GEOLOGY OF THE WARMAN REGION

PHASE 2

by

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Report No. 0013-002

for

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FOREWARD

The regional geological setting of the Warman property was provided by Dr. Alan Lissey of Groundwater Engineering Limited, Edmonton and Dr. E.A. Christiansen of E.A. Christiansen Consulting Limited. The detailed geology of the property was provided by Beak Consultants Limited who is responsible for this report which is based in part on excerpts from the geology provided by the former two firms. With the exception of the Chapter on Regional Geology (3.3.2), Beak Consultants Limited are responsible for the remainder of the contents of this report including the application of the regional geology to the probable environmental impact of the Warman Refinery.

LIMITATIONS

The Saskatchewan Research Council geologic logs are based on cores, cutting samples, and electric logs and are believed to represent the geology at a specific site at the time studied. The other geologic logs are based on cutting samples and electric logs only which makes this information less reliable than the SRC information. The oil and potash company information is in the form of electric logs mainly and was used primarily for identifying the bedrock deposits and the bedrock surface. The contacts between glacial deposits, which were determined in the geologic logs, were projected through the most likely depth in the geophysical logs.

Straight lines drawn between adjacent logs in cross sections are to guide the eye from contacts in one log to another and do not represent the actual contact between geologic units nor do they imply the nature of these units is the same as at the actual sites where the information was obtained.

Curved lines in cross sections represent the available geologic models that best fit the geologic information available at the time the cross sections were drawn. These lines do not necessarily represent the actual contacts between geologic units nor do they necessarily imply that the nature of these units is the same as at the sites where the information was obtained. Similarly, contour lines on the bedrock surface represent the available geologic models that best fit the information available at the time they were drawn. The degree of confidence of such interpretations will depend on the quality and quantity of information, the location of which is shown on the map and cross sections.

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1. INTRODUCTION

1.1 Terms of Reference

On January 17, 1978, the author was commissioned by Beak Consultants Limited to execute Phase 2 of the "Geology of the Warman Region" as proposed in the Phase 1 report (0013-001) of September 15, 1977.

1.2 Objective

The Objective of Phase 2 of the "Geology of the Warman Region" is threefold:

(1) to prepare a map of the geology and bedrock topography of the Warman Region,

(2) to construct 10 cross sections showing the stratigraphy of the bedrock and glacial deposits, and

(3) to show the extent, thickness, and lithology of the Tyner Valley Aquifer.

1.3 Location

The Warman Region extends from 52° to 53° North Latitude and from 105° 15' to 107° 15' West Longitude (Fig. 0013-002-01). This region includes the western 3/8 of the Melfort area (73A) and the eastern 5/8 of the Saskatoon area (73B). The Warman Site is about 13 miles northeast of the city of Saskatoon.

1.4 Previous Work

Geology and groundwater maps were published for the Warman Region by Christiansen (1967) and Meneley (1967). These maps show the geology and bedrock surface topography, cross sections, and groundwater resources.

In the folio on the "Physical environment of Saskatoon", Christiansen (1970) and Meneley (1970) dealt with the geology and groundwater respectively.

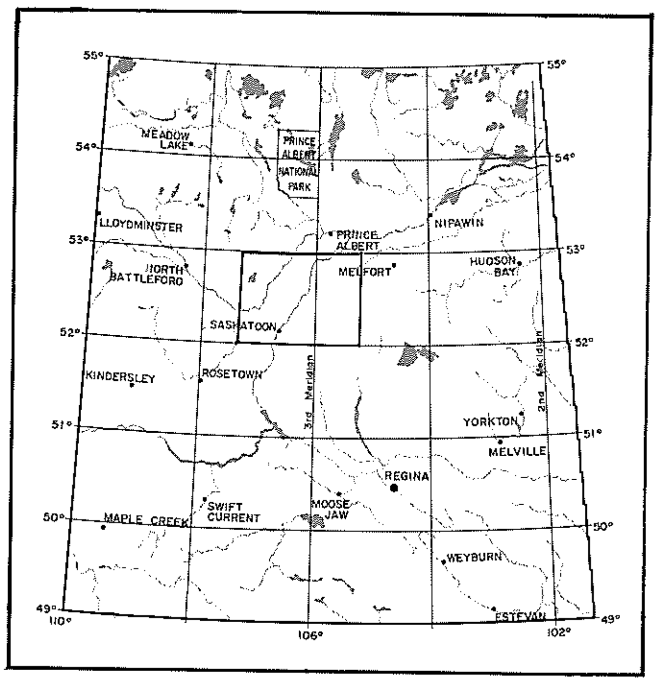

Figure 0013-002-01. Location of Warman Region.

Since 1972, the Warman Region has been studied from time to time by the author and W.A. Meneley, and the results of these studies form part of the information used in this report.

Papers on "Collapse structures near Saskatoon" (Christiansen, 1967) and "Pleistocene stratigraphy of the Saskatoon area" (Christiansen, 1968) formed the basis for the discussion of these subjects. Geological and geophysical logs from the Saskatchewan Research Council (SRC), oil and potash companies, and the Family Farm Improvement Branch (FFIB) provided the subsurface information. Many of the SRC logs included carbonate curves which are important criteria for separating the tills in the Warman Region. In response to a special request, FFIB supplied logs up to and including 1977.

1.5 Present Study

From the geological and geophysical logs mentioned above, a geology and bedrock surface topographic map was prepared (Fig. 0013-002-02). The 10 cross sections (Figs.0013-002-03 to 12) were constructed by taping the matte positive log reductions on the cross section paper which enabled the author to have all of the information before him when making the interpretations. These figures are in the back.

2. BEDROCK STRATIGRAPHY

2.1 Introduction

The bedrock deposits of the Warman Region include: Lea Park Formation and Upper Colorado Group, Judith River Formation, and Bearpaw Formation. In addition to these bedrock deposits, the Lower Colorado and Swan River-Mannville Groups are also shown in cross sections.

2.2 Swan River-Mannville Group

In the Shellbrook map-area immediately north of the Warman Region, the Swan River-Mannville Group is composed of 400 to 650 feet of interbedded sand, silt, and clay, locally with cemented and carbonaceous zones (Christiansen, 1973). The Swan River-Mannville Group is Lower Cretaceous and is known to extend thoughout the Warman Region.

2.3 Lower Colorado Group

The Lower Colorado Group in the Warman Region ranges in thickness from 270 to 340 feet. In the Shellbrook map-area, the sediment is composed of gray, marine, noncalcareous silt and clay. The Lower Colorado Group has a lower electrical resistance than both the underlying Swan River-Mannville Group and the overlying Lea Park Formation and Upper Colorado Group (see resistance log of electric logs in cross sections).

2.4 Lea Park Formation and Upper Colorado Group

Because the Lea Park Formation cannot be differentiated from the Upper Colorado Group on electric logs, they are combined into one unit. The Lea Park Formation and Upper Colorado Group is composed of 300 to 900 feet of gray, marine silt and clay which becomes slightly sandy as the overlying Judith River Formation is approached. The upper part of the unit is noncalcareous, whereas the lower part is marked by the calcareous Second White Speckled Shale which is readily distinguished on electric logs.

2.5 Judith River Formation

The Judith River Formation is composed of 0 to 150 feet of nonmarine, interbedded, fine-grained sand, silt, and clay with carbonaceous and concretionary zones. The Judith River Formation is a deltaic sediment which extended eastward into a late Cretaceous Sea.
The boundary of the Judith River Formation in Figure 0013-002-02 was formed by fluvial and glacial erosion; however, the eastern part

of the Formation is less sandy suggesting the margin of the delta in which the Judith River Formation was deposited did not extend very far eastward of its present erosional boundary.

2.6 Bearpaw Formation

The Bearpaw Formation is composed of 0 to 350 feet of gray, marine, noncalcareous silt and clay. A 40-foot, marine sand occurs about 250 feet above the base of the Formation. The Bearpaw Formation in the Warman Region is preserved only in the collapse areas (Fig. 0013-002-11).

3. BEDROCK SURFACE TOPOGRAPHY

3.1 Introduction

The Bedrock surface in the Warman Region was formed primarly by glacial and fluvial erosion, and, locally, this surface was affected by collapse.

3.2 Glacial Erosion

Glacial erosion was the most important process in shaping the bedrock surface. In nearly all of the boreholes, the weathered, preglacial zone was removed by glacial erosion leaving the unoxidized bedrock directly in contact with the unoxidized, overlying glacial deposits. Glacial erosion has entirely removed the preglacial Tyner and Battleford Valleys northeast of Saskatoon and has widened these preglacial valleys, particularly the Tyner Valley west and north of Saskatoon (Figs. 0013-002-07,10). Cross section EE' (Borehole Sites 67-73) shows a concave-shaped bedrock surface, which is typical of glacial erosion and which, in this case, has greatly widened the Tyner Valley.

Such erosional surfaces have been described by Christiansen and Whitaker (1976). Although the glacier that deposited the till of the Sutherland Group most greatly modified the bedrock surface, the younger glaciers also eroded this surface locally. The Battleford Valley was over-deepened by the glacier or glaciers that deposited the Saskatoon Group (Fig. 0013-002-02). Similarly the glacier that deposited the Battleford Formation eroded the bedrock surface south of Saskatoon (Fig. 0013-003-11).

In as much as glacial erosion has been demonstrated to be such an important erosional process, this model with its upward-facing concave surfaces has been used commonly to draw the bedrock surface or surfaces of sediments on which till was deposited.

3.3 Fluvial Erosion

To a much lesser degree, the bedrock surface of the Warman area was also modified by fluvial erosion, both preglacially and glacially. The Tyner and Battleford Valleys, although modified by glacial erosion, were formed initially by fluvial erosion prior to glaciation. Upstream from Saskatoon, quartzite and chert gravels have been encountered in boreholes in the bottom of these valleys indicating their preglacial age. If such gravels were deposited in the Tyner and Battleford Valleys in the Warman Region, these deposits were subsequently removed by glacial erosion.

Fluvial erosion also took place during glaciation. The Patience Lake Valley (Figs.0013-002-02,06,07) was formed by fluvial erosion between the deposition of tills of the Sutherland and Saskatoon Groups.

3.4 Collapse

Although Christiansen (1967) suggested the bedrock surface in the Saskatoon Low (Fig. 0013-002-02) had been affected by collapse, more recent studies suggest that most of the collapse in the Saskatoon area is restricted to the bedrock and that the "Low" on the bedrock surface was formed, for the most part, by glacial erosion. Further studies, however, are required to determine the origin of this depression on the bedrock surface south of Saskatoon.

Clearly the depressions in the bedrock surface in the Alvena-Cudworth area and the one in the southeast corner of the Warman Region are not caused by collapse because the elevation of the Second White Speckled Shale is not affected under the depressions.

The bedrock surface at Borehole Site 112 (Fig. 0013-002-11) is interpreted as being collapsed because the collapse of the Judith River Formation is the same as the drop of the bedrock surface relative to the adjacent boreholes. In any case, collapse is not believed to be an important process in the formation of the bedrock surface in the Warman Region.

4. GLACIAL STRATIGRAPHY

4.1 Introduction

The glacial deposits of the Warman Region have been divided into the Empress, Sutherland, and Saskatoon Groups (Figs. 0013-002-03 to 12). The Saskatoon Group has been subdivided into the Floral and Battleford Formations and Surficial Stratified Drift. Where the glacial deposits cannot be separated into the above units, they are shown as drift, undifferentiated.

4.2 Empress Group

The Empress Group, which was named by Whitaker and Christiansen (1972), is composed of 0 to 426 feet of sand and gravel with a few till, silt, and clay interbeds lying between bedrock and till. Although by definition the Empress Group may include both preglacial and glacial deposits, only glacial sediments were encountered in the

Empress Group of the Warman Region. The Group forms the major aquifers of the Region, and the Tyner Valley Aquifer (Meneley, 1970) is a major one of these (Figs. 0013-002-06,07,10).

4.3 Sutherland Group

The Sutherland Group is composed of 0 to 460 feet of till and minor amounts of stratified sediment. The tills of the Sutherland Group are less calcareous and have a lower electrical resistance than the tills of the Saskatoon Group (see electrical logs and carbonate curves plotted on the electric logs in the cross sections). Where the weathered zone on top of the Sutherland Group was not removed by erosion, the unit is represented by a unique olive gray color with yellowish brown staining, the upper part of which is commonly deminished of carbonates (Fig. 0013-002-06, Borehole Site 46).

4.4 Saskatoon Group

4.4.1 Introduction

The Saskatoon Group in the Warman Region was subdivided locally into the Floral and Battleford Formations and Surficial Stratified Drift. Over much of the Region, however, the Group was not subdivided.

4.4.2 Floral Formation

The Floral Formation ranges in thickness from 0 to 150 feet thick where it is identified in Figure 0013-002-11. In the Warman Region, the Floral Formation is composed of till and sands and gravels. Most of these sands and gravels occur in the Dalmeny and Forestry Farm Aquifers which are shown on cross sections DD', EE', GG', and HH' (Figs. 0013-002-06,07,09,10). The upper part of the till of the Floral Formation is commonly weathered to a yellowish brown color with iron oxide staining on well-developed joint surfaces.

4.4.3 Battleford Formation

The Battleford Formation ranges in thickness from 10 to 310 feet in cross section II' (Fig. 0013-002-11). The Formation is composed mainly of a soft, unjointed, unstained till. Over much of the Warman Region, particularly the Saskatoon River lowland, the Battleford Formation is too thin to be shown in the cross sections.

4.4.4 Surficial Stratified Drift

The Surficial Stratified Drift ranges in thickness from 0 to 320 feet and is composed of deltaic and lacustrine sands, silts, and clays. In boreholes, the sediments become finer textured with depth. Over much of the Saskatchewan Rivers lowland, the Surficial Stratified Drift is too thin to be shown in the cross sections.

5. GEOLOGICAL PROCESSES

5.1 Introduction

Glacial thrusting and collapse are the main processes that have affected the structure of the bedrock and glacial deposits. The bedrock deposits have been affected primarily by collapse, whereas the drift was affected mainly by glacial thrusting.

5.2 Glacial Thrusting

Glacial thrusting was one of the most important processes operative during glacial time. Glacial thrusting occurred near the glacier margin where material was eroded from the ice-thrust depression and carried upward along diverging flowlines (Fig. 0013-002-13) to form a repetition of beds by overthrusting. Christiansen and Whitaker (1976) demonstrated that the depression east of Tyner, Saskatchewan (Fig. 0013-002-14) is an ice-thrust depression. They further showed that the

Figure 0013-002-13. Schematic diagram showing the process of glacial thrusting. From Clayton and Moran (1974).

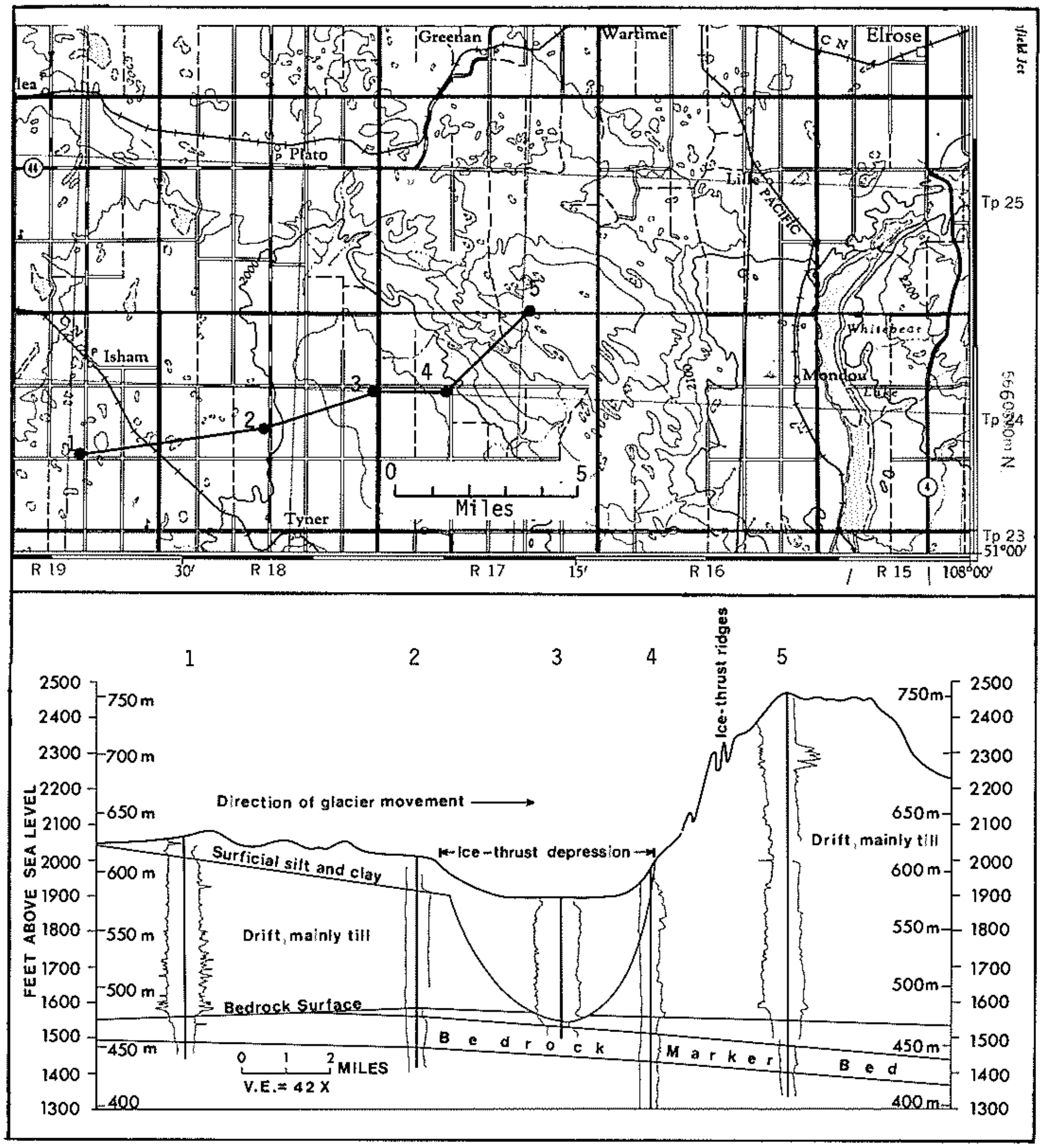

Figure 0013-002-14. Omission of beds in the ice-thrust depression east of Tyner, Saskatchewan. From Christiansen and Whitaker (1976).

Dirt Hills Moraine is composed of a stack of drift and bedrock formed by glacial thrusting (Fig. 0013-002-15).

The glacial thrusting model was used to explain the shape of the bedrock surface and the structure of the glacial deposits. Figure 0013-002-13 shows the origin of upward-facing concave surfaces which form the contact between most of the units in the cross sections of the Warman Region. The closed depression on the bedrock surface in the Warman Region are interpreted as ice-thrust depressions. The large hill east of Redberry Lake is interpreted as an ice-thrust moraine similar to the Dirt Hills Moraine (Fig. 0013-002-15).

5.3 Collapse

Christiansen (1967) showed that bedrock deposits in the Saskatoon Low were collapsed and suggested that the depression on the bedrock surface south of Saskatoon (Saskatoon Low) is a collapsed feature. Christiansen (1971) also demonstrated that Crater Lake lies in a collapse depression which formed about 13,600 years ago, and Gendzwill and Hajnal (1971) showed that the collapse was caused by removal of salt from Devonian, Elk Point, Prairie Evaporite Formation (Fig. 0013-002-16).

Although the bedrock deposits in the Warman Region are known to be collapsed in numerous localities, it is now thought that most of the depressions in the bedrock and till surfaces are ice-thrust depressions rather than collapse features. The presence of an older till of the Sutherland Group (Lower Till) over an area of collapsed bedrock (Christiansen, 1970, p.8) suggests that collapse took place here prior to or during the deposition of this till.

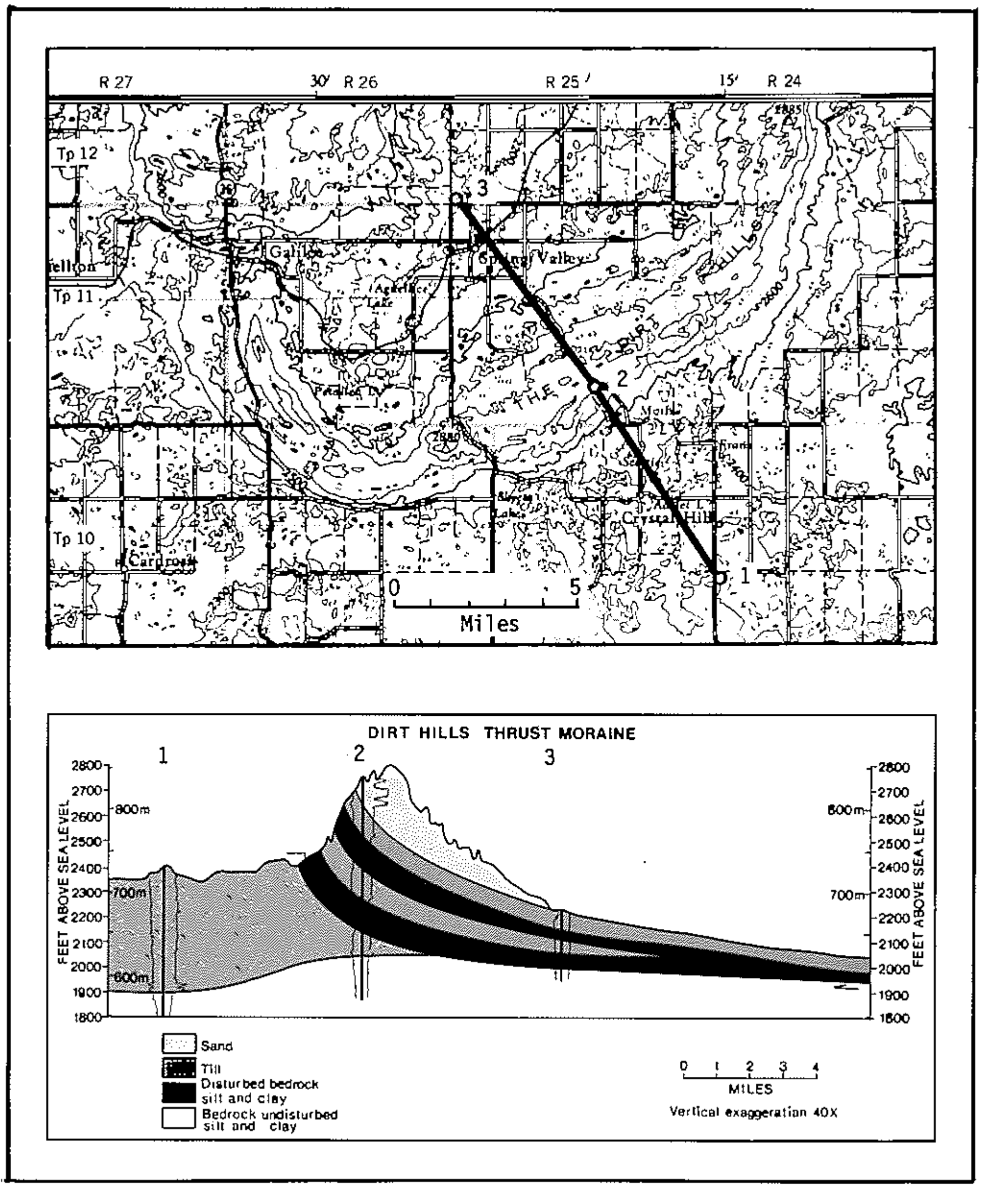

Figure 0013-002-15. Repetition of drift and bedrock by glacial thrusting in the Dirt Hills Moraine, 30 miles south of Moose Jaw, Saskatchewan. From Christiansen and Whitaker (1976).

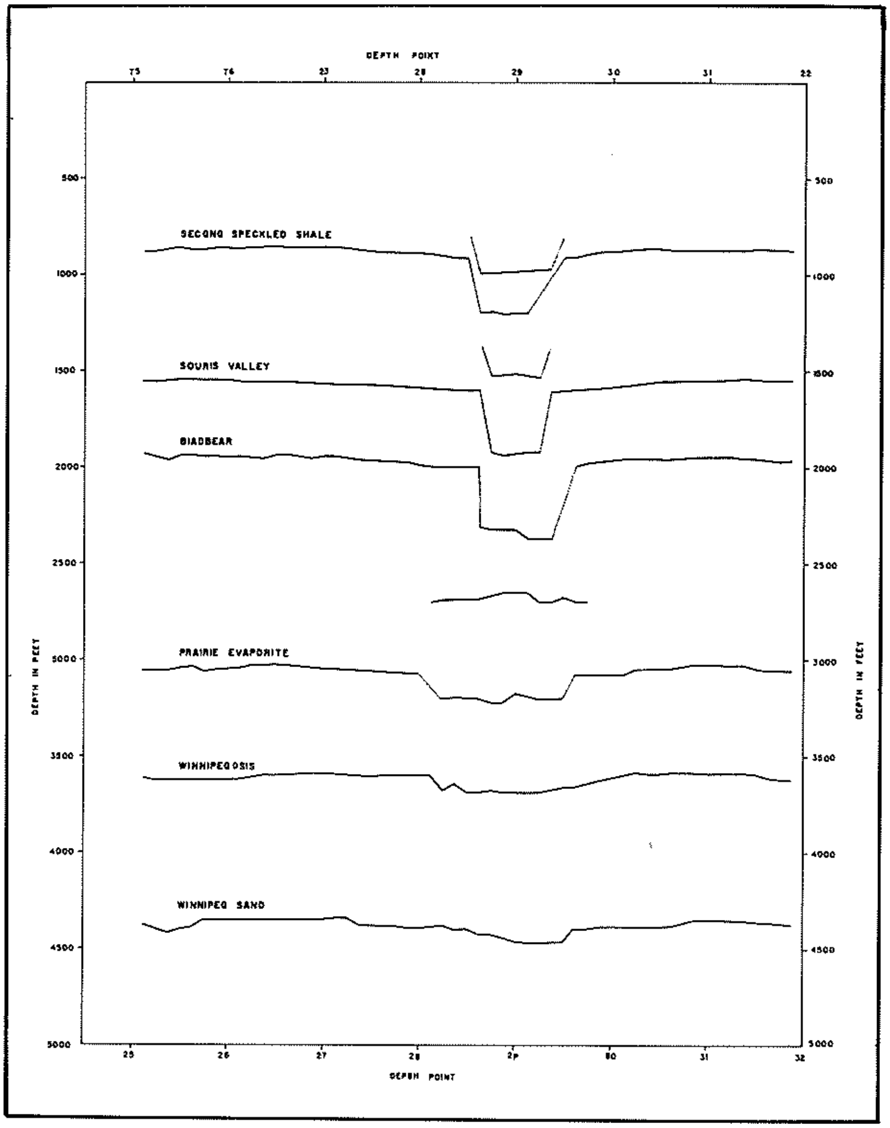

Figure 0013-002-16. Seismic cross section showing that the Crater Lake structure is the result of removal of salt from the Devonian Prairie Evaporite Formation. From Gendzwill and Hajnal (1971).

6. GROUNDWATER OCCURRENCE

In the Warman Region, groundwater occurs in the Swan River-Mannville, Tyner Valley, Dalmeny-Forestry Farm, and Surficial Stratified Drift Aquifers. These aquifers are shown in the cross sections and the extent of the Tyner Valley Aquifer is shown on the map (0013-002-02). The Swan River-Mannville Group is considered too saline for human consumption, but the remainder are used as sources of potable water. The Tyner Valley and Dalmeny Aquifers are the most extensive and productive and supply most of the water for the Saskatoon milk shed. For further information on these two aquifers see Meneley (1970).

7. ENVIRONMENTAL CONSIDERATION

7.1 Introduction

In considering Warman as a radioacitve disposal site, the following factors should be considered: (1) Tyner Valley Aquifer, (2) the discontinuity in the Sutherland Group between the Warman Site and the South Saskatchewan River, and (3) collapse structures.

7.2 Tyner Valley Aquifer

The Warman Site overlies the Tyner Valley Aquifer which, according to Meneley (1970, p. 46), ... "is the most extensive and, potentially, the most productive aquifer system in the Saskatoon area". The Tyner Valley Aquifer extends from east of the South Saskatchewan River westward and southwestward up the preglacial Battleford and Tyner Valleys (Fig.0013-002-02).

Borholes at Borehole Sites 3 and 65 (Figs. 0013-002-02) and boreholes near Battleford and Denholm in the North Saskatchewan River alluvium suggest that the valley, where the North Saskatchewan River crosses the Battleford Valley, is filled with more than 100 feet of sand. This alluvial sand would provide hydraulic continuity between the

Tyner Valley Aquifer and the North Saskatchewan River. Such continuity would provide an accessible outlet for the groundwater which Meneley (1970, p. 45) indicated is flowing to the North Saskatchewan River. As a consequence of the hydraulic continuity within the Tyner Valley Aquifer (Fig. 0013-002-06) and between it and the North Saskatchewan River through the alluvial fill, radioactive contaminators that reach the Tyner Valley Aquifer will eventually appear in the North Saskatchewan River.

7.3 Discontinuity in Sutherland Group

Between 112 and 116 feet,clayey gravel was encountered in a testhole at Borehole Site 49 (Fig. 0013-002-06). This discontinuity is apparent on the electric log and can be traced from the Warman Site westward to Borehole Site 48 and eastward to Borehole Site 51, east of the South Saskatchewan River. This bed probably intersects the valley walls of the South Saskatchewan River and, presumably, would be the path of least resistance for groundwater percolating through the Sutherland Group. Further studies of this discontinuity in the Sutherland Group are required.

7.4 Collapse Structures

The study of the Crater Lake collapse structure by Christiansen (1971) and Gendzwill and Hajnal (1971) has shown that this collapse structure formed about 13,600 years ago as a result of the dissolution of salt in the Prairie Evaporite Formation. Figure 0013-002-11 shows that collapse has affected the bedrock deposits in the Saskatoon area, and Christiansen (1970, p. 8) has shown that the Lower Till of the Sutherland Group lies in a collapsed depression. Figure 0013-002-12 shows that the Warman Site overlies about 500 feet of salt of the Elk Point Group. Because of the durability of radioactive wastes, the problem of salt collapse should be considered in any environmental impact assessment.

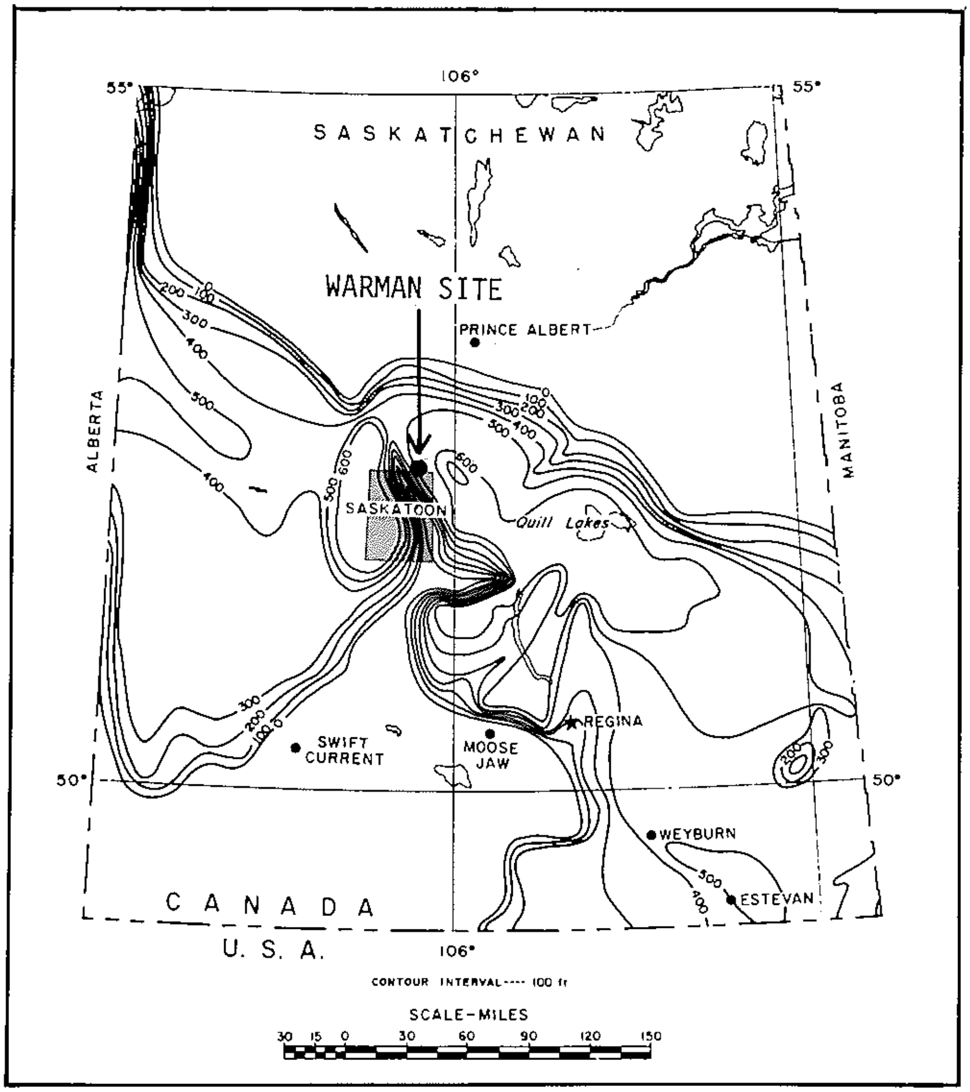

Figure 0013-002-17. Thickness of salt in the Devonian Elk Point Group. From Pearson (1963).

8. LITERATURE CITED

Christiansen, E.A. 1967. Geology and groundwater resources of the Saskatoon area (73B), Saskatchewan. Sask.Res. Counc., Geol. Div., Map 7.

Christiansen, E.A. 1967. Collapse structures near Saskatoon, Saskatchewan, Canada. Can. Jour. Earth Sci., v.4, p. 757-767.

Christiansen, E.A. 1968. Pleistocene stratigraphy of the Saskatoon area, Saskatchewan, Canada. Can. Jour. Earth Sci., v. 5, 1167-1173.

Christiansen, E.A. 1970. Geology. In Physical environment of Saskatoon, Canada. Edited by E.A. Christiansen. Nat. Res. Counc., Ottawa, Pub. 11378, p. 3-17

Christiansen, E.A. 1971. Geology of the Crater Lake collapse structure in southeastern Saskatchewan. Can. Jour. Earth Sci., v. 8, p.1505-1513.

Christiansen, E.A. 1973. Geology and groundwater resources of the Shellbrook area (73G), Saskatchewan. Sask. Res. Counc., Geol. Div., Map 17.

Christiansen, E.A. and Whitaker, S.H. 1976. Glacial thrusting of drift and bedrock. In Glacial till. Edited by R.F. Legget. Roy. Soc. Canada, Spec. Pub. 12, p. 121-130.

Clayton, L. and Moran, S.R. 1974. A glacial process-form model. In Glacial geomorphology, D.R. Coates (Ed.), Pub. in Geomorph., State Univ. New York, Binghamton, N.Y.

Gendzwill, D.J. and Hajnal, Z. 1971. Seismic investigation of the Crater Lake structure in southeastern Saskatchewan. Can. Jour. Earth Sci., v. 8, p.1514-1524.

Meneley, W.A. 1967. Geology and groundwater resources in the Melfort area (73A), Saskatchewan. Sask. Res. Counc., Geol. Div., Map 6.

Meneley, W.A. 1970. Groundwater resources. In Physical environment of Saskatoon, Canada. Edited by E.A. Christiansen. Nat. Res. Counc., Ottawa, Pub. 11378, p. 39-50.

Pearson, W.J. 1963. Salt deposits of Canada. N. Ohio Geol. Soc. Symposium on Salt, p. 196-239.

Whitaker, S.H. and Christiansen, E.A. 1972. The Empress Group in southern Saskatchewan. Can. Jour. Earth Sci., v. 4, p. 353-360.

APPENDIX 1. NAME AND LOCATION OF BOREHOLES

Borehole Site No.	Name	Location
1	EPD Leask	NE9-22-46-6-W3
2	SRC Wandsworth	SE1-26-45-5-W3
3	DTRR Fort Carlton	NW 9-45-4-W3
4	SRC Carlton	NE16-36-44-4-W3
5	SRC Duck Lake	SW2-8-44-2-W3
6	SRC Duck Lake	NE16-4-44-2-W3
7	SRC Batoche	SW3-4-44-1-W3
8	Grey Owl #1	16-10-44-27-W2
9	SRC Domremy	SE8-6-44-26-W2
10	Britalta Pelican Lake #1	2-2-44-26-W2
11	SRC Lepine	SW1-27-42-25-W2
12	SRC Basin Lake	SW2-26-42-24-W2
13	SRC Hazel Lake	NE14-29-42-23-W2
14	SRC Paddling Lake	SE1-5-46-7-W3
15	SRC Marcelin	SE1-28-45-6-W3
16	CDR Carlton	13-23-44-5-W3
17	EPD Laird	SW14-44-5-W3
18	EPD Laird	2-28-43-4-W3
19	Calstan Laird # 16-16	16-16-43-4-W3
20	EPD Rosthern	NW5-7-43A-3-W3
21	SRC Rosthern	SW4-1-43A-3-W3
22	SRC Gabriel Ferry	NW5-18-42-1-W3
23	SRC Alvena	SE1-15-42A-1-W3
24	Britalta Carpenter # 1	5-30-41-27-W2
25	FFIB Cudworth	12-4-41-26-W2
26	SRC Pilger	NW13-36-39-24-W2
27	SRC Oscar Lake	NW16-11-45-9-W3
28	SRC Krydor	NW12-10-44-8-W3
29	Pheas Banff Tallman	12-2-44-7-W3
30	EPD Blaine Lake	SW1-25-43-7-W3
31	Britalta Waldheim # 1	2-20-42-5-W3

Borehole Site No.	Name	Location
32	Britalta Rosthern # 1	13-36-41-4-W3
33	SRC Hague Ferry	SE1-12-41-3-W3
34	Britalta Hague # 1	9-6-41-2-W3
35	SRC Hague Ferry	SE7-5-41-2-W3
36	SRC Smuts	NE16-23-40-2-W3
37	Britalta Smuts # 1	16-10-40-1-W3
38	FFIB Smuts	16-3-40-1-W3
39	SRC Buffer Lake	NE8-33-39-28-W3
40	Shell Prud'homme	16-6-39-27-W2
41	EPD Prud'homme	3-8-39-27-W2
42	Kennco Prud'homme	3-27-38-27-W2
43	SRC Bruno	SE14-9-38-25-W2
44	BA Carmel Pappenfoot	5-11-37-24-W2
45	EPD Borden	15-25-41-9-W3
46	SRC Langham	SE9-26-40-7-W3
47	SRC Warman	NE13-9-39-5-W3
48	Warman	13-6-39-4-W3
49	AEC Warman	16-28-38-4-W3
50	FFIB Aberdeen	14-36-38-4-W3
51	NRC Clarkboro	NE16-32-38-3-W3
52	SRC Porter Lake	SE1-1-38-3-W3
53	Atl-Rich St. Denis	4-2-38-2-W3
54	SRC Vonda	SW4-23-37-1-W3
55	SRC Prud'homme	NW12-7-37-28-W2
56	IMP South Bend	1-4-37-28-W2
57	Can Oil Trojan #16-36	16-36-36-28-W2
58	IMP Meacham	16-32-36-27-W2
59	SRC Meacham	SW4-30-36-26-W2
60	IMP Saxby	4-19-36-26-W2
61	Dafoe Wolverine	1-35-35-25-W2
62	SRC Rutan	NE13-24-35-25-W2
63	Dafove Wolverine	13-24-35-25-W2
64	Prairie Inter Rock #4-36	4-36-39-9-W3
65	DTRR Borden Bridge	SE13-19-34-8-W3
66	Sohio # 1	1-22-39-8-W3

Borehole Site No.	Name	Location
67	NRC Langham	SE15-33-38-7-W3
68	Cominco Dalmeny	SE3-30-38-6-W3
69	Cominco Dalmeny	SW12-21-38-6-W3
70	Cominco Dalmeny	SE9-15-38-6-W3
71	Cominco Dalmeny	SW4-18-38-5-W3
72	DWD Clarks Crossing	NE1-5-38-5-W3
73	Mitchell Saskatoon	SW2-27-37-5-W3
74	ICL Rochdale #4-26	4-26-37-5-W3
75	EPD Sutherland	1-24-37-5-W3
76	SRC Sutherland	SE2-17-37-4-W3
77	Heinze Floral	NE15-36-36-4-W3
78	Midas STH #5	NW13-31-36-3-W3
79	Midas STH #9	SE1-29-36-3-W3
80	Midas STH #21	NW13-24-36-3-W3
81	FFIB Saskatoon	7-18-36-2-W3
82	SRC Blucher	NW5-34-35-2-W3
83	PCA Saskatoon	5-34-35-2-W3
84	SRC Blucher	SW4-27-35-2-W3
85	FFIB Krydor	13-2-43-8-W3
86	SRC Redberry Lake	SE4-18-43-7-W3
87	SRC Tallman	NW13-22-43-7-W3
88	FFIB Asquith	14-18-37-9-W3
89	NPC Asquith #13-14	13-14-37-9-W3
90	SRC Dunfermline	NW13-35-37-8-W3
91	Sohio #2	7-22-39-7-W3
92	SRC Langham	SE16-14-40-7-W3
93	SRC Langham	NW13-36-40-7-W3
94	SRC Hepburn	NE16-24-41-7-W3
95	Cominco Vanscoy	NW5-17-35-7-W3
96	Cominco Vanscoy	NW13-33-35-7-W3
97	Midas STH #40	SW4-11-36-7-W3
98	Midas STH #24	NW13-18-36-6-W3
99	Midas STH #44	NE16-20-36-6-W3
100	SRC Cory	NE16-27-36-6-W3
101	Midas STH #34	SE1-12-37-6-W3

Borehole Site No.	Name	Location
102	SRC Saskatoon	NW15-17-37-5-W3
103	PDL Clarkboro	NW15-9-38-4-W3
104	Winsal Osler #3-28	3-28-39-4-W3
105	SRC Neuanlage	NE13-13-40-4-W3
106	SRC Duck Lake #3	SE1-33-45-2-W3
107	Britalta Macdowell #1	2-1-46-28-W2
108	U of S Grasswood	NW16-18-35-5-W3
109	SRC Grasswood	SW4-26-35-5-W3
110	Midas STH #3	SW4-6-36-4-W3
111	SRC Floral	NE16-10-36-4-W3
112	Midas STH #6	NW13-23-36-4-W3
113	PCA Saskatoon #3	16-26-36-4-W3
114	SRC Strawberry Hills	NE9-18-37-3-W3
115	Midas STH #31	SW4-28-37-3-W3
116	Saskatoon Aberdeen #1	9-6-39-2-W3
117	FFIB Alvena	14-27-40-1-W3
118	FFIB Alvena	9-11-41-1-W3
119	SRC Hoey	NE16-7-45-26-W2
120	Okalta Hagen #13-34	13-34-45-25-W2
121	SRC Birch Hills	NW13-19-46-23-W2
122	SRC Prud'homme (SPC#9)	SE2-14-38-28-W2
123	SRC Muskiki Lake	NE8-16-39-26-W2
124	Pheas Shell Bremen	4-29-39-26-W2
125	Calstan Gulf Leofnard	13-3-42-26-W2
126	SRC Tway	SW12-11-44-24-W2
127	SRC Crystal Springs	NE12-29-44-23-W2
128	FFIB Osler	NW13-34-39-4-W3