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REPORT 66-1

GEOLOGY OF THE CITY OF EDMONTON

PART 1: CENTRAL EDMONTON

by

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PART 1: CENTRAL EDMONTON

Abstract

The City of Edmonton is built upon surficial deposits of variable thickness underlain by Upper Cretaceous strata. The surficial deposits, of late Pleistocene age, consist of well-sorted preglacial sands and gravels, glacial till, and proglacial lake sediments, in ascending order. The surficial deposits generally thicken towards the northern part of the area due to relief developed on the bedrock surface. Maximum relief on the upper surfaces of the map-units ranges from 120 feet on the bedrock surface to 32 feet on the till surface.

Values obtained for the engineering properties of bedrock and surficial deposits exhibit marked variation owing to compositional and textural differences within and among the units mapped.

INTRODUCTION

The high-rise buildings that are changing Edmonton's skyline, the rapidly expanding storm sewer network, and the proposed rapid transit system all require a detailed knowledge of the distribution and kinds of deposits beneath Edmonton's surface and of the engineering properties of these deposits. This report contains the results of a drilling program carried out during October-December, 1965, in cooperation with the Engineering Department, City of Edmonton. The program is a continuing one, and additional reports will be issued as data become available.

The area covered by this report is the central business section of Edmonton, bounded by 114th Street on the west, 114th Avenue on the north, 92nd Street on the east, and Jasper Avenue on the south (Fig. 1).

Previous Work

Previous geological investigations within or near the present city limits of Edmonton have been of a reconnaissance nature except for a few coal studies. Selwyn (1874) reported on the coal-bearing beds of Edmonton and introduced the term "Edmonton" to describe them. Tyrrell (1887) later added to these descriptions, and Dowling (1910) described the Edmonton coal field.

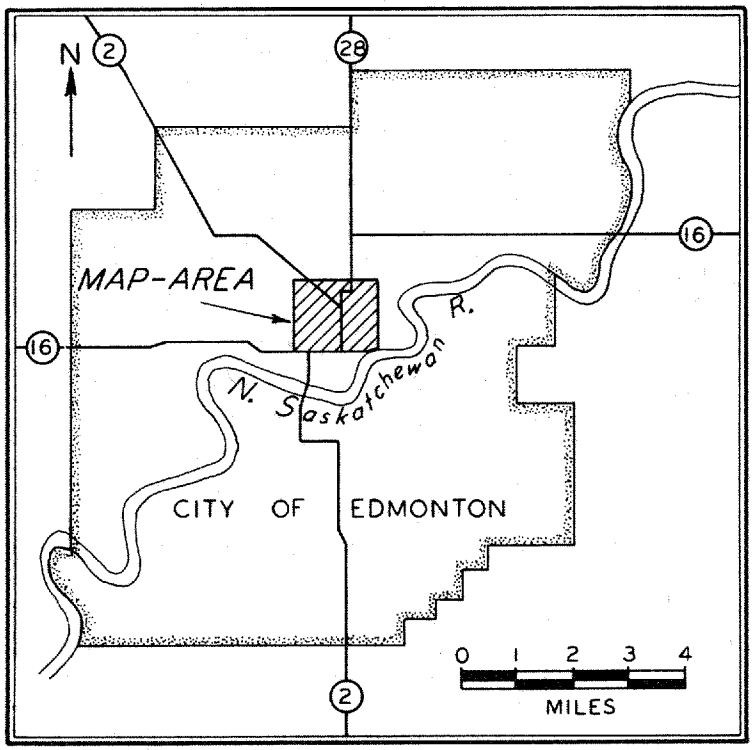

Figure 1. Location of map-area.

Duff (1951) described Pleistocene deposits in the Edmonton district, and Hughes (1958) conducted a study of Glacial Lake Edmonton sediments. Bayrock and Hughes (1962) subsequently mapped the surficial deposits of the Edmonton district (excluding the city) in some detail.

Sources of Data

Drilling was performed with a truck-mounted auger drill contracted from Mobile Augers and Research Ltd. of Edmonton. Forty-two holes were drilled for an aggregate total depth of 4986 feet. The use of an auger drill permitted dry holes, collection of uncontaminated samples, detailed logs of each drill hole, as well as a rapid and inexpensive means of drilling. The holes were drilled to bedrock wherever possible, but the auger was limited to a maximum depth of 150 feet.

In addition, existing well logs from various sources, excavations and natural outcrops were used to supplement the data obtained

from the auger holes.

Contour and isopach maps were constructed of the various units and surfaces represented in the subsurface (Figs. 2-7). Ground elevations are taken from detailed topographic maps of the city and are accurate to ± 2 feet. Subsurface contacts are thought to be accurate to ± 1 foot from the top of the hole.

Geologic cross sections were constructed to show salient features (Fig. 9).

Acknowledgments

The Engineering Department of the City of Edmonton provided assistance in the drilling program in addition to the services of Mr. W. Woida, an excellent and conscientious assistant. Mr. C. Pearson, Mobile Augers and Research Ltd., is responsible for the quality and accuracy of the drill hole logs. Dr. S. Pawluk, Dept. of Soil Science, University of Alberta, provided the mechanical analysis data, and Dr. S. Thompson, Dept. of Civil Engineering, University of Alberta, provided engineering data.

DESCRIPTION OF DEPOSITS

The City of Edmonton is underlain by a variety of sedimentary deposits ranging from coal to glacial lake sediments. These deposits can be divided into four different units which are, in ascending order — (1) bedrock, consisting of sandstone, shale, and coal of the Edmonton Formation, (2) preglacial Saskatchewan Sands and Gravels, (3) glacial till, and (4) Glacial Lake Edmonton sediments. Each of the units possesses distinctive geologic and engineering properties.

Geology

Edmonton Formation

The Edmonton Formation consists of interbedded bentonitic shales and sandstones with numerous coal seams (Dowling, 1910; Ower, 1958). The sediments, poorly consolidated, dip southwestward at about 20 feet per mile and are Late Cretaceous in age.

The surface of the Edmonton Formation has been eroded by a preglacial river system (Gravenor and Bayrock, 1961). The maximum relief developed on the bedrock surface in the area mapped is about 120 feet (Fig. 2). The highest part is along Jasper Avenue between 97th Street and 105th Street where bedrock comes within 40 feet of the surface.

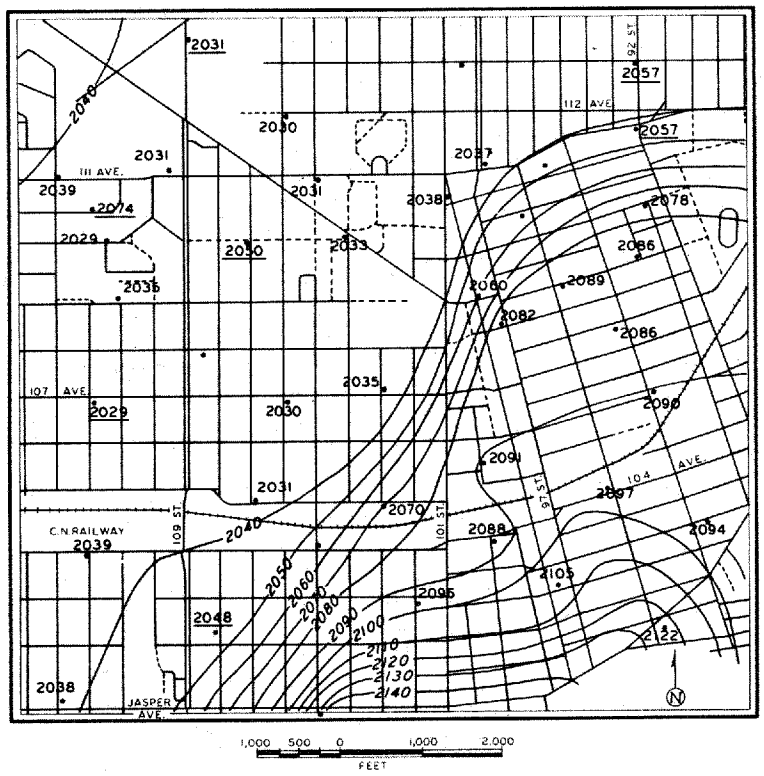

Figure 2. Contour map of bedrock surface (elevations in feet above sea level; underlined elevations indicate bedrock not reached).

To the northwest and west from the highest area, the bedrock surface slopes downward to a relatively flat preglacial valley floor. Along the eastern portion of the map-area a broad, flat terrace, 100 feet below the surface, is present between the bedrock high and the valley wall (Fig. 2). The terrace extends approximately from 104th Avenue to 108th-A Avenue and from 97th Street to beyond the eastern boundary of the map-area. North of the terrace the bedrock surface slopes downward, reaching the valley floor at 112th Avenue. Over 150 feet of fill is present where the bedrock surface is lowest. The present gradient on the bedrock surface on the floor of the preglacial valley is 8 feet per mile measured from Jasper Avenue and 113th Street to 112th Avenue and 105th Street (Fig. 9, Section E-E').

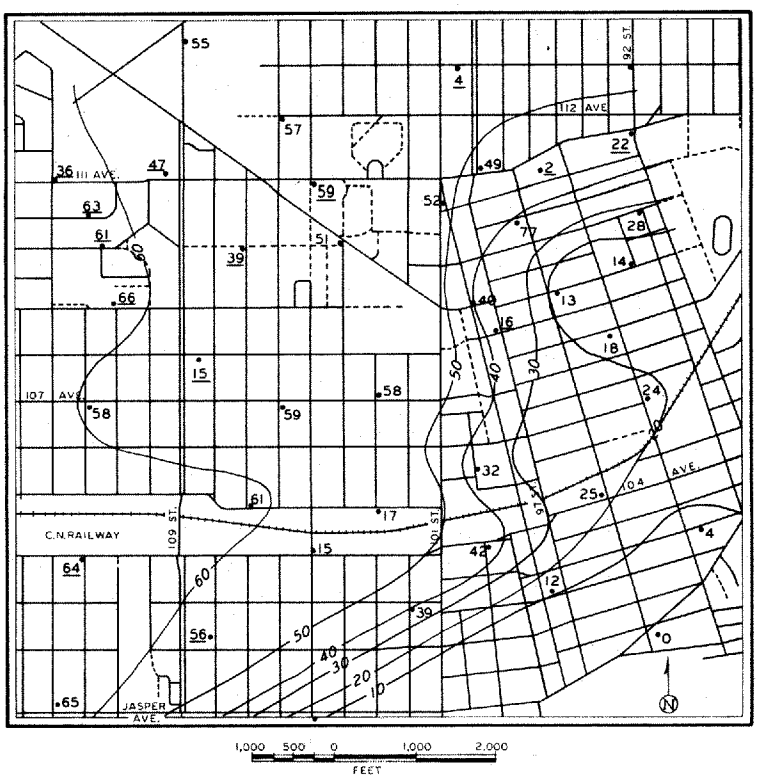

Figure 3. Isopach map showing Saskatchewan Sands and Gravels thicknesses (underlined values indicate minimum thicknesses).

Saskatchewan Sands and Gravels[1]

The Saskatchewan Sands and Gravels form a series of quartzose sediments of fluviatile origin, distributed discontinuously throughout Alberta. They are associated with more than one period of deposition and erosion but are definitely of preglacial origin and Pleistocene in age (Bayrock, 1965).

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[1] The terminology of these deposits is confused (Westgate, 1965). In this paper the term "Saskatchewan Sands and Gravels" will be used to denote all sands and gravels lying above the Edmonton Formation and beneath the till, and "Saskatchewan sands" or "Saskatchewan gravels" where a size connotation is desired.

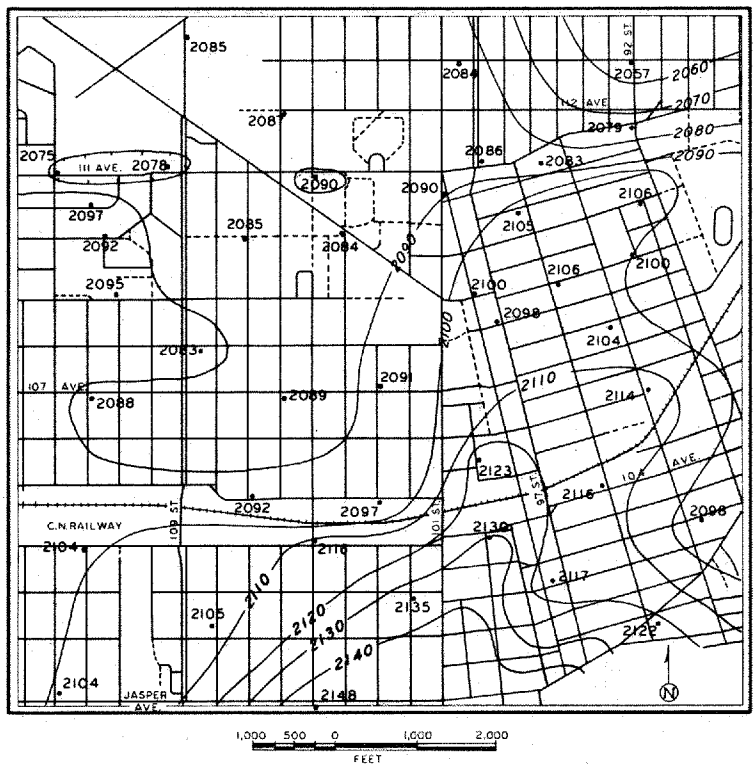

Figure 4. Contour map of till lower surface (elevations in feet above sea level).

The Saskatchewan Sands and Gravels overlie the Edmonton Formation throughout the map-area except for one small area near 95th Street and Jasper Avenue and another near 105th Street and Jasper Avenue (Fig. 3), where the deposits are absent. Saskatchewan Sands and Gravels should probably also be absent from other parts of the area of the bedrock high (Fig. 2).

The Saskatchewan Sands and Gravels consist mainly of sorted, rounded, quartz sand with minor silt and clay. Gravel lenses or beds are common, especially near the base of the formation. Analyses of six samples of the sand give the following average mechanical composition: sand 91 per cent, silt 3 per cent, clay 6 per cent. The Saskatchewan Sands and Gravels may be distinguished from overlying glacial sediments by the absence of igneous rocks derived from the Shield.

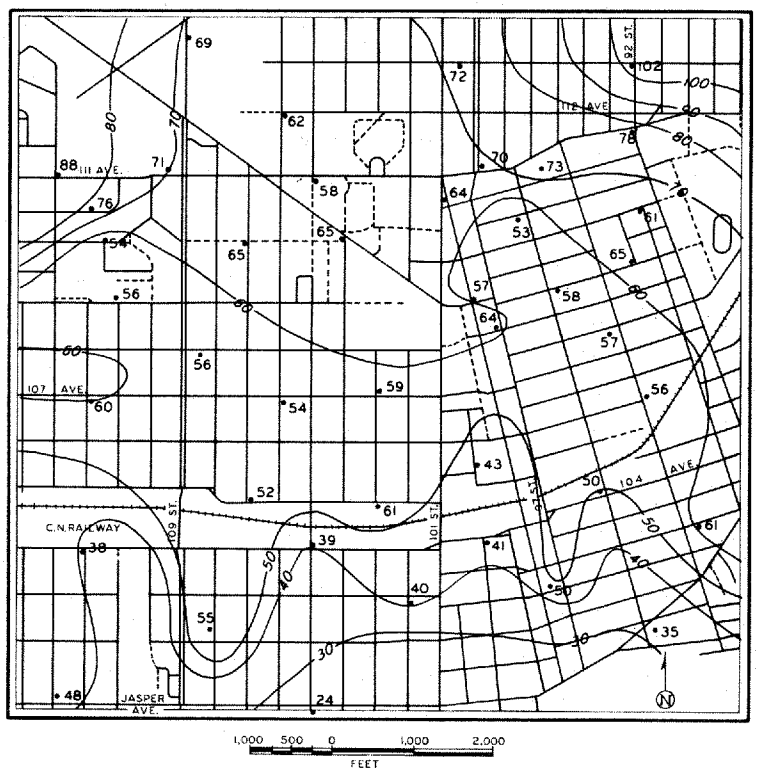

Figure 5. Isopach map showing till thicknesses.

A thin layer of gravel averaging 4 feet in thickness is present at the base of Saskatchewan Sands and Gravels. This gravelly horizon commonly contains bedrock fragments in large proportions. In one instance (hole 6) the layer of gravel with bedrock fragments is 12 feet thick.

The Saskatchewan Sands and Gravels tend to fill irregularities in the underlying bedrock surface. They reach thicknesses of over 65 feet in the preglacial valley in the northwest part of the map-area and are thin or absent where the bedrock surface is high (Fig. 3). Relief on the upper surface of the sands and gravels is about 80 feet (Fig. 4), due in part to the presence of a narrow northeast-trending ridge in the vicinity of 104th Avenue and 100th Street (Fig. 9, Section A-A'). From the cross section it is evident that this ridge is 25 feet higher than the surrounding Saskatchewan Sands and Gravels surface. Conclusive evidence for the origin of this ridge is lacking, but it could be a high river terrace or an ice-push feature. Cross section C-C', farther to the north, shows a typical profile without the anomalous ridge.

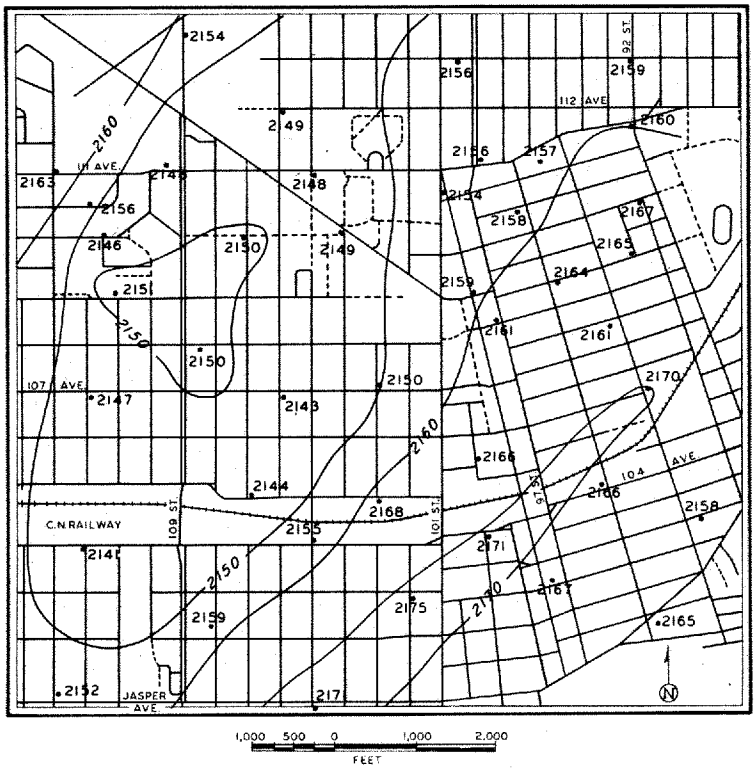

Figure 6. Contour map of till upper surface (elevations in feet above sea level).

An anomalous thickness of Saskatchewan sand is present in hole 13 at the intersection of 96th Street and 110th Avenue, where over 75 feet of sand were encountered beneath the till. This thick sand layer may represent infilling of a small tributary channel or gully or an error in interpretation of drill hole data. It has been disregarded in compiling the data shown in figure 3.

Till

Till is unsorted, unstratified sediment deposited by a glacier. In the map-area till has the following average mechanical composition (six samples): sand 44 per cent, silt 26 per cent, clay 30 per cent. This is quite similar to the composition of other tills in central Alberta (Bayrock, 1960) because of the similarity of the bedrock source materials in this region. The till is brown where oxidized, grey where unoxidized;

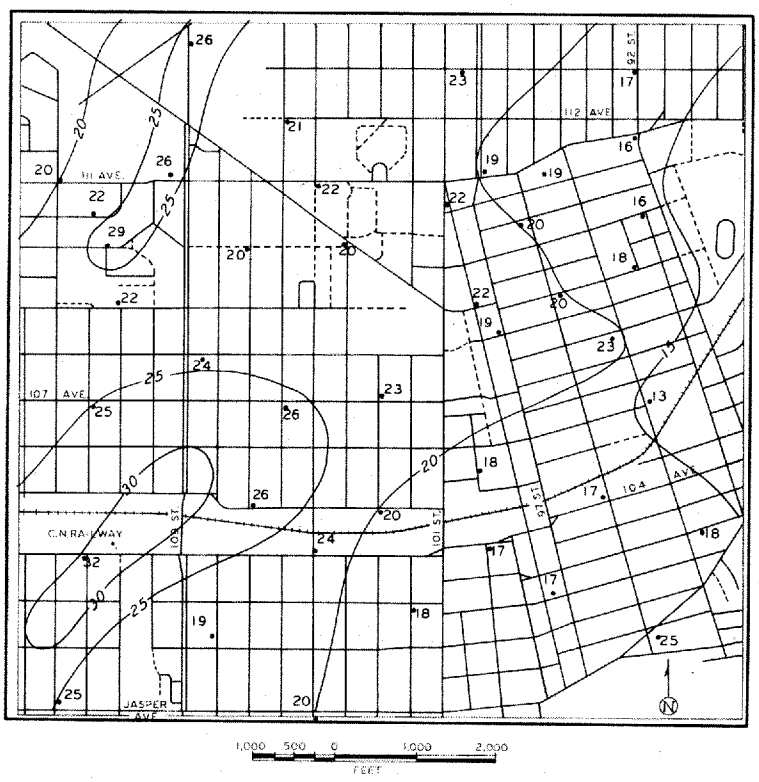

Figure 7. Isopach map showing thicknesses of Glacial Lake Edmonton sediments.

the color change from brown to grey occurs about 20 feet below the surface and is not a reflection of a change in composition. Lenses of stratified sand and gravel are commonly present in the till; the lenses are usually less than 1 foot thick and represent minor washing of glacial debris by running water. In one hole (hole 1), at the corner of 113th Street and 111th Avenue, a bedrock erratic 4 feet thick was encountered at the base of the till above the Saskatchewan Sands and Gravels. The till ranges in thickness from 24 feet to over 100 feet. As with the Saskatchewan Sands and Gravels, the till is thin over bedrock highs and thicker over the pre-glacial valleys (Fig. 5).

The contact between the till and the Saskatchewan Sands and Gravels is sharp and easily recognized in the subsurface by a good driller. In places, as at the corner of 96th Street and 110th Avenue (hole 2), a glacial sand lens is present directly above Saskatchewan sands, making the contact difficult to pick. No evidence of weathering is visible at the

Table 1. Maximum Thicknesses and Relief on Upper Surfaces of Bedrock and Surficial Deposits in the Map-Area

Unit	Maximum Thickness (feet)	Maximum Relief on Upper Surface (feet)
Lake sediments	32	Modified by man < 32
Till	100	32
Saskatchewan Sands and Gravels	65+	80
Bedrock	—	120

till-Saskatchewan Sands and Gravels contact.

Maximum relief on the upper surface of the till is about 32 feet, caused in part by the northeast-trending ridge in the southeast part of the map-area (Fig. 6). However, as shown in table 1, each successive deposit has tended to smooth out irregularities on the underlying surface, leaving less relief at progressively higher levels in the section.

Glacial Lake Edmonton Sediments

Glacial Lake Edmonton sediments consist of varved silts and clays, with scattered pebbles, laid down in a large proglacial lake at the close of the Wisconsin glacial period (Bayrock and Hughes, 1962). The clays are brown near the surface but may be grey (unoxidized) at depths exceeding 20 feet. The lake sediments range in thickness from 16 feet to over 30 feet, the thickness being variable over the entire map-area (Fig. 7). The thickness is a reflection of the relief present on top of the till surface, with clay being thin over areas where the till surface is high.

The lake deposits are more clayey in the uppermost few feet than in the lower portions. Mechanical analyses of typical lake deposits from the lower beds average 5 per cent sand, 40 per cent silt, and 55 per cent clay. It should be pointed out that outside of the map-area the lower lake sediment beds may consist of fine sand. Also, till-like lenses of clay with pebbles may be encountered in a few places.

Engineering Properties

Averages of engineering properties of the various materials underlying the study area are set out in table 2.

Bedrock is variable in composition, and, although generally compact, some beds may show significant departures from values shown in the table. Saskatchewan Sands and Gravels are highly compact and provide a good bearing surface provided that they are undisturbed and that quicksand conditions are not induced or encountered. The till is dense with a high bearing capacity except for the uppermost few feet. Lake sediments are not compact and are unsuitable for large structures.

All of the deposits contain a high proportion of montmorillonite (bentonite) in the clay fraction. The montmorillonite is calcium-saturated in till and lake deposits and sodium-saturated in bedrock. This accounts for the relatively higher plasticity of the bedrock clays, although the till and lake deposits contain the same clay minerals.

HISTORICAL GEOLOGY

After deposition of the Edmonton Formation near the end of Cretaceous time, the Alberta Plains were subjected to a series of erosion cycles during Tertiary and early Pleistocene times. The last of these cycles led to the establishment of a drainage system, now largely buried by glacial deposits, similar to the existing one. The preglacial North Saskatchewan River formed part of the drainage system, flowing through the northern portion of the map-area. It had a valley up to 200 feet deep and a few miles wide, bounded by steep banks. During the development of the preglacial North Saskatchewan River, the Saskatchewan Sands and Gravels were deposited as valley fill during the Pleistocene Epoch (Gravenor and Bayrock, 1961). More than one cycle of deposition and erosion took place, as evidenced by the distribution of the sands and gravels at different elevations in Edmonton and surrounding areas. However, deposition of the sands and gravels ceased as they were overridden by the continental ice sheet advancing from the northeast (Gravenor and Ellwood, 1957). The ice advance occurred during classical Wisconsin time, approximately 20,000 years ago, the ice reaching a thickness of over 5000 feet in the Edmonton area (Bayrock and Hughes, 1962). Deglaciation occurred about 10,000 years ago.

Following the retreat of the ice sheet, Glacial Lake Edmonton was formed through accumulation of meltwaters, covering the City of Edmonton area with 50 to 100 feet of water (Bayrock, in press). The lake drained southeast through the Gwynne Outlet, near the Edmonton International Airport (Bayrock and Hughes, 1962). Further wasting of the ice

Table 2. Typical Engineering Properties of Bedrock and Surficial Deposits Underlying the City of Edmonton*

Property	Bedrock	Saskatchewan Sands and Gravels	Till	Lake Edmonton Sediments
Shearing Strength	High	High	Medium-High	Low-Medium
Moisture Content	15%	Variable	18%	25%
Liquid Limit	Variable	----	40	65
Plastic Limit	Variable	----	15	25
Dry Density	Compact	Medium-dense to dense	Dense, tough	Medium
Penetration (ASTM Standard Test)	100->200	30->200	25-200	15-25
Compressibility	Low	Low	Low	Low-Medium

* Data obtained from S. Thompson, Department of Civil Engineering, University of Alberta, and Research Council of Alberta files.

sheet opened lower outlets to the east, which ultimately drained Lake Edmonton.

Following the disappearance of Lake Edmonton, the post-glacial North Saskatchewan River began downcutting in and draining of the Edmonton area, developing its present river valley. The present surface of the Edmonton area has suffered only minor modification between the time of draining of Glacial Lake Edmonton to the present.

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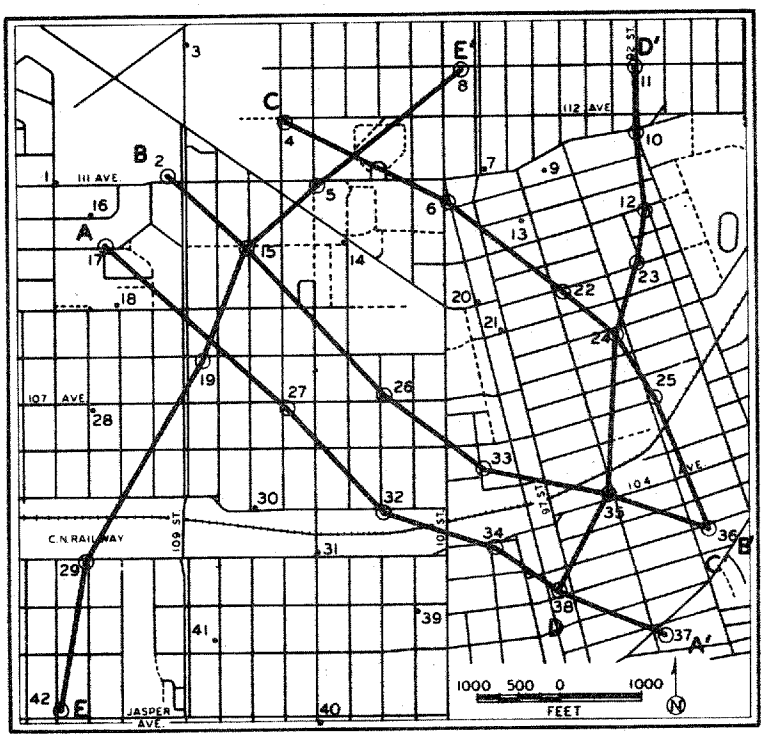

Figure 8. Index map showing locations of drill holes and cross sections.

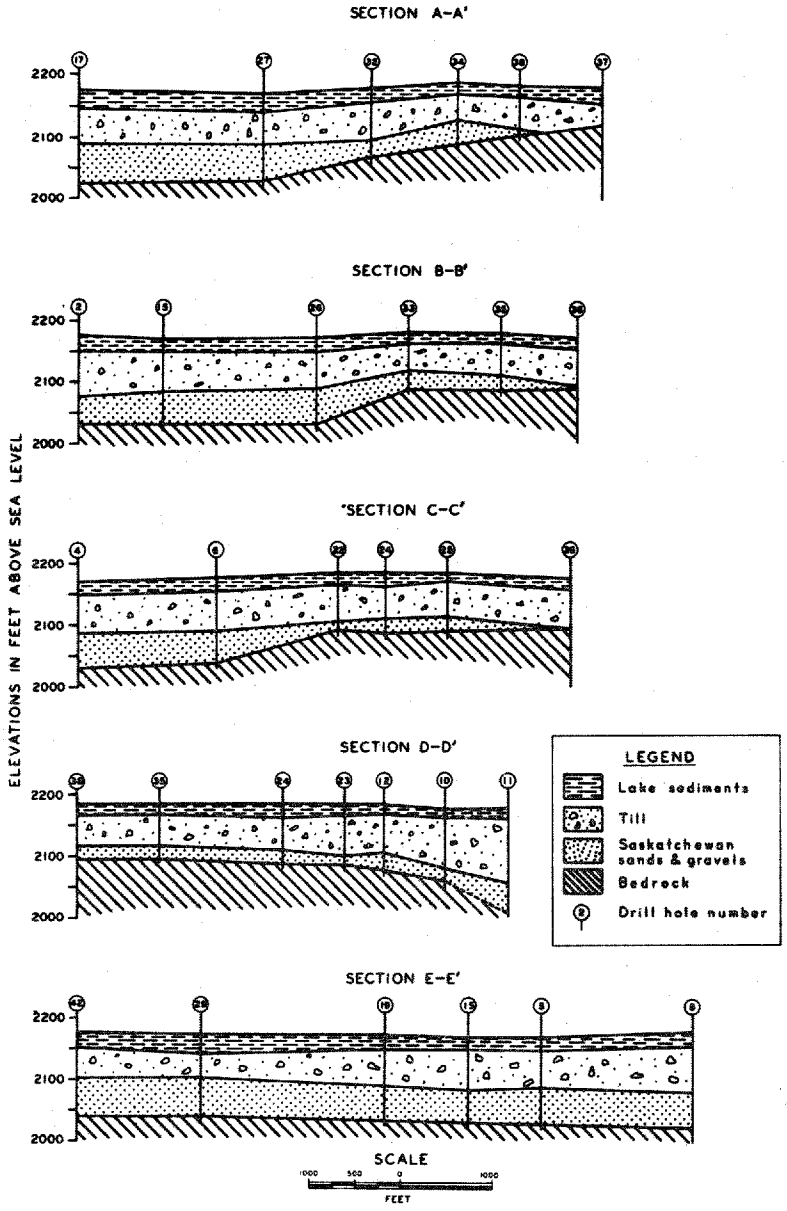

Figure 9. Cross sections of surficial deposits.

APPENDIX: LOGS OF DRILL HOLES

(see Figure 8 for locations)

1

Location:	NE Corner 113 St.-111 Ave.
Elev:	2183 ft.
Total Depth:	144 ft.

Depth (Ft.)	
0-19	Clay, lacustrine
19-97	Till
97-101	Bedrock erratic, sandstone
101-144	Sand, Saskatchewan

2

Location:	North side 111 Ave. between 109-110 St.
Elev:	2175 ft.
Total Depth:	144 ft.

Depth (Ft.)	
0-25	Clay, lacustrine
25-45	Till, grey
45-55	Sand, glacial
55-97	Till, grey
97-140	Sand, Saskatchewan
140-144	Gravel, Saskatchewan

3

Location: SE Corner 109 St.-114 Ave.
Elev: 2180 ft.
Total Depth: 149 ft.

Depth (Ft.)	
0-25	Clay, lacustrine
25-94	Till
94-144	Sand, Saskatchewan
144-149	Gravel, Saskatchewan

4

Location: SE Corner 105 St.-112 Ave.
Elev: 2170 ft.
Total Depth: 143 ft.

Depth (Ft.)	
0-20	Clay, lacustrine
20-82	Till, dense
82-135	Sand, Saskatchewan
135-140	Gravel, Saskatchewan
140-144	Bedrock

5

Location: SE Corner 105 St.-111 Ave.
Elev: 2170 ft.
Total Depth: 139 ft.

Depth (Ft.)	
0-22	Clay, lacustrine
22-30	Till, brown, sandy
30-40	Sand, coarse, brown
40-80	Till, few sand lenses
80-139	Sand, Saskatchewan
139	Gravel, Saskatchewan

6

Location:	NE Corner 101 St.-110A Ave.
Elev:	2176 ft.
Total Depth:	139 ft.

Depth (Ft.)	
0-22	Clay, lacustrine
22-25	Till, brown
25-28	Sand, glacial
28-85	Till
85-90	Sand, glacial
90-126	Sand, Saskatchewan (contact unreliable)
126-138	Gravel, Saskatchewan
138-139	Bedrock

7

Location:	NE Corner 97 St.-111 Ave.
Elev:	2175 ft.
Total Depth:	144 ft.

Depth (Ft.)	
0-19	Clay, lacustrine
19-89	Till, few sand lenses
89-138	Sand and gravel, Saskatchewan
138-144	Bedrock, sandstone (?)

8

Location:	Lane west of 97 St., south side of 113 Ave.
Elev:	2179 ft.
Total Depth:	99 ft.

Depth (Ft.)	
0-23	Clay, lacustrine
23-95	Till, dense
95-99	Sand, Saskatchewan (?)

9

Location:	Lane south of 111 Ave., 60 ft. E of projection of 95A St.
Elev:	2176 ft.
Total Depth:	94 ft.

Depth (Ft.)	
0-19	Clay, lacustrine
19-92	Till
92-94	Sand, Saskatchewan

10

Location:	SW Corner 92 St.-111 Ave.
Elev:	2176 ft.
Total Depth:	119 ft.

Depth (Ft.)	
0-16	Clay, lacustrine, few pebbles
16-97	Till, few thin sand lenses
97-119	Sand, Saskatchewan

11

Location:	SW Corner 92 St.-113 Ave.
Elev:	2176 ft.
Total Depth:	119 ft.

Depth (Ft.)	
0-17	Clay, lacustrine
17-118	Till, sand lenses, wet
118-119	Sand, Saskatchewan (?)

12

Location:	SW Corner 93 St.-109A Ave.
Elev:	2183 ft.
Total Depth:	108 ft.

Depth (Ft.)	
0-16	Clay, lacustrine
16-77	Till, few sand lenses
77-105	Sand and gravel, Saskatchewan
105-108	Bedrock, sandstone

13

Location:	SW Corner 96 St.-110 Ave.
Elev:	2178 ft.
Total Depth:	149 ft.

Depth (Ft.)	
0-20	Clay, lacustrine
20-73	Till, few sand lenses
73-149	Sand, Saskatchewan

14

Location:	W. side 104 St., 125 ft. S of Kingsway
Elev:	2169 ft.
Total Depth:	140 ft.

Depth (Ft.)	
0-20	Clay, lacustrine
20-32	Till, sandy
32-40	Bedrock erratic
40-85	Till, dense
85-129	Sand, Saskatchewan
129-136	Sand and gravel, Saskatchewan
136-140	Bedrock

15

Location:	SW Corner 107 St.-110 Ave.
Elev:	2170 ft.
Total Depth:	124 ft.

Depth (Ft.)	
0-20	Clay, lacustrine
20-85	Till
85-123	Sand, Saskatchewan
123-124	Gravel, Saskatchewan

16

Location:	65 ft. E of 11120-110A Ave., N side 110A Ave.
Elev:	2178 ft.
Total Depth:	144 ft.

Depth (Ft.)	
0-22	Clay, lacustrine
22-81	Till
81-144	Sand and gravel, Saskatchewan

17

Location:	NW Corner 111 St.-109 Ave.
Elev:	2173 ft.
Total Depth:	144 ft.

Depth (Ft.)	
0-28	Clay, lacustrine
28-83	Till
83-139	Sand, Saskatchewan
139-144	Gravel, Saskatchewan

18

Location:	NW Corner 111 St.-109 Ave.
Elev:	2173 ft.
Total Depth:	144 ft.

Depth (Ft.)	
0-22	Clay, lacustrine
22-78	Till
78-138	Sand, Saskatchewan
138-144	Gravel, Saskatchewan

19

Location:	Lane W of 108 St., S side 108A Ave.
Elev:	2173 ft.
Total Depth:	99 ft.

Depth (Ft.)	
0-24	Clay, lacustrine
24-67	Till
67-80	Sand, glacial
80-85	Gravel, Saskatchewan
85-99	Sand, Saskatchewan

20

Location:	NE Corner 99 St.-108A Ave.
Elev:	2179 ft.
Total Depth:	119 ft.

Depth (Ft.)	
0-22	Clay, lacustrine
22-79	Till
79-85	Sand, Saskatchewan
85-88	Gravel, Saskatchewan
88-119	Sand, Saskatchewan
119	Bedrock? small pebbles and coal

21

Location:	NW side 97 St.-108 Ave.
Elev:	2181 ft.
Total Depth:	99 ft.

Depth (Ft.)	
0-19	Clay, lacustrine
19-83	Till
83-89	Sand, Saskatchewan
89-91	Gravel, Saskatchewan
91-99	Sand, Saskatchewan

22

Location:	Lane E of 96 St., S side 108A Ave.
Elev:	2184 ft.
Total Depth:	99 ft.

Depth (Ft.)	
0-20	Clay, lacustrine
20-46	Till
46-49	Sand and gravel, glacial
49-78	Till, few thin gravel lenses
78-91	Sand, Saskatchewan
91-99	Bedrock

23

Location:	NW Corner 93 St.-108A Ave.
Elev:	2183 ft.
Total Depth:	99 ft.

Depth (Ft.)	
0-18	Clay, lacustrine
18-83	Till, with thin sand lenses
83-90	Sand, Saskatchewan
90-97	Sand and gravel, Saskatchewan
97-99	Bedrock?

24

Location: Lane west 95 St., 60 ft. S of 107A Ave.
Elev: 2184 ft.
Total Depth: 104 ft.

Depth (Ft.)	
0-23	Clay, lacustrine
23-80	Till, sand and gravel lenses
80-85	Sand, Saskatchewan
85-95	Sand and gravel, Saskatchewan
95-98	Sand, Saskatchewan (?)
98-104	Bedrock, shale

25

Location: 100 ft. E of 95 St., S side 106 Ave.
Elev: 2183 ft.
Total Depth: 99 ft.

Depth (Ft.)	
0-13	Clay, lacustrine
13-69	Till
69-93	Sand and gravel, Saskatchewan
93-99	Bedrock, shale with coal

26

Location: NE Corner 103 St.-107 Ave.
Elev: 2173 ft.
Total Depth: 143 ft.

Depth (Ft.)	
0-23	Clay, lacustrine
23-82	Till, few sand lenses
82-101	Sand, Saskatchewan
101-104	Gravel, Saskatchewan
104-138	Sand, Saskatchewan
138-140	Gravel, Saskatchewan
140-144	Bedrock, shale

25

27

Location:	SE Corner 106 St.-107 Ave.
Elev:	2169 ft.
Total Depth:	144 ft.

Depth (Ft.)	
0-26	Clay, lacustrine
26-80	Till
80-135	Sand, Saskatchewan
135-139	Gravel, Saskatchewan
139-144	Bedrock, shale

28

Location:	SE Corner 112 St.-107 Ave.
Elev:	2173 ft.
Total Depth:	143 ft.

Depth (Ft.)	
0-25	Clay, lacustrine
25-85	Till, few sand lenses
85-90	Gravel, Saskatchewan
90-136	Sand, Saskatchewan
136-143	Gravel, Saskatchewan, with bedrock intermixed

29

Location:	SW Corner 111 St.-104 Ave.
Elev:	2174 ft.
Total Depth:	138 ft.

Depth (Ft.)	
0-32	Clay, lacustrine
32-70	Till
70-128	Sand, Saskatchewan
128-134	Gravel, Saskatchewan
134-138	Bedrock, shale

26

30

Location:	NE Corner 107 St.-105 Ave.
Elev:	2170 ft.
Total Depth:	144 ft.

Depth (Ft.)	
0-26	Clay, lacustrine
26-78	Till
78-126	Sand, Saskatchewan
126-132	Gravel, Saskatchewan
132-139	Gravel, Saskatchewan, and bedrock, mixed
139-144	Bedrock, shale

31

Location:	NE Corner 105 St.-104 Ave.
Elev:	2179 ft.
Total Depth:	78 ft.

Depth (Ft.)	
0-24	Clay, lacustrine
24-63	Till
63-78	Sand, Saskatchewan Boulder at 78 ft.

32

Location:	SE Corner 103 St.-105 Ave.
Elev:	2178 ft.
Total Depth:	108 ft.

Depth (Ft.)	
0-20	Clay, lacustrine
20-81	Till
81-98	Sand, Saskatchewan
98-108	Bedrock (?)

33

Location: NW Corner 100 St.-105A Ave.
Elev: 2184 ft.
Total Depth: 96 ft.

Depth (Ft.)	
0-18	Clay, lacustrine
18-61	Till
61-93	Sand, Saskatchewan
93-96	Bedrock

34

Location: SE Corner 100 St.-104 Ave.
Elev: 2188 ft.
Total Depth: 109 ft.

Depth (Ft.)	
0-17	Clay, lacustrine
17-58	Till
58-95	Sand, Saskatchewan, few pebbles
95-100	Gravel, Saskatchewan
100-108	Bedrock, shale
108-109	Bedrock, coal

35

Location: NW Corner 96 St.-104 Ave.
Elev: 2183 ft.
Total Depth: 100 ft.

Depth (Ft.)	
0-17	Clay, lacustrine
17-67	Till
67-80	Sand, Saskatchewan
80-88	Gravel, Saskatchewan
88-92	Gravel and bedrock, intermixed
92-95	Bedrock, shale
95-96	Bedrock, coal
96-100	Bedrock, shale (?)

36

Location:	Lane E 95 St., S side 103 Ave.
Elev:	2177 ft.
Total Depth:	94 ft.

Depth (Ft.)	
0-18	Clay, lacustrine
18-79	Till
79-83	Gravel, Saskatchewan
83-84	Bedrock, coal
84-94	Bedrock

37

Location:	Lane E 96 St., 135 ft. S of Jasper Ave.
Elev:	2182 ft.
Total Depth:	67 ft.

Depth (Ft.)	
0-25	Clay, lacustrine
25-60	Till
60-67	Bedrock, coal and shale

38

Location:	Lane W 97 St., N side 102A Ave.
Elev:	2184 ft.
Total Depth:	89 ft.

Depth (Ft.)	
0-17	Clay, lacustrine
17-67	Till
67-79	Sand and gravel, Saskatchewan, dirty
79-89	Bedrock, sandstone

39

Location:	SE Corner 102 St.-103 Ave.
Elev:	2193 ft.
Total Depth:	104 ft.

Depth (Ft.)	
0-18	Clay, lacustrine
18-58	Till
58-92	Sand, Saskatchewan
92-97	Gravel, Saskatchewan
97-104	Bedrock

40

Location:	E side 105 St., 75 ft. S of lane S of Jasper Ave.
Elev:	2192 ft.
Total Depth:	59 ft.

Depth (Ft.)	
0-20	Clay, lacustrine
20-44	Till
44-59	Bedrock, sandstone

41

Location:	180 ft. N of NW Corner 108 St.-102 Ave.
Elev:	2179 ft.
Total Depth:	130 ft.

Depth (Ft.)	
0-19	Clay, lacustrine
19-74	Till
74-130	Sand, Saskatchewan, few stones

42

Location:	NE Corner 113 St.-Jasper Ave.
Elev:	2177 ft.
Total Depth:	139 ft.

Depth (Ft.)	
0-25	Clay, lacustrine
25-73	Till
73-138	Sand, Saskatchewan, few pebbles
138-139	Bedrock, sandstone