

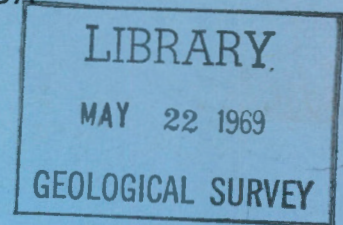
mc82
.8c21t
135
e.2

No. 135

CANADA
DEPARTMENT OF ENERGY, MINES AND RESOURCES

GEOLOGICAL SURVEY OF CANADA

TOPICAL REPORT NO. 135

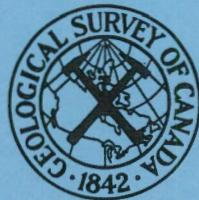


BEDROCK CONDITIONS AT PROPOSED DAM
SITES INVESTIGATED BY INLAND WATERS
BRANCH IN NORTHWEST ONTARIO IN 1968

includes

- Lastcedar dam site (87°20', 53°07')
- Pym dam site (86°16', 52°18')
- Stockman dam site (87°04', 52°58')
- Manson Channel (87°12', 52°51')

E. B. OWEN



OTTAWA

1969

This document was produced
by scanning the original publication.

Ce document est le produit d'une
numérisation par balayage
de la publication originale.

NOT TO BE QUOTED AS A PUBLICATION
FOR DEPARTMENTAL USE

CANADA

DEPARTMENT OF ENERGY, MINES AND RESOURCES

GEOLOGICAL SURVEY OF CANADA
TOPICAL REPORT NO. 135

BEDROCK CONDITIONS AT PROPOSED DAM SITES
INVESTIGATED BY INLAND WATERS BRANCH IN
NORTHWEST ONTARIO IN 1968

includes

Lastcedar dam site (87° 20', 53° 07')

Pym dam site (86° 16', 52° 18')

Stockman dam site (87° 04', 52° 58')

Manson Channel (87° 12', 52° 51')

by

E. B. Owen

OTTAWA

1969

CONTENTS

	Page
Introduction	1
Lastcedar dam site	3
General Description	3
Description of bedrock cores from holes Nos. LR-1 to LR-4 ..	4
Pym dam site	9
General description	9
Description of bedrock cores from holes Nos. PY-1, PY-2 and PY-4	10
Stockman dam site	16
General Description	16
Description of bedrock cores from holes Nos. ST-1 and ST-2..	17
Manson Channel	19
General Description	19
Description of bedrock cores from hole No. MA-2	20

Illustrations

1. Map showing location of drill holes at Lastcedar dam site	21
2. Map showing location of drill holes at Pym dam site	22
3. Map showing location of drill holes at Stockman dam site	23
4. Map showing location of drill holes at Manson Channel	24

INTRODUCTION

This report was prepared at the request of Inland Waters Branch, Department of Energy, Mines and Resources. It contains descriptions of bedrock cores from test borings put down in 1968 by the Branch at 3 proposed dam sites and a channel project (Manson Channel) in Northwest Ontario. Included also is a brief summary of bedrock conditions at each boring and, as well, general descriptions of bedrock at each site. The latter were based entirely upon the examination of the cores. Bedrock was not examined in the field.

With the exception of the upper parts of bedrock encountered at Pym dam site all the cores examined consisted of Precambrian rocks. At Pym site from 8 to 24.5 feet of incompetent Paleozoic sedimentary rocks overlie the Precambrian. These cores as well as those from Paleozoic rocks underlying 4 proposed dam sites on Albany River are stored with the Geological Survey of Canada, 601 Booth St., Ottawa and can be examined at any time. The Paleozoic cores from the 4 Albany River dam sites were also obtained in 1968. They are described in Topical Report No. 133.

The purpose of this report is to interpret bedrock conditions at the proposed dam and channel sites as indicated by the cores in such a manner as to provide the design engineer with material assistance in such matters as foundation treatment, excavation methods, stability of slopes, cut-off and grouting treatment and foundation drainage. To this end whenever it was possible the thickness of weathered, broken surface rock which would have to

be excavated to expose fresh, solid bedrock against which concrete or soil could be placed has been indicated in the core descriptions. The occurrence of structures in bedrock such as jointing, bedding or faulting have also been indicated. Such structures exert considerable control on the stability of bedrock, on the permeability of the rock mass, on the manner in which the rock breaks when excavated and the size and shape of the resultant rock fragments. The approximate dip of these structures and of the gneissosity can be obtained from the core. However the direction of dip and their strike can only be obtained by an examination of bedrock outcrops adjacent to the proposed site. From the viewpoint of slope stability the attitudes of these structures are important. Any structures in bedrock along which appreciable quantities of water may have moved have been noted. These were determined chiefly by the presence of solution cavities which in some instances may have been refilled by secondary deposition or by coatings of carbonates along the walls of the fracture and on fragments of rock in the fracture zone.

Dr. H.H. Bostock, Geological Survey of Canada, assisted in the examination of the Precambrian cores. Three of the proposed sites (Manson Channel, Pym and Stockman) are located in areas where the bedrock geology has been mapped by Dr. Bostock (Map No. 4-1962, Lansdowne House, Ontario; Geol. Surv. Can.).

Lastcedar Dam Site

General Description

Lastcedar dam site is situated on Winisk River near the outlet of Winisk Lake. It is included on National Topographic sheet No. 43E (Winiskisis Channel) and on aerial photograph A. 14073-62 of the Department of Energy, Mines and Resources.

Four test borings were put down by Inland Waters Branch at this dam site. Two of the holes were located close to the edges of the River and the other two in the abutment areas. Bedrock was encountered at depths ranging from 7 to 43 feet. The thickest overburden was in the left abutment area.

About 70 percent of the core recovered in the four test borings consisted of granodiorite. The remainder included gneiss (22 percent) with lesser quantities of quartz monzonite and pegmatite.

The relative shallow thickness of overburden indicates the dam structures would be founded on bedrock. The rocks at the proposed dam site are competent and should provide satisfactory foundation material. There is very little weathering present either at bedrock surface or at depth along open joint fractures. Consequently, except for loose fragments, it will not be necessary to remove any surface rock before concrete can be placed.

In all four test borings there was some indication of perculating groundwater along open joint fractures, usually within 25 feet of bedrock surface. The dips of the joint planes are irregular. They are not closely spaced and it is believed they could be sealed by grouting.

Lastcedar Dam Site

Hole No. LR-1

Elevation ground surface: 649.0
Elevation bedrock surface: 642.0
Elevation bottom of hole: 609.0

<u>Depth (feet)</u>	<u>Description</u>
0.0 - 7.0	Overburden
7.0 - 29.7	Granodiorite: fine- to medium-grained, light grey to grey, gneissic, gneissosity dips 10 to 30 degrees, longest core is 13 inches, 2 feet of lost core chiefly in the upper 8 feet.
29.7 - 31.8	Diorite: fine-grained, grey, massive, quartz, biotite, hornblende, longest core is 2 inches, 5 inches lost core.
31.8 - 38.5	Granodiorite: as 7.0-29.7, longest core is 5 inches, no lost core.
38.5 - 39.8	Diorite: as 29.7-31.8, longest core is 5 inches, no lost core.
39.8 - 40.0	Granodiorite: as 7.0-29.7.
40.0	Bottom of hole.

Note:

Bedrock consists of granodiorite and quartz diorite; it is competent throughout with no weathered surface rock; there are indications of ground-water movement along 45 to 60 degree dipping, open, joint fractures in the upper 23 feet of bedrock.

Lastcedar Dam Site

Hole No. LR-2

Elevation ground surface: 665.0
Elevation bedrock surface: 621.9
Elevation bottom of hole: 594.7

<u>Depth (feet)</u>	<u>Description</u>
0.0 - 43.1	Overburden
43.1 - 54.4	Granodiorite: fine- to medium-grained, grey, longest core is 3 inches, 6 inches lost core.
54.4 - 55.7	Monzonite: medium-grained, pink, quartz with pegmatitic segregations, longest core is 3 inches, no lost core.
55.7 - 58.7	Granodiorite: as 43.1-54.4, longest core is 5 inches, no lost core.
58.7 - 59.6	Pegmatite: pink, brecciated with closed fractures, two open fractures lined with hematite, chlorite and calcite.
59.6 - 64.0	Gneiss: medium-grained, pinkish-white to grey, granodioritic, indistinct banding, a minute fracture lined with chlorite and minor calcite at 63.9, longest core is 7 inches, no lost core.
64.0 - 64.7	Monzonite: medium-grained, pink, quartz, chlorite with pyrite along a fracture at the upper contact.
64.7 - 65.4	Granodiorite: fine- to medium-grained, grey to medium grey, with variable biotite contact.

Hole No. LR-2 (cont'd)

65.4 - 70.3

Granodiorite: fine- to medium-grained, grey-white to pink, biotite, gradational to medium-grained quartz monzonite, minor indistinct foliation, open fractures at 68.7 dip 60 degrees and at 69.8 dip 90 degrees, hematite and calcite are present along fractures and the surrounding rock is slightly leached, longest core is 9 inches, 6 inches lost core.

70.3

Bottom of hole.

Note:

Bedrock is competent throughout with no weathered surface rock; there are indications of groundwater movement along open joint fractures throughout all the core recovered; dips of fractures vary from 45 to 90 degrees; grouting will be necessary to seal this rock.

Lastcedar Dam Site

Hole No. LR-3

Elevation ground surface: 651.0
Elevation bedrock surface: 637.0
Elevation bottom of hole: 606.0

<u>Depth (feet)</u>	<u>Description</u>
0.0 - 13.9	Overburden
13.9 - 23.1	Gneiss: fine-grained, grey to pink, biotite, quartz, feldspar, gneissosity dips at 20 degrees, longest core is 17 inches, no lost core.
23.1 - 23.6	Granodiorite: fine- to medium-grained, grey, a 5-inch band parallel to gneissosity, no lost core.
23.6 - 39.4	Gneiss: as 13.9 - 23.1, longest core is 17", no lost core.
39.4 - 45.0	Gneiss: medium-grained, grey-green, biotite, hornblende, quartz, dioritic, contains pinkish-white granitic bands and segregations dipping 20 degrees, longest core is 4 inches, no lost core.
45.0	Bottom of hole.

Note:

Bedrock consists of fresh, competent gneiss; excellent core recovery; small open fractures with indications of percolating groundwater at 18.0 feet (dipping 45 to 70 degrees), at 28 feet (dipping 70 degrees) and at 44.5 feet (dipping 70 degrees).

Lastcedar Dam Site

Hole No. LR-4

Elevation ground surface: 665.0
Elevation bedrock surface: 640.3
Elevation bottom of hole: 613.0

<u>Depth (feet)</u>	<u>Description</u>
0.0 - 24.7	Overburden
24.7 - 25.2	Gneiss: medium-grained, grey, hornblende, biotite, gneissosity dips at 20 degrees (BX).
25.2 - 27.4	Granodiorite: medium-grained, grey, biotite, minor steeply dipping foliation, longest core is 4 inches, no lost core (BX).
27.4 - 28.5	Pegmatite: pink, a 5-inch wide dyke dipping at 70 degrees.
28.5 - 52.0	Granodiorite: fine- to medium-grained, grey to pinkish-white, minor foliation, a few small scattered irregular pegmatitic segregations, longest core is 12 inches, 18 inches of lost core.
52.0	Bottom of hole.

Note:

Bedrock encountered in this hole consists chiefly of granodiorite; it is a competent rock with no surface weathering; the permeability of the rock mass is low; indications of perculating groundwater was noted only in one small fracture at 47.0.

Pym Dam Site
General Description

Four holes were put down at Pym dam site. Three of these encountered bedrock at depths ranging from 102 to 113.8 feet; the other hole (No. PY-2) was stopped about 30 feet above bedrock surface.

Bedrock encountered consisted of 8 to 24.5 feet of Paleozoic sedimentary rocks overlying Precambrian granitic rocks. The Paleozoic rocks and the upper part of the Precambrian which is highly weathered are not competent and would not provide satisfactory foundation material. The following table indicates the minimum depths at which competent fresh bedrock is believed to exist at Pym dam site.

Hole No.	Thickness of incompetent rock*	Depth to competent rock from ground surface
PY-1	48.5 feet	150 feet
PY-3	9.6 "	117.6 "
PY-4	25.4 "	139 "

* Includes both Paleozoic and Precambrian rocks measured downward from bedrock surface.

Bedrock surface beneath the proposed dam site as indicated by the drilling is flat with no indication of a buried valley. The surface of the Precambrian rocks has a relief of about 16 feet ranging from elevation 476.7 at hole No. PY-1 along the right side of Attawapiskat River to elevation 492.8 beneath the left abutment (hole No. PY-3). Evidence of perculating groundwater was observed along a few irregular open fractures in the fresh Precambrian rock.

Pym Dam Site

Hole No. PY-1

Elevation ground surface: 603.2
Elevation bedrock surface: 501.2
Elevation bottom of hole: 432.2

<u>Depth (feet)</u>	<u>Description</u>
0.0 - 102.0	Overburden
102.0 - 107.0	Dolomite: fine-grained, buff-coloured, sandy, porous, longest core is 2.5 inches, 2 feet of lost core (BX).
107.0 - 112.7	Sandstone: fine-grained, grey, argillaceous, slightly dolomitic, minor porosity, a few minor scattered shaley partings, 6 inches of lost core.
112.7 - 114.2	Shale: grey, sandy, longest core is 3 inches, 4 inches of lost core.
114.2 - 117.5	Shale: green, slightly sandy, silty, longest core is 4 inches, 2 inches of lost core.
117.5 - 119.1	Siltstone: green, longest core is 4 inches, 1 inch of lost core.
119.1 - 123.5	Sandstone: fine-grained, green, argillaceous, considerable secondary marcasite, longest core is 11 inches, 14 inches of lost core.
123.5 - 125.6	Conglomerate: quartz-pebble, green, sandstone and siltstone matrix, longest core is 2 inches, 12 inches of lost core.
125.6 - 126.5	Boulder (?): granitic, considerably more fresh than granitic rocks below.
at 126.5	Precambrian surface.

Hole No. PY-1 (cont'd)

- 126.5 - 132.2 Granodiorite: fine-grained, light-grey to white, highly weathered, consists of clay minerals, chlorite and quartz, longest core is 9 inches, 29 inches recovered.
- 132.2 - 132.9 Pegmatite: coarse-grained, pink, weathered, longest core is 2 inches, no lost core.
- 132.9 - 138.1 Material recovered consists of a mixture of the above rocks with brown clayey material, all highly weathered, longest core is 1 inch, 6 inches recovered.
- 138.1 - 143.4 Lost core.
- 143.4 - 145.8 Material as 132.9-138.1
- 145.8 - 150.5 Gneiss: fine-grained, pink, horizontal to irregular gneissosity, chlorite, biotite, quartz, feldspar, less weathering relative to rocks above, scattered, irregular clay-filled fractures usually at 90 degrees to the core, indications of perculating groundwater at 146.2, longest core is 2 inches, 6 inches lost core.
- 150.5 - 153.7 Gneiss: fine- to medium-grained, grey, granodioritic, biotite, quartz, feldspar, minor epidote, gneissosity approximately horizontal, not weathered, evidence of perculating groundwater along a horizontal fracture at 153.0, longest core is 2 inches, 15 inches recovered.
- 153.7 - 154.9 Pegmatitic segregation: pink to white, contains remnants of gneiss as 150.5-153.7, core to 1 inch, no lost core.
- 154.9 - 158.3 Gneiss: fine- to medium-grained, granodioritic, biotite, hornblende, quartz, disseminated epidote, gneissosity horizontal to irregular, longest core is 2 inches, no lost core.

Hole No. PY-1 (cont'd)

158.3 - 158.5	Amphibolite: black, a 2-inch band parallel to gneissosity.
158.5 - 159.1	Gneiss: as 154.9-158.3.
159.1 - 160.1	Gneiss: as 154.9-158.3, slightly altered, calcite filled fractures, a soft, 2-inch chloritized amphibolite band at 160.1.
160.1 - 161.4	Gneiss: as 154.9-158.3.
161.4 - 169.5	Quartz monzonite: fine- to medium-grained, light pink to white, massive, pegmatitic, scattered vertical fractures partly opened containing chlorite and epidote, longest core is 4 inches, no lost core.
169.5 - 170.2	Granodiorite: medium-grained, grey, horizontal foliation, longest core is 3 inches, no lost core.
170.2 - 171.0	Quartz monzonite: as 161.4-169.5.
171.0	Bottom of hole.

Note:

Bedrock encountered in this hole consists of 24.5 feet of Paleozoic sedimentary rocks overlying Precambrian granitic rocks. The Paleozoic rocks are not competent nor is the upper 24 feet of Precambrian. Competent rock commences about 150 feet beneath ground surface.

Pym Dam Site

Hole No. PY-3

Elevation ground surface: 608.6
Elevation bedrock surface: 500.6
Elevation bottom of hole: 464.6

<u>Depth (feet)</u>	<u>Description</u>
0.0 - 108.0	Overburden.
108.0 - 110.6	Lost core.
110.6 - 115.8	Sandstone: fine-grained, green, argillaceous, porous, longest core is 1 inch, 8 inches of core recovered.
at 115.8	Precambrian surface.
115.8 - 117.6	Granodiorite: as 117.6-144.0 but only 6 inches of core recovered, rock here probably highly weathered.
117.6 - 144.0	Granodiorite: fine-grained, grey, biotite, quartz with scattered plagioclase crystals to 5 mm., massive, uniform, longest core is 24 inches, no lost core.
144.0	Bottom of hole.

Note:

Bedrock encountered in this hole consisted of about 8 feet of Paleozoic rocks overlying Precambrian. The upper 2 feet of Precambrian rock is probably soft and weathered as core recovery here was poor. Competent rock starts at about 117.6 feet beneath ground surface. Between 123.0 and 124.5 feet considerable weathering exists along irregular open joint fractures. The weathered rock is soft and friable and extends up to 1 inch from each side of the fracture. A vertical healed fracture with a 1/4-inch alteration halo exists between 137.4 and 138.3.

Pym Dam Site

Hole No. PY-4

Elevation ground surface: 610.8
Elevation bedrock surface: 497.0
Elevation bottom of hole: 449.8

<u>Depth (feet)</u>	<u>Description</u>
0.0 - 113.8	Overburden.
113.8 - 115.0	Lost core.
115.0 - 115.3	Dolomite: fine-grained, buff-coloured, sandy, porous, (BX).
115.3 - 121.9	Sandstone: fine-grained, grey to buff-mottled, dolomitic, argillaceous, porous, a few minor scattered shaley partings, longest core is 4 inches, 8 inches of lost core.
121.9 - 125.3	Shale: grey, sandy, core in poor condition, 16 inches lost core.
125.3 - 129.0	Shale: green, sandy, longest core is 5 inches, 21 inches of core recovered.
129.0 - 131.0	Lost core.
131.0 - 131.2	Shale: as 125.3-129.0, probably caved bedrock fragments.
131.2 - 132.4	Sandstone: fine-grained, green, argillaceous, longest core is 3 inches, no lost core.
132.4 - 132.9	Conglomerate: quartz pebbles to one-half inch, green, silty to sandy matrix, longest core is 5 inches, no lost core.
at 132.9	Precambrian surface.

Hole No. PY-4 (cont'd)

- 132.9 - 139.2 Granodiorite: fine-grained, white to light grey, highly weathered, consists of clay minerals, chlorite, muscovite and quartz, longest core is 5 inches, 76 inches of core recovered.
- 139.2 - 139.3 Granodiorite: as 132.9-139.2, weathering decreases abruptly in this interval, disseminated pyrite is present, minor iron stain.
- 139.3 - 153.9 Granodiorite: fine-grained, grey to grey-buff, with scattered bands of fine-grained, light buff quartz monzonite up to 6 inches in width and dipping at 60 degrees, at 152.7 a 2-inch thick quartz monzonite layer containing an open joint lined with calcite and minor iron sulphide crystals, longest core is 7 inches, no lost core.
- 153.9 - 156.9 Granodiorite: fine-grained, grey, slightly foliated to massive, scattered open fractures containing clay minerals, rock along fractures is frequently altered, a few discontinuous clay partings are present where alteration is most intense, longest core is 4 inches, no lost core.
- 156.9 - 161.0 Granodiorite: fine-grained grey, slightly foliated to massive, scattered minor closed fractures are marked with reddish alteration, longest core is 3 inches, no lost core.
- 161.0 Bottom of hole.

Note:

Bedrock encountered in this hole is similar to that encountered in hole No. PY-1. It consists of 19.1 feet of Paleozoic sedimentary rocks overlying Precambrian granitic rocks. The Paleozoic rocks are not competent nor is the upper 6.3 feet of Precambrian. Competent rock starts at about 139 feet beneath ground surface. A few small open fractures were encountered in the rock beneath 139 feet along which there was evidence of perculating groundwater. These could be grouted.

Stockman Dam Site

General Description

The two holes put down at Stockman dam site encountered bedrock at 14.3 and 9.0 feet beneath ground surface. The shallow thickness of overburden indicates any structure located here would be found on bedrock.

Bedrock at the dam site is competent and should provide satisfactory foundations for a dam. The surface rock is not weathered and very little would have to be removed before concrete or dyke material could be placed against it. The permeability of the rock mass is probably low. With the exception of the rock between 37.9 and 40.5 feet in hole No. ST-1 there was no indication of perculating groundwater.

Stockman Dam Site

Hole No. ST-1

Elevation of ground surface: 625.7
Elevation of bedrock surface: 611.4
Elevation of bottom of hole: 585.2

<u>Depth (feet)</u>	<u>Description</u>
0.0 - 14.3	Overburden.
14.3 - 30.6	Gneiss: medium-grained, grey, pink to white, granodioritic, general dip of gneissosity is about 45 degrees, pink pegmatite and biotite-rich segregations are present locally, longest core is 8 inches, no lost core.
30.6 - 37.9	Diorite: fine-grained, grey, banded, biotite-rich, quartz, banding up to 1 1/2 inches wide and dips 30 to 60 degrees, longest core is 11 inches.
37.9 - 40.5	Gneiss: medium-grained, grey, pink to white, granitic, longest core is 2 inches, 6 inches of core recovered.
40.5	Bottom of hole.

Note:

Bedrock consists of massive, competent gneiss with the exception of the rock between 37.9 and 40.5 at the bottom of the hole where only 6 inches of core was recovered; there are indications this core loss was due to the presence of a water-bearing, fractured zone in the rock.

Stockman Dam Site

Hole No. ST-2

Elevation of ground surface: 625.4
Elevation of bedrock surface: 616.4
Elevation of bottom of hole: 582.4

<u>Depth (feet)</u>	<u>Description</u>
0.0 - 9.0	Overburden.
9.0 - 43.0	Gneiss: fine- to medium-grained, grey to pink-white, granodioritic, scattered pegmatitic segregations, gneissosity dips 30 degrees, longest core is 13 inches, 12 inches of core lost.
43.0	Bottom of hole.

Note:

Bedrock is massive, competent gneiss; between 26.2-27.1 the core is cut by a small slip dipping at 75° which shows minor displacement of the gneissic bands, the slip is cemented with calcite; there was no indication of perculating groundwater in the core.

Manson Channel Site

General Description

Two holes were put down at Manson Channel site but only one (MA-2) encountered bedrock. The 5 feet of core recovered from this hole was sufficient to identify the rock and to provide some information regarding its suitability as abutment or foundation material. The rock consists of massive granodiorite and is considered to be extremely competent. Jointing is present but the hole did not penetrate sufficient rock to determine its extent. There was no visible weathering. It is probable very little surface rock will have to be removed to expose fresh rock against which concrete or dyke material could be placed.

Manson Channel Site

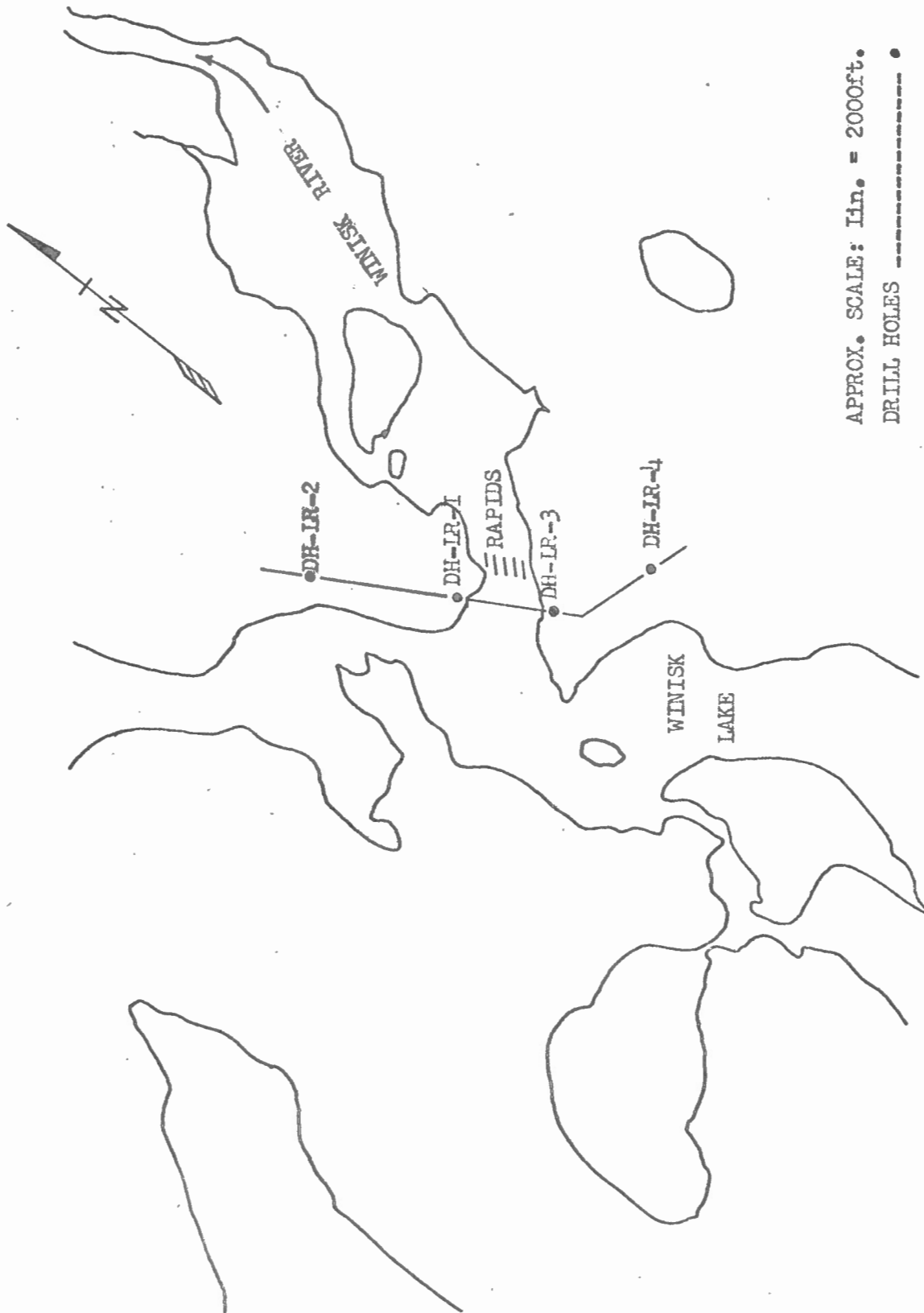
Hole No. MA-2

Elevation ground surface: 649.2
Elevation bedrock surface: 610.0
Elevation bottom of hole: 605.0

<u>Depth (feet)</u>	<u>Description</u>
0.0 - 39.2	Overburden.
39.2 - 44.2	Granodiorite: fine- to medium-grained, grey to grey-pink, gneissic in places, gneissosity dips at 60 degrees, core up to 6 inches, 2 inches lost core.
44.2	Bottom of hole.

Note:

Bedrock is competent and should provide satisfactory abutment and foundation material; there is evidence of groundwater movement along a joint fracture at 40.2; this joint dips at 45 degrees; core usually broken at 90 degrees and never along gneissosity.



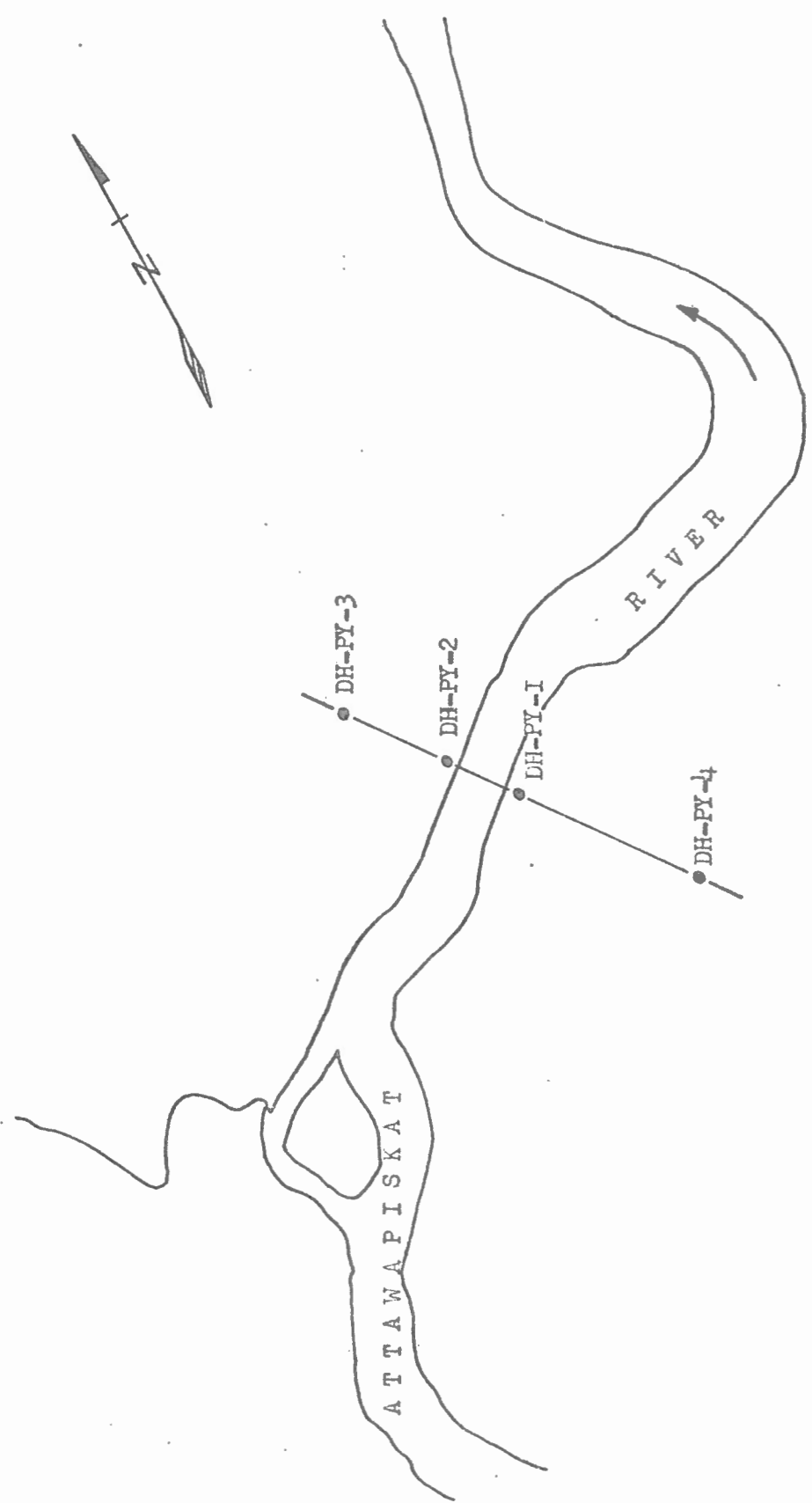
APPROX. SCALE: 1in. = 2000ft.

DRILL HOLES

LASTCEDAR SITE

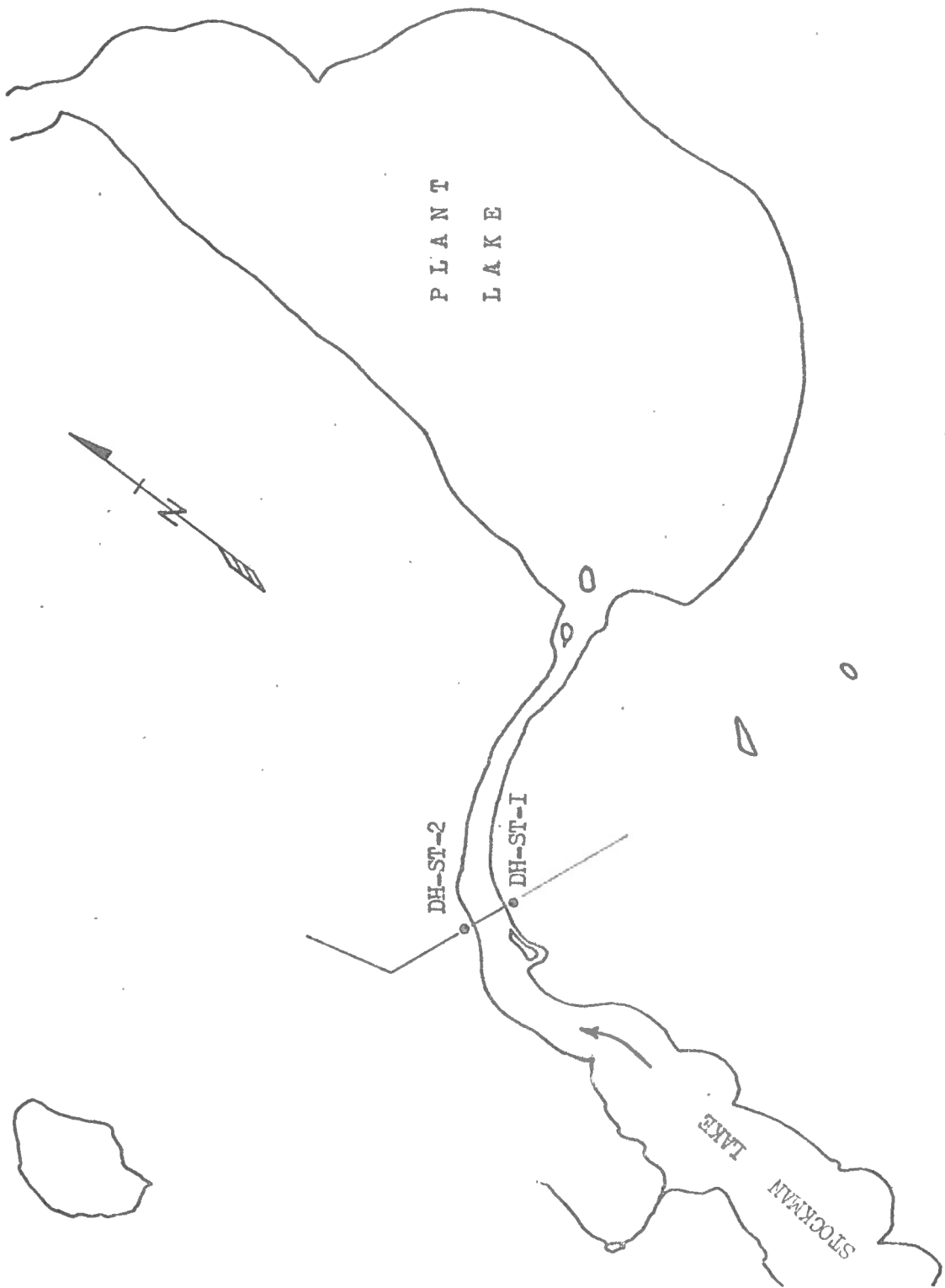
LAT. 53° 07'

LONG. 87° 20'



APPROX. SCALE: 1in. = 2000ft.
DRILL HOLES

PYM SITE
LAT. 52° 18'
LONG. 86° 16'



APPROX. SCALE: 1in. = 2000ft.
DRILL HOLES -----●-----

STOCKMAN SITE

LAT. 52° 58'
LONG. 87° 04'



APPROX. SCALE: 1 in. = 2000 ft.

DRILL HOLES

MANSON CHANNEL SITE

LAT. 52° 51'
LONG. 87° 12'