

CANADA
DEPARTMENT OF ENERGY, MINES AND RESOURCES

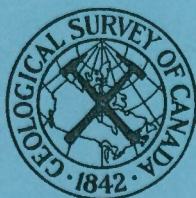
GEOLOGICAL SURVEY OF CANADA
TOPICAL REPORT NO. 120

MACKENZIE RIVER DRAINAGE BASIN
DAM SITE INVESTIGATION

SITE No. 23

LOWER DIRECTION DAM SITE
(MAP AND NOTES)

E. B. OWEN



OTTAWA
1966

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 ONLY

CANADA

DEPARTMENT OF ENERGY, MINES AND RESOURCES

GEOLOGICAL SURVEY OF CANADA

TOPICAL REPORT No. 120

MACKENZIE RIVER DRAINAGE BASIN

Dam Site Investigation

Site No. 23

LOWER DIRECTION DAM SITE

(Map and Notes)

by

E. B. Owen

OTTAWA

1966

Lower Direction Dam Site

General Description

The examination of Lower Direction dam site was part of an investigation by the Water Resources Branch, Department of Energy, Mines and Resources of the hydroelectric power potential in the Mackenzie River drainage basin. Lower Direction dam site is situated on Flat River in the Northwest Territories about four and a half miles upstream from the junction of the Flat and South Nahanni Rivers. An alternate site (Upper Direction) is four and a half miles further upstream. Lower Direction dam site is included on National Topographic Series sheet No. 95F (Virginia Falls), scale 1:250,000 and on aerial photograph A17428-13. The geology is described in Geological Survey of Canada Paper 60-19¹.

The chief purpose of constructing a dam on Flat River is to provide storage for larger dams on South Nahanni River. The location of Lower Direction site is such that it would possibly be in the reservoir area of the first dam across the South Nahanni downstream from the mouth of the Flat. However, as there is a shortage of suitable dam sites on Flat River, it was considered Lower Direction site should be included in the inventory despite its unfavourable location. Also, the heights of the several dams proposed for the South Nahanni had not been decided upon at the time of the investigation (July, 1964).

¹ Douglas, R.J.W. and Norris, D.K.: Virginia Falls and Sibbeston Lake Map-areas, Northwest Territories, Geol. Surv., Can., Paper 60-19, 1960.

Description of Potential Aggregate for the following Grain Size Analyses Curves

Sample Number	Location	Field Description of Material	Group ¹ Symbol	Field Description of Overburden	Thickness of Deposit	Areal Extent (Estimated)	Remarks
14	Cut bank along left side of Flat River; 50 feet from river; 4 feet above river; 6 feet beneath ground surface.	Sand: fine-grained, minor silt; uniform, loose; no visible stratification; an alluvial deposit.	SP-SM	None	8 + feet, limited by water table.	Large, covers a wide terrace along left side of river.	Potential fine aggregate; permeability ² computed in the field 9.24 feet per day.
16	Bluff along left side of Flat River; one-half mile downstream from site; 200 feet above river; 6 feet beneath ground surface.	Gravel: sandy, minor silt; numerous subrounded granitic and quartzitic boulders to 12 inches; considerable black shale as platy fragments; a glacio-fluvial deposit.	GW	Silty clay as in sample No. 15	Unknown	Large	Overlies bedrock; shale content less than in Recent gravel along Flat and South Nahanni Rivers.

- 1 Unified Soil Classification System
- 2 Permeability computed in the field using a Soiltest Permeameter, Model K-620

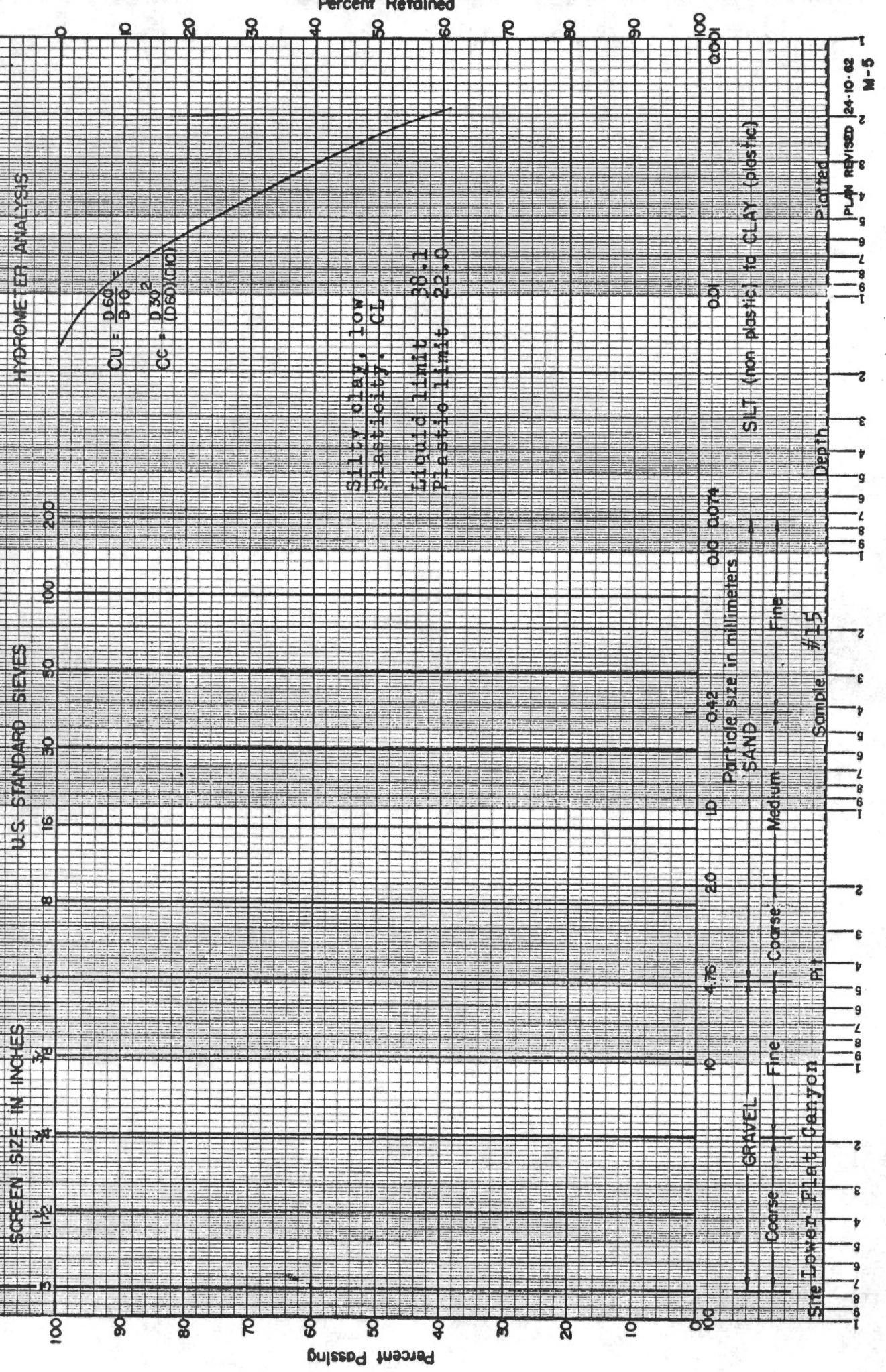
Description of Potential Impervious Material for the following Grain Size Analyses Curves

Sample Number	Location	Field Description of Material	Group ¹ Symbol	Field Description of Overburden	Thickness of Deposit	Areal Extent (Estimated)	Remarks
15	Right side of South Nahanni River; one-half mile upstream from mouth of Flat River; 350 feet above river; 3 feet beneath ground surface	Clay: considerable silt; buff-colored, firm, dry, low-plastic; a glacio-lacustrine deposit.	CL	None	Up to 100 feet	Extends for several miles along South Nahanni River.	Liquid limit - 38.1 Plastic limit - 22.0
17	Shot hole 350A, seismic line No. 2; 4 feet beneath ground surface	Gravel: silty, sandy; slightly plastic; a till-like material.	GM	3 to 4 feet of till and residual soil	40 + feet	Unknown	Liquid limit - 38.0 Plastic limit - 33.4

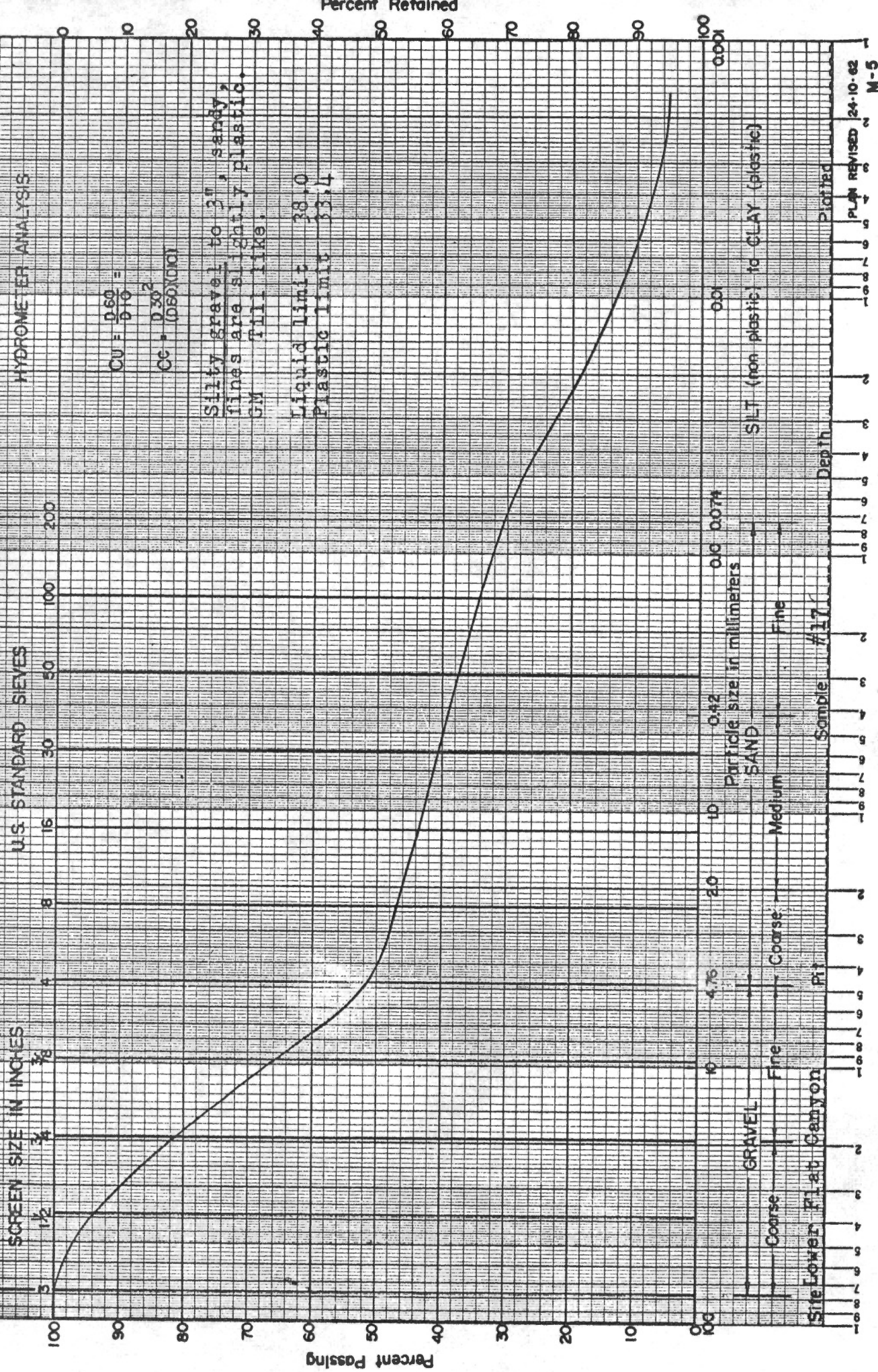
¹ Unified Soil Classification System

WATER RESOURCES BRANCH

GRAIN SIZE ANALYSIS



WATER RESOURCES BRANCH
GRAIN SIZE ANALYSIS



$CU = \frac{D_{60}}{D_{10}} =$
 $Cc = \frac{D_{30}^2}{D_{60} \times D_{10}}$

Silty gravel to 3", sandy,
 fines are slightly plastic,
 GM fill like.

Liquid limit 38.0
 Plastic limit 33.4

SILT (non plastic to CLAY (plastic))

Depth
 Sample #17
 Site Lower Flat Canyon
 Coarse
 Fine
 Coarse
 Medium
 Fine
 GRAVEL
 SAND
 PLAIN
 M-5
 24-10-82
 REVISED
 PLOTED

Chemical Analysis of Flat River Water, Lower Direction dam site
(parts per million)

Location	Date	Discharge	pH	SiO ₂	Ca	Mg	Na	K	Fe	CO ₃	HCO ₃	SO ₄	Cl	F	NO ₃	Turbidity	Hardness as CaCO ₃
Left side of Flat River, 12 inches beneath water surface	July 24, 1964	Med. Temp. 54°F	7.9	4.5	36.6	6.7	1.0	0.6	0.51	0	114	23.2	0.1	0.15	Tr.	2	119

Chemical Analysis of the Water from a spring near Lower Direction dam site
(parts per million)

Location	Date	Discharge	pH	SiO ₂	Ca	Mg	Na	K	Fe	CO ₃	HCO ₃	SO ₄	Cl	F	NO ₃	Turbidity	Hardness as CaCO ₃
2 miles north-west of site, at head of small valley	July 30, 1964	100 <u>gpm</u> Temp. 39°F	7.4	6.2	197	33.0	1.6	1.1	3.6	0	562	154	0.4	0.55	0.2	0.9	628



Plate 1

View of left abutment, Lower Direction dam site; D 25 foot bed of fine-grained, grey-weathering, dolomitic limestone about 500 feet above the river; F east-dipping, thrust fault, displacement along fault is 40 feet; T talus.

G.S.C. 13-4-64



Plate 2

View of right abutment, Lower Direction dam site; Δ survey station M.3; G.B. gravel bar on which seismic line No. 1 was located.

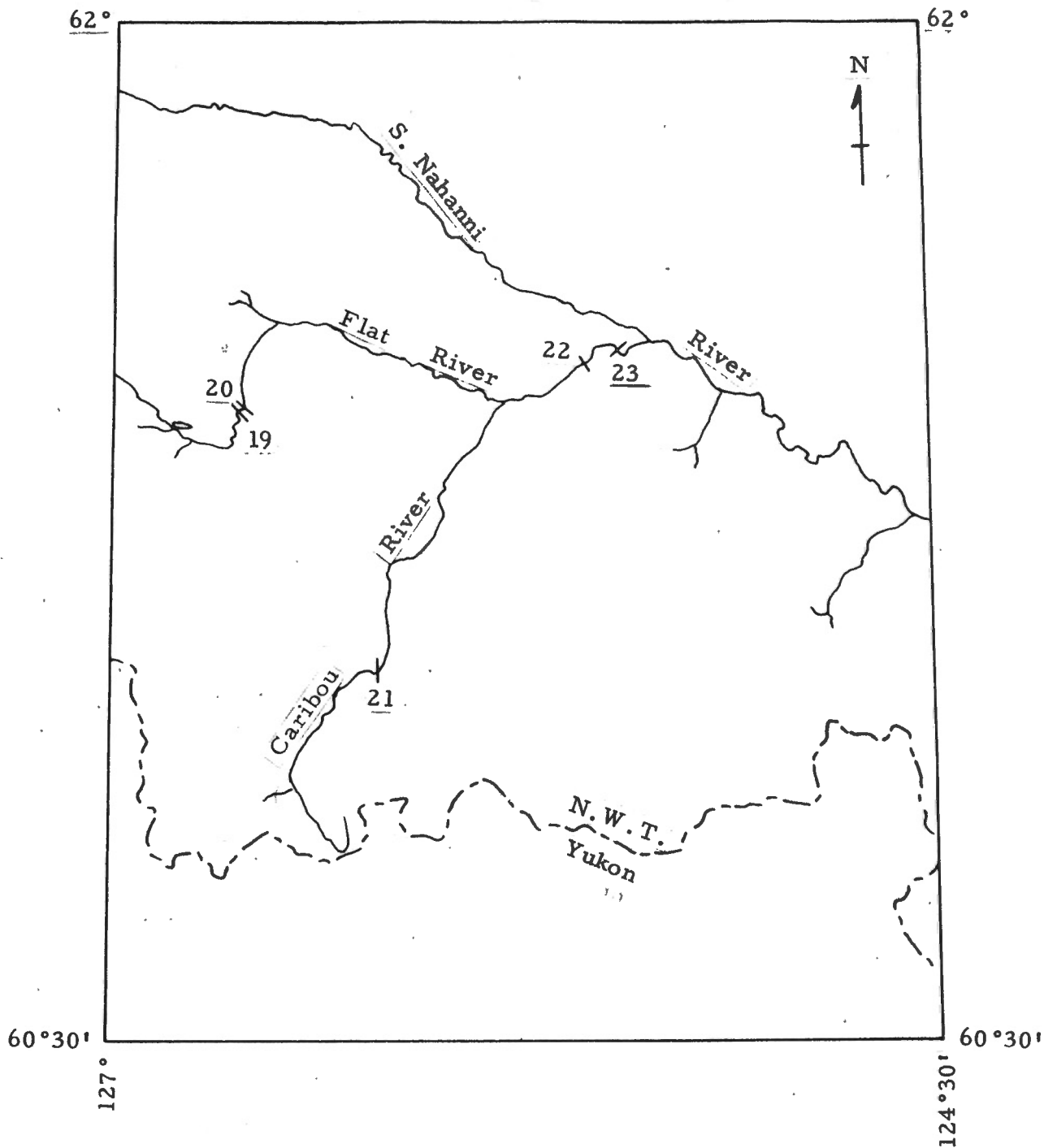
G.S.C. 14-3-64



Plate 3

View looking upstream through Lower Direction dam site

G.S.C. 14-6-64



LOCATION OF PROPOSED DAM SITES
MACKENZIE RIVER DRAINAGE BASIN

Scale: 1:1,000,000

<u>Site No.</u>	<u>Name</u>	<u>River</u>
19	Upper Seaplane	Flat
20	Lower Seaplane	Flat
21	Caribou	Caribou
22	Upper Flat Canyon	Flat
23	Lower Flat Canyon	Flat