to 10 m high cut in Halton Till or Georgian Bay Formation; and by gravel bars built across shore re-entrants and valley mouths. The largest gravel bar is located at the Credit River south of Erindale. These gravels are partly cemented with calcium carbonate. Extensive deposits of fine sand mantle most of the Iroquois lake plain.

POSTGLACIAL DEPOSITS

Elevated terraces above the modern flood plains are of limited areal extent but are found along the Credit River, Etobicoke Creek, the Humber River, and Sixteen Mile Creek. These represent abandoned flood plain and channel deposits above the modern flood plain. They seldom exceed 1 to 2 m in thickness.

Accumulations of organic matter in swamps and bogs are most prominent in channels eroded in bedrock west of the Niagara Escarpment. A few small kettle bogs occur along Cheltenham Moraine. More numerous kettle bogs, with as much as 5 m of peat, occur along the Brampton Esker. Heart Lake is the most prominent of these depressions. Another notable deposit is at Eglinton Ave. West and Kennedy Rd. This much disturbed deposit is over 2 m deep. A piece of wood about 1 m below the present surface yielded a radiocarbon age of 8280± 160 (Wat-1783).

Flood plains are evident along most medium and larger streams. Low slopes and numerous bedrock outcrops have inhibited downcutting and fostered lateral erosion. Nevertheless, flood plains are usually narrow. Modern floodplain sediments consist of undifferentiated alluvial gravel, sand, silt, clay, and muck.

ECONOMIC GEOLOGY

The Whirlpool Formation (sandstone) and the Amabel Formation (dolostone) have been exploited in several active and abandoned quarries along the Niagara Escarpment. Shale quarries at Streetsville in Queenston Formation and at Cooksville in Georgian Bay Formation are the basis of brick manufacturing. The Acton gas field, located south of Limehouse, taps Middle Ordovician carbonates at a depth of about 550 m (Sanford 1961).

Sand and gravel have been exploited in several pits along the Credit River, west of the Escarpment north of Limehouse, along terraces of the Credit River near Huttonville, and in the Brampton Esker. Large Iroquois gravel bars were formerly the sites of several gravel pits and shallow water sand was exploited in several pits near Clarkson. Few of these are still active. Urban encroachment is rapidly sterilizing large aggregate deposits in the Brampton Esker. Remaining deposits of all types are significant for local use but are commonly of inferior quality because of the presence of clay and siltstone.

Aggregate Resources Inventories (Ontario Geological Survey 1980, 1981, 1982. 1983) are available for portions of this area.

The peat deposits on Eglinton Ave. have supplied horticultural peat moss to individual householders in recent years but is being destroyed by urban development.

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Ministry of Northern Development and Mines
Ontario

Mines and Minerals Division
Ontario Geological Survey

MAP P.3171

QUATERNARY GEOLOGY

BRAMPTON AREA

Scale 1:50 000

1000 m 0 1 2 km

NTS Reference: 31 M/12

LOCATION MAP

LEGEND

CENOZOIC

QUATERNARY

RECENT

16 **Modern alluvium:** undifferentiated gravel, sand, silt, clay, muck

15 **Organic deposits:** peat, muck

PLEISTOCENE

LATE WISCONSINAN

14 **Older terrace alluvium:** poorly sorted, dirty, sand and gravel

13 **Lake Iroquois deposits:** beach gravel

12 **Deltaic and lacustrine deposits:** predominantly gravelly sand and silty sand

11 **Deltaic and lacustrine deposits:** gravel to gravelly sand

10 **Glaciolacustrine deposits:** massive to laminated silt and clay, may contain poorly sorted diamicton layers

9 **Outwash deposits:** predominantly sand

8 **Outwash deposits:** predominantly gravel

7 **Ice-contact deposits:** predominantly poorly sorted sand

6 **Ice-contact deposits:** predominantly poorly sorted gravel

5 **Halton Till:** red to brown gritty silt to clayey silt till

4 **Lacustrine deposits:** interstadial silt and clay

3 **Wentworth Till:** stony sand till

2 **Bedrock drift complex:** extensive but discontinuous thin bouldery till, in places sufficiently thick to subdue bedrock topography

PALEOZOIC

1 **Bedrock:** exposed or thin drift covered shale and dolostone

SYMBOLS

- Crest of small moraine
- Trend of subdued moraine
- Ice-contact face
- Sand and gravel pit
- Rock quarry
- Esker
- Glacial striae
- Abandoned shoreline
- Bedrock stress release feature

SOURCES OF INFORMATION

Base map derived from Map 31 M/12 of the National Topographic System, scale 1:50 000.

Contour interval: 50 feet (15.24 m).

CREDITS

Geology by P.F. Karrow, J. Easton and D.S. Turnbull, 1984 to 1987.

To enable rapid dissemination of data, this map has received only a cursory edit. Discrepancies may occur for which the Ontario Geological Survey does not assume liability.

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Information from this publication may be quoted if credit is given. It is recommended that reference to this map be made in the following form:

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