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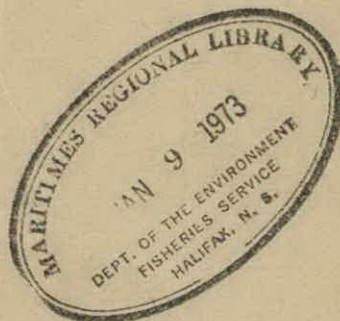
RESOURCE DEVELOPMENT BRANCH

4768

MANUSCRIPT REPORT

No. 73-1

RECOMMENDATIONS CONCERNING THE RETENTION
OR REMOVAL OF WATER CONTROL STRUCTURES
ON THE WEST RIVER, SHEET HARBOUR, NOVA SCOTIA.



Prepared by

L.J.A. Ducharme &
Hans Jansen
Resource Development Branch

January, 1973

Fisheries Service
Halifax, N.S.



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Recommendations Concerning the Retention or Removal of
Water Control Structures on the West River, Sheet Harbour,
Nova Scotia.

INTRODUCTION

The West River, Sheet Harbour presently supports a natural population of Atlantic salmon, with annual runs in the range of 3 - 600 fish. The recreational value of this resource is enhanced by the stream's proximity to the large population center of Halifax-Dartmouth.

With the discontinuation of water use by the Scott Paper Company, the hazards or benefits of existing water storage dams, or their remnants, on fish populations in the watershed, was reconsidered. Recommendations were made concerning the removal, retention or reconstruction of the dams on the basis of fishery benefits.

LOCATION AND DESCRIPTION OF STRUCTURES WITH RECOMMENDATIONS
RELATED TO FISH PASSAGE

The West River system has been divided as follows:

- Main West River
- Rocky Lake Brook
- Little River
- Killag River
- Beaver Lakes Branch
- Rocky Brook Lake Branch

The dams have been numbered in an upstream progression. Both dam names and numbers correspond to those given in the report prepared by the Department of the Environment, Water Planning and Management Branch (see Fig. 1). For each of the 30 dams listed, a brief description of the location, the condition of the structure and the fishery recommendation is given.

Main West River

The main branch of West River, Sheet Harbour, has 8 dam sites and a natural barrier located between the former mill at Sheet Harbour to the headwaters and these can be described as follows.

Slasher Dam (1)

This dam is located at Sheet Harbour to the east of the island just upstream of the site of the former mill.

The structure has a maximum height of about 10 feet and a length of about 65 feet. It controls about a four-foot head of water and was used to flush the water-stored pulpwood through the slasher saws and down the flume to the pulp mill. The dam was constructed about 1935 and has been repaired on several occasions. It consists of sawn timber supported by steel uprights with stoplog controlled openings.

The dam is in very poor condition as a result of damage during Hurricane Beth. It is considered to be beyond repair and will probably deteriorate further in the near future.

At present, the dam is a barrier to fish passage, however, fish passage is provided for in the Lower or Mill Dam (2) which is located to the west of the island at this location. If the Slasher Dam (1) is to be reconstructed, fish passage would continue at the Lower or Mill Dam (2). If the Slasher Dam (1) were to be removed, most of the river flow would be through the channel on this side of the island. The stream bed elevation on this side of the island is several feet lower than the concrete sill elevation of the Lower or Mill Dam (2). Contours of the river bottom above the Slasher Dam (1) are required to determine if a barrier for fish passage would be created by removing the dam. The probability of creating a barrier by removal of this dam is not too likely, however, the possibility does exist.

The removal of Slasher Dam (1) is recommended. Most of the flow would then pass through that channel (except at very high water) which has a more gradual slope. This work would facilitate Atlantic salmon passage into the Sheet Harbour Lakes. Gaspereau would also gain access to the lakes.

Lower or Mill Dam (2)

This dam is located at Sheet Harbour to the west of the island just upstream of the former mill.

The dam was reconstructed in 1971 for about \$4,000 to replace a 40-year-old dam that was in bad condition. It is constructed of steel uprights and supports embedded or bolted to a concrete base to hold timber stoplogs. Two stoplog-controlled openings in the center of the structure control the water level to a maximum of four feet. The dam has a length of about 170 feet and a maximum height of 5 feet. Access to the center section for removal or installation of stoplogs would be difficult, in particular, during high flows. The dam is generally in very good condition.

Lower or Mill Dam (Cont'd)

Adequate fish passage is provided by a 5 foot wide clear opening that extends to stream bed level.

At the time of visit, this dam was holding very little water. The removal of the stoplogs and the stoplog retainers (steel I beams) is recommended as the steel retainers could lead to serious debris accumulation during flood periods.

Main River Dam (3)

This site is located 12.3 miles upstream from Slasher Dam (1) and Lower or Mill Dam (2).

A dam has been located here for many years. The present structure was constructed about 20 years ago and in 1969 the top part was repaired by Scott at a cost of about \$4,000. Approximately 50 yards upstream of the dam are the remains of a previous structure which presently serves no purpose and is submerged at medium to high lake levels.

The Main River Dam consists of timber cribbing with inclined flash boards on the upstream face which are covered by earth and rock fill. It has a maximum height of about 15 feet and controls the water level of River Lake over a height of 12 feet. The dam is about 250 feet long. The two outlets, each 8 feet in width, are controlled by steel plate stoplogs, three feet in height which are lifted by manual chain hoists. An overflow spillway 40 feet in width normally maintains the lake below the top of the flash boards.

The structure is in fairly good condition. Some of the flash boards are missing, however, and it appears that a section of the dam has settled. The life of this structure could perhaps be extended by carrying out repairs of moderate cost. This timber dam is, however, approximately 20 years old and its life cannot be extended forever. Extensive repairs or complete reconstruction would probably be required within 10 years. Problems in manipulating the steel plate stoplogs would be encountered during high flows with the existing structure.

The dam is a complete barrier for fish passage. An estimated cost of providing fish passage facilities for this site would be roughly \$30,000.

This dam should be removed, as it prevents salmon access to at least 4 miles of good rearing and spawning areas. This represents a 24% increase to existing rearing areas.

Natural Barrier (Falls) (31)

This site is located 5.0 miles upstream from Main River Dam (3).

The width of the river at this location is approximately 50 feet. Through the rapids most of the flow is concentrated through a 4-foot-wide gorge. The rapids extend for an overall horizontal distance of approximately 125 feet with a 20-foot drop in the water surface elevation. The greatest drop takes place at the lower portion of the rapids where the water surface drops 11 feet in a horizontal distance of 30 feet. Immediately upstream over a distance of 30 feet is another 6-foot difference in the water surface elevation. The upper portion of the rapids are fairly gentle with a 3-foot drop in approximately 65 feet.

These falls are a natural barrier for fish passage. Due to the nature of the natural configuration of the rock at the site, fish passage cannot be obtained by blasting alone. A conventional-type fishway including extensive blasting would be required to provide fish passage at the barrier. The site is approximately 1/2 mile from the nearest road, which makes it fairly inaccessible for construction. The cost of providing fish passage at this site would be in excess of \$60,000.

Approximately 5 miles of stream 10 yards wide are available for salmon production above the falls. This would represent a 15% increase in available salmon rearing area. Because of the low benefit/cost ratio, no recommendation is being made to remove this natural barrier.

Kent Dam (4)

This site is located 5.3 miles upstream from Main River Dam (3) and 0.3 miles upstream from the rapids (31).

There are no signs of this structure remaining at the site.

Cope Dam (5)

This site is located 0.9 miles upstream from Kent Dam (4).

Air reconnaissance indicated no signs of a structure remaining at this site.

Bottle Dam (6)

This site is located 1.8 miles upstream from Cope Dam (5) and is located on Sand Brook.

Air reconnaissance indicated no signs of a structure remaining at this site.

Sand Lake Dam (7)

This site is located 2.9 miles upstream from Bottle Dam (6) and is at the outlet of Sand Lake. There are no streams located above this site.

Parts of the structure remain on the stream banks but nothing is left in the channel.

Burke Dam (8)

This site is located 3.2 miles upstream from Cope Dam (5) on Burke Brook. There is approximately 3.0 miles of stream upstream of the site.

Air reconnaissance indicated no signs of a structure remaining at this site.

Rocky Lake Brook

Rocky Lake Brook enters West River, Sheet Harbour, on the east bank approximately 1.1 miles upstream from Slasher Dam (1) and Lower or Mill Dam (2). There are 4 dam sites on this system which can be described as follows.

Allan Dam (9)

This site is located 1.9 miles upstream from the

Allan Dam (9) (Cont'd)

mouth of Rocky Lake Brook on an unnamed tributary. There is approximately 2.1 miles of stream above the site.

There are no signs of this structure remaining at the site.

Cody Dam (10)

This site is located 1.2 miles upstream from the mouth of Rocky Lake Brook.

The remains of timber cribwork exists on banks of the stream with a slight constriction on the left bank. A section of channel about 15 feet wide is completely free of obstruction.

Rocky Lake Dam (11)

This site is located 1.8 miles upstream from Cody Dam (10) and is located at the outlet of Rocky Lake.

The remains of a timber cribbing, inclined flash board structure about 15 feet high protrudes approximately one-half way across the stream channel from the left bank. The right half of the structure is completely gone and this part of the channel is unobstructed over a width of 20 feet. The sill of the structure is intact and protrudes about three feet above the stream bed. Numerous logs are piled on the remains of the dam and also in the stream channel about 100 feet downstream.

The removal of the left half of this dam and of the sill down to natural riverbed bottom is recommended as it obviously has caused debris to accumulate and obstruct the open half of the channel.

Sams Lake Dam (12)

This site is located 1.3 miles upstream from Rocky Lake Dam (11) and is located at the outlet of Sam Lake. There is approximately 2.0 miles of stream above the site.

This dam was constructed around 1935, of timber cribbing with inclined flash boards. It is about 120 feet in length

Sams Lake Dam (12) (Cont'd)

and probably originally had a height of five feet. The dam is now almost completely destroyed but the sill still remains in the channel. At low streamflow the water flows under and through the old sill. The remains of the structure do not store any volume of water upstream. The dam is accessible by forest road.

A beaver dam is located 100 feet upstream of the dam site. The beaver dam maintains a head on the lake of about one foot above the natural level.

It is recommended that the remains of the sill be completely removed as it could cause debris to accumulate.

Little River

Little River enters West River, Sheet Harbour, on the west bank approximately 4.0 miles upstream from Slasher Dam (1) and Lower or Mill Dam (2). There are 5 dam sites on this system that can be described as follows.

Union Dam (13)

This site is located 2.3 miles upstream from the mouth of Little River.

The site is fairly inaccessible although there are remains of some old wood roads in the area. The dam was constructed around 1940 and was used for stream driving and water storage for Sheet Harbour Lake.

The structure consists of timber cribbing and inclined flash boards. It has a length of about 200 feet and a maximum height of 10 feet. There are two stoplog-controlled outlets, each seven feet wide.

The dam is now in poor condition with badly rotted cribwork and flash boards. The stoplogs have been removed and the dam has apparently not been used for some time. Considerable leakage takes place below the sill.

Because of its poor condition this dam would require major repairs.

Union Dam (13) (cont'd)

The complete removal of this structure is necessary to provide salmon access to approximately 3 miles of stream suitable for salmon production representing a potential increase of 18% over present rearing area.

Southwest Lake Dam (14)

This site is located 3.7 miles upstream from Union Dam (13) and it is located at the outlet of Southwest Lake.

The site is accessible by an old woods road, however, the bridge across Little River on this road is out.

The structure has an overall length of 220 feet consisting of 100 feet of earth dyke with timber core and the remainder is of timber cribwork with inclined flash boards. The maximum height of the dam is about 10 feet. The structure has one outlet 10 feet wide and about 5 feet high that was controlled by stoplogs. The sill is several feet above stream bed level.

The dam is presently in poor condition and has rotted to some extent. To the right of the outlet the flashboards are broken over a length of about 30 feet.

Because of its poor condition, this dam would require major repairs.

This dam should also be removed because of a one mile river section suitable for salmon production above the lake.

Bailey Dam (15)

This site is located 2.8 miles upstream from Southwest Lake Dam (14).

There are no signs of this structure remaining at the site.

Lower Kidney Lake Dam (16)

This site is located 0.8 miles upstream from Bailey Dam (15) and is located at the outlet of Kidney Lakes. There

Lower Kidney Lake Dam (16) (Cont'd)

are no streams located above this location.

The dam was built around 1935. The overall length is about 75 feet and the maximum height was probably 15 feet. The cribwork of the dam is badly rotted, the flashboards are broken down and there is a considerable amount of debris piled up behind and on top of the structure. The remains of the structure and the debris create ponding to a level of about 12 feet above the stream bed.

Below the dam, the stream flows through a gorge about 30 feet wide.

This dam should be removed completely to prevent the possibility of a total blockage due to debris accumulation.

Lake Alma Dam (17)

This site is located 0.8 miles from Little River on Alma Lake Brook and it is located at the outlet of Alma Lake.

The dam was constructed by Scott in 1967 at a cost of about \$5,000 to replace a completely deteriorated dam at the same location. It is a wooden timber and plank dam with inclined flash boards on the upstream face. The dam has an overall length of approximately 200 feet and has two 8 foot wide openings in the center controlled by wooden stoplogs. The maximum height is about 12 feet. There is approximately four feet between the stream bed level and the sill of the stoplog section.

The structure is very watertight and in good condition. Some difficulty could be encountered with the manipulation of the 8-foot-long stoplogs, particularly under high flow conditions.

An estimated cost of providing fish passage facilities for this site would be roughly \$30,000.

We do not recommend the removal of this structure nor do we recommend its maintenance. It does not interfere with salmon migration and probably improves trout habitat in the Alma Lake, conversely some long term benefits for gaspereau production might be derived from its removal. The fishery benefits or disadvantages of Alma Lake Dam are difficult to evaluate and probably annul each other.

Killag River

Killag River enters West River, Sheet Harbour, on the east bank approximately 8.4 miles upstream from Slasher Dam (1) and Lower or Mill Dam (2). There are 9 dam sites on this system that can be described as follows.

Killag River Dam (18)

This site is located 0.3 miles upstream from the mouth of the Killag River.

Air reconnaissance indicated no signs of a structure remaining on this site.

Black Brook Lake Dam (19)

This site is located 0.6 miles upstream from the mouth of Black Brook. Black Brook enters the Killag River 1.0 mile upstream from Killag River Dam (18). There is approximately one mile of available river upstream of this site.

The remains of this structure protrude about 30 feet out from both banks. The cribwork has rotted and is completely grown over. Some timber remains across the stream channel.

We recommend that the remains of the Black Brook Dam be removed from the stream channel.

Cameron Dam (20)

This site is located 9.9 miles upstream from Killag River Dam (18).

Rotted and grown over remains of this dam protrude about 100 feet from the right bank and 70 feet from the left bank. The height of the remains is about four feet. In the stream channel itself which is about 40 feet wide, parts of the structure remain. There is only one section, a few feet in width, which is completely open.

We recommend the removal of the remains which lie in the stream channel.

Cameron Flowage (21)

This site is located 0.2 miles upstream from Cameron Dam (20).

Remains of a rock-filled structure 150 feet long and three feet high are at this site. A center section approximately 25 feet wide is completely open.

Tait Dam (22)

This site is located 2.0 miles upstream from Cameron Flowage (21) on McNeil Brook.

Air reconnaissance indicated no signs of a structure remaining on this site.

McNeil Dam (23)

This site is located 2.4 miles upstream from Tait Dam (22) on McNeil Brook. There is approximately 1.5 miles of stream above the site.

Air reconnaissance indicated no signs of a structure remaining on this site.

MacDonald Flowage Dam (24)

This site is located 2.6 miles from Cameron Flowage (21) on the West Killag River.

Air reconnaissance indicated no signs of a structure remaining on this site.

West Lake Dam (25)

This site is located 0.8 miles upstream from MacDonald Flowage Dam (24) at the outlet of West Lake. There is approximately 2.2 miles of stream above the site.

Air reconnaissance indicated no signs of a structure remaining on this site.

Upper Killag Dam (26)

This site is located 2.8 miles upstream from MacDonalld Flowage Dam (24) on the West Killag River. There is approximately 1.5 miles of stream above the site.

Air reconnaissance indicated no signs of a structure remaining on this site.

Beaver Lake Branch

The Beaver Lake Brook enters the West River, Sheet Harbour, on the west bank approximately 14.2 miles upstream from Slasher Dam (1) and Lower or Mill Dam (2). There is one dam site on this system which can be described as follows.

Beaver Lakes Dam (27)

This site is located 0.25 miles upstream from the mouth of Beaver Lake Brook and 0.25 miles downstream from Beaver Lake.

There are no signs of this structure remaining at the site.

Rocky Brook Lake Branch

Rocky Brook enters the West River, Sheet Harbour, on the west bank approximately 17.0 miles upstream from Slasher Dam (1) and Lower or Mill Dam (2). There are three dam sites on this system which can be described as follows.

Rocky Brook Lake Dam (28)

This site is located 0.4 miles upstream from the mouth of Rocky Brook and is located at the outlet of Rocky Brook Lake.

There are no signs of this structure remaining at the site.

Grassy Lake (29)

This site is located 1.5 miles upstream from Rocky Brook Lake Dam (28). There are no streams above the site.

Grassy Lake (29) (Cont'd)

The structure is constructed of earth and rock fill. It is approximately 40 feet in length with a maximum height of 3 feet. The dam is being gradually washed away by natural outflow from the lake. It is believed that this dam was constructed by a local property owner in order to raise the level of Grassy Lake.

We do not recommend any action to be taken with this dam.

Fisher Lake Dam (30)

This site is located on Rocky Brook 1.2 miles from the point where Grassy Lake enters Rocky Brook. There is approximately 1.6 miles of intermitant stream above this site.

There are no signs of this structure remaining at the site.

ESTIMATED FISHERIES BENEFITS FROM REMOVAL OF DAMS

The removal of several dams as proposed could increase the salmon production areas of the West River system by 177,600 square yards or 46% of the present available area.

Assuming that an equivalent increase in salmon production resulted from the proposed dam removals and subsequent re-utilization by Atlantic salmon, an additional 105 fish (46%) would be caught by anglers (average angling yield past 10 years = 238 fish). Assuming that the catch effort remained unchanged at 8 rod/days per fish (from 1967 to 1970, 6,582 rod/days were expended in catching 784 salmon at West River) and assuming an average expenditure of \$15.00 (Spargo, 1961) per rod/day, economic benefits resulting from this increase in fishery benefits resulting from this increase in fishery resource would be approximately \$12,600 per annum.

CONCLUSIONS & RECOMMENDATIONS

Through aerial survey and site visits, it has been established that only 10 out of 30 dams remain in the West

River watershed. The condition of these dams ranges from vestigial to intact. Three of these structures are preventing Atlantic salmon access to potential rearing areas, therefore, their complete removal is recommended. They are as follows:

<u>Dam</u>	<u>Potential Salmon Rearing Area (miles) Obstructed</u>	<u>% of Total Available Rearing Area in System</u>
Main River Dam (3)*	4	24%
Union Dam (13)	3	18%
South West Lake Dam (14)	1	4%
	<hr/> 8	<hr/> 46%

Six more structures should be completely removed as they partially obstruct waterways frequented by either Atlantic salmon or Speckled trout, these are as follows:

- Slasher Dam (1)
- Rocky Lake Dam (11)
- Sams Lake Dam (12)
- Black Brook Lake Dam (19)
- Cameron Dam (20)
- Lower Kidney Lake Dam (16)

Finally, the stoplogs and stoplog retainers (steel) on Lower or Mill Dam (2) should be removed to prevent debris accumulation and thus facilitate salmon access to the lake area.

A 20-foot natural falls (31) located on the Main West River, 5 miles above the Main River Dam, was also investigated. It obstructs passage to 5 miles of stream or approximately 15% of the available salmon rearing area in the West River system. The cost of facilities to overcome this obstruction has been estimated at \$60,000. No recommendation has been made because the benefits accrued from this development work would not warrant the capital expenditure.

The potential increase in salmon production from the

* Location indicated by number on attached map.

proposed dam removal could result in an additional 105 fish angled each year. The expenditure generated by this increase in angling yield is estimated at \$12,600 per annum.

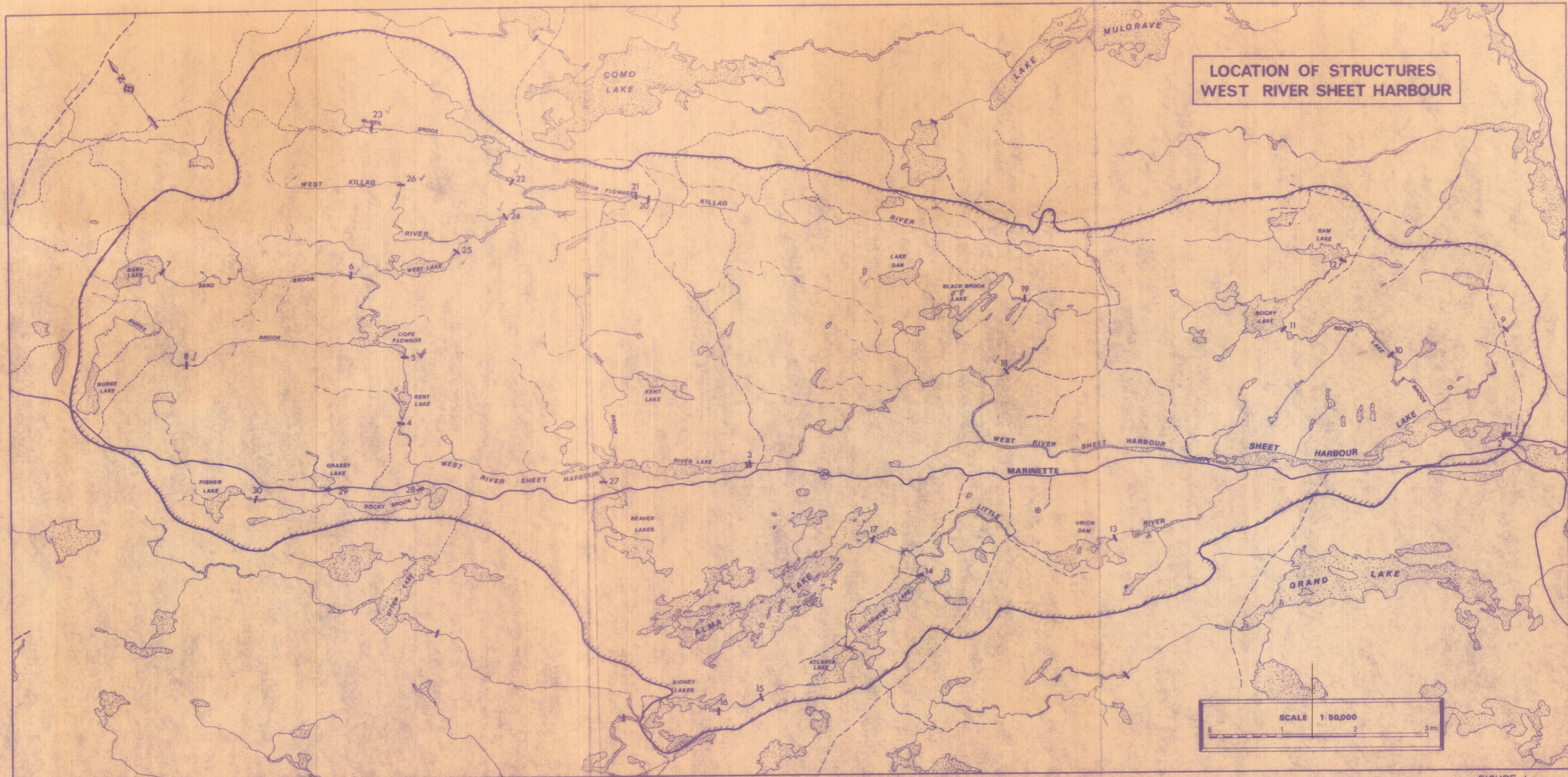
SOURCE OF INFORMATION

The following references were used in the preparation of this report:

1. Topographic Maps (1954) - Scale 1:50,000
2. West River, Sheet Harbour, Description of Structures by Department of the Environment, Water Planning and Management Branch, December, 1972.
3. A report dated November, 1972 by Scott Paper Company prepared for the Nova Scotia Water Resources Commission.
4. Biological Survey Report of 1965, Department of the Environment, Fisheries Service, Resource Development Branch.
5. Spargo, R.A., 1961. Benefit-Cost Analysis and Project Evaluation, p. 299-310. In "Resources for Tomorrow" Conference in Montreal, October 23-31, 1961. Vol. 1.

In addition, an air reconnaissance of the West River, Sheet Harbour system was carried out in a Nova Scotia Lands and Forests Beaver aircraft on October 27, 1972. The flight was not too successful, however, because of the excessive speed of the aircraft which made it possible only to obtain quick glimpses of structures.

On three occasions in November and December site visits were made to obtain detailed information on several of the dams and on the rapids below Kent Lake that were located from the flight on October 27, 1972.



**LOCATION OF STRUCTURES
WEST RIVER SHEET HARBOUR**

SCALE 1:50,000
0 1 2 3 mi

FIGURE 1



1 - Slasher Dam (1) partially
breached



2 - Slasher Dam (1) looking
downstream



3 - Lower or Mill Dam



4 - Main River Dam (3)



5 - Natural falls (31)
impassable to Atlantic
salmon



6 - Same as - 5 - View from
the bluff. Note river
section (approx. 50 feet
wide) above.