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SUBJECT CORNWALL ISLAND MODEL - SECOND STUDY FOR THE EFFECTS OF CONSTRUCTION DELAYS IN CORNWALL NORTH CHANNEL.

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ISSUED TO St. Lawrence Seaway Authority.

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CORNWALL ISLAND MODEL - SECOND STUDY FOR THE EFFECTS OF CONSTRUCTION
DELAYS IN CORNWALL NORTH CHANNEL

INTRODUCTION

In Item 2 of the memorandum to the National Research Council Associate Committee on St. Lawrence River Model Studies, January 23, 1958, the St. Lawrence Seaway Authority requested a study to provide an alternative scheme which would assist the delayed construction schedule for the compensating channel on the north side of Cornwall Island. The Seaway stressed that it would prefer that the work be done by widening and/or deepening the upper portion of the section cofferdammed in January 1958.

CONDITION

In this area, the river bed forms a ridge 15 ft. high and 2200 ft. long, lying between gauges 8 and 9, like a submerged weir with a wide crest, across the Cornwall North Channel. The flow is controlled by this ridge. The Froude number in the section is 0.5 or, expressed in depth, two times the critical depth. In order to restore the flow to natural after the navigation excavation is completed in the South Channel, a channel must be cut through this ridge. In ACN II/7, the upstream section of the regulating channel was cut through the ridge to elevation 138 and produced natural distribution. The downstream section of the regulating channel has no effect on the distribution and is included to collect and re-direct the upstream water away from the entrance of the future all-Canadian navigation channel.

The area of the channel at present cofferdammed is downstream of the ridge, therefore it is evident that there is no chance of utilizing the space within the cofferdam to satisfy the basic requirement of natural flow distribution.

The study included finding the effect caused by different sections of the channel.

MODEL PROCEDURE

Four lengths of regulating channel, each increasing by approximately 1200 feet upstream, were tested:

- (a) Excavated downstream of gauge 10.
- (b) Excavated to present upstream cofferdam.
- (c) Excavated further 1200 feet upstream.
- (d) Excavated by dragline along shoreline a further 1000 ft.

During tests the American navigation scheme, W.E.S. Plan 2, was installed in the South Channel, and the Canadian navigation scheme, including the downstream section of the compensating channel, in the North Channel. Tests were made for the discharge of 270,000 c.f.s. only. The Massena diversion was not in operation and Lake St. Francis was regulated as in nature.

RESULTS

In the attached figure the relationship between length of regulating channel, from gauge 10 upstream, and discharge distribution is plotted. The curve clearly indicates that the entire channel is required for establishing the natural flow balance. The section cofferdammed in January 1958 has little effect on the discharge distribution. Widening or deepening it will increase the flow from 1/2 to 3/4 percent to the North Channel only, because the first 1000 feet are below the ridge. Only a cut through this ridge can establish natural flow distribution.