NEWFOUNDLAND AND LABRADOR HYDRO

A BRIEF OVERVIEW OF ENVIRONMENTAL INFORMATION ON THE POTENTIAL HYDROELECTRIC DEVELOPMENT OF THE BAY DU NORD AND MAIN RIVERS

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FOREWORD

As part of Hydro's planning process for system expansion, the Environmental Services Department was requested to prepare a preliminary environmental overview of five potential hydroelectric sites on the Island of Newfoundland. The sites which were judged to be relatively less environmentally sensitive, Granite Canal, Island Pond and Star Lake were discussed in a report prepared by Environmental Services Department (November 1982).

The Main and Bay du Nord Rivers are discussed separately because they present major environmental concerns. While such concerns should not eliminate these rivers from consideration, the following points must be noted:

1. The costs of assessing, monitoring and mitigating the impacts of developments on these rivers will run into millions of dollars.

2. Development of these rivers would result in unmitigatable impacts on their wilderness, recreational and scientific values.

3. The relatively pristine nature of these major rivers ensures opposition to development by organized environmental groups.

4. Approval to proceed with these developments under the Environmental Assessment Act cannot be guaranteed.

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1. INTRODUCTION

It is a responsibility of Hydro's Corporate Planning Division to present recommendations for system expansion. These recommendations should reflect both the result of cost effectiveness analysis of alternatives and the technical, economic and environmental implications of each available alternative.

As part of this planning process, the Environmental Services Department was requested to prepare a preliminary environmental overview of five potential hydroelectric sites on the Island of Newfoundland. Information on two of these sites, Main River, and Bay du Nord River is presented in this report. The remaining locations, Granite Canal, Island Pond and Star Lake, are discussed in a separate report.

In order to satisfy this request, the Environmental Services Department defined the following objectives.

1. To obtain and review available environmental information concerning the sites;

2. To identify data gaps and the studies required to satisfy these data deficiencies;

3. To comment on the environmental sensitivity of these sites;

4. To identify potential resource use conflicts;

5. To examine the proposals in light of existing provincial and federal legislative frameworks; and,

6. To rank the two proposals in terms of environmental preference for consideration along with engineering and economic criteria.

In order to obtain environmental information and to gauge government reaction to the proposed developments, representatives of the following federal and provincial resource and regulatory agencies were interviewed:

a) Provincial Wildlife Division (J. Hancock, K. Curnew and M. Strapp).
b) Provincial Parks (G. Ryan)
c) Historic Resources Division (J. Sproull-Thompson)
d) Department of Mines and Energy (D. Vanderveer, K. Anderson, and B. Greene)
e) Forest Inventory Division (G. Small)
f) Fisheries and Oceans Canada (H. Bain, R. McGubbin, T. Anderson, T.R. Porter and J. Pratt)
g) Canadian Wildlife Service (I. Goudie)

Documents obtained from these agencies and from Hydro's files were reviewed for pertinent information.

2. LEGISLATIVE FRAMEWORK

The government of Newfoundland and Labrador has developed Acts, regulations and guidelines to protect the environment. This section briefly discusses certain relevant pieces of legislation which may affect the potential developments.

The Environmental Assessment Act is the means by which government evaluates the potential overall environmental impacts of hydroelectric developments.

Once a development is registered under this Act, the Minister of Environment based on the advice of selected Provincial and Federal Government Departments, decides whether or not an environmental assessment is required. If an assessment is required, then the Minister, on the advice of an Assessment Committee composed of representatives of concerned government departments, provides guidelines for studies to be done as part of an impact assessment. Once the proponent has completed the required studies, he must submit an acceptable Environmental Impact Statement (EIS) to the Minister. The Minister evaluates the environmental impact of a development based on the contents of the EIS, the advice of the Assessment Committee and, if he feels it necessary, on the results of public hearings. The Minister must then recommend to Cabinet that the development be permitted to proceed subject to any terms or conditions, or not be permitted to proceed. This whole process can take from about 1.5 years to three or four years depending on the sensitivity of the proposal.

Other legislation, for example, the Fisheries Act, the Department of Environment Act and the Quarries Act deal with activities during the construction and operation of a facility. It is important to be aware of this legislation since it can cause delays in obtaining necessary approvals and permits, and/or the imposition of special conditions because of the environmental sensitivity of an undertaking. The application of specific pieces of legislation pertaining to various construction activities cannot be defined until a detailed description of the development is available. However, it is essential to recognize that provincial and federal environmental legislation can cause increased costs in terms of delays and modifications throughout the construction and operation of a development.

3. DEVELOPMENT OUTLINE

3.1 Main River

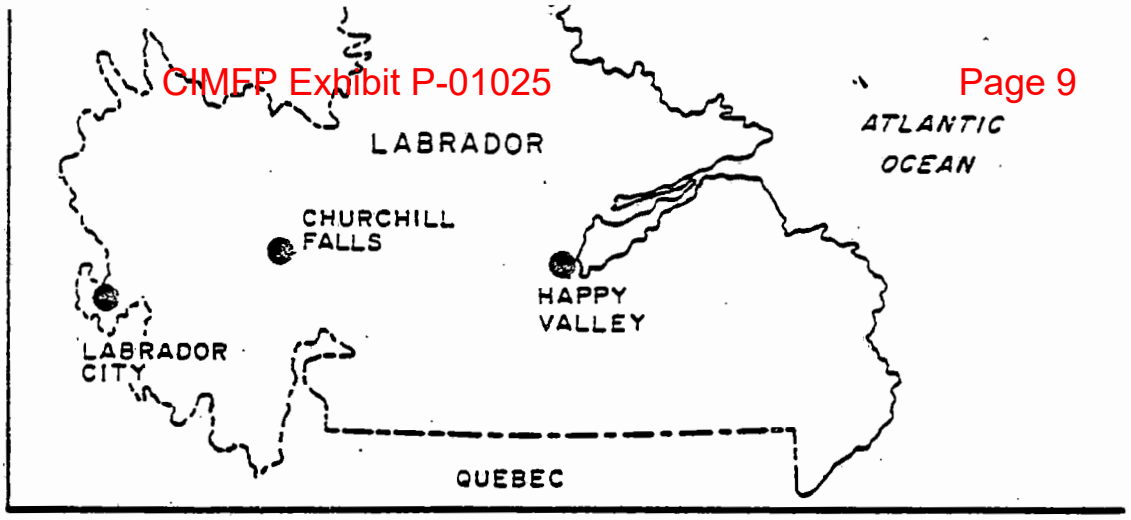
The Main River is situated in the southern portion of the Great Northern Peninsula of insular Newfoundland (Figure 1). From its headwaters on the eastern slope of the Long Range Mountains, the river flows east, into Sop's Arm, White Bay. The river is about 50 km long and drops from an elevation of 400 m to sea level at a rate of approximately 65 m/km.

The scheme envisaged for developing hydroelectric power on the Main River is described in the report "Water Resources Study of the Province of Newfoundland and Labrador" prepared for the Atlantic Development Board by Shawinigan Engineering Company Ltd. and James F. MacLaren Ltd. in 1968. The Development requires a dam located on the river approximately 22.5 km above the mouth to create the required storage (Figure 2). A forebay dyke would be located about 1.6 km east of the main dam, and two spillway structures would be situated in the area north and east of the forebay dyke. From the forebay dyke a combination of pipelines and penstocks would conduct the water a distance of some 9 km to the powerhouse located about 3.2 km from the river mouth. The continuous power available is 110 MW.

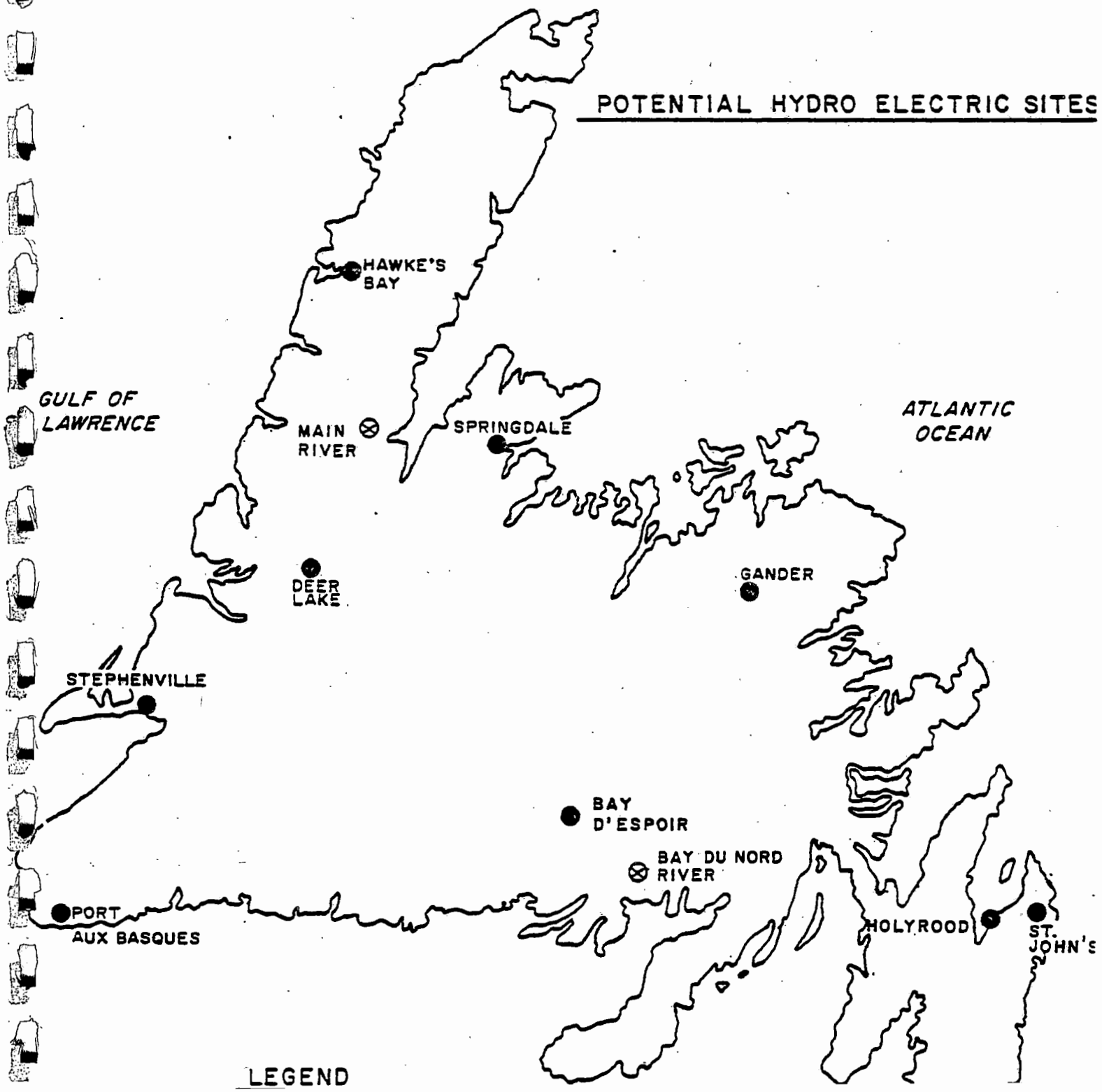
3.2 Bay du Nord River

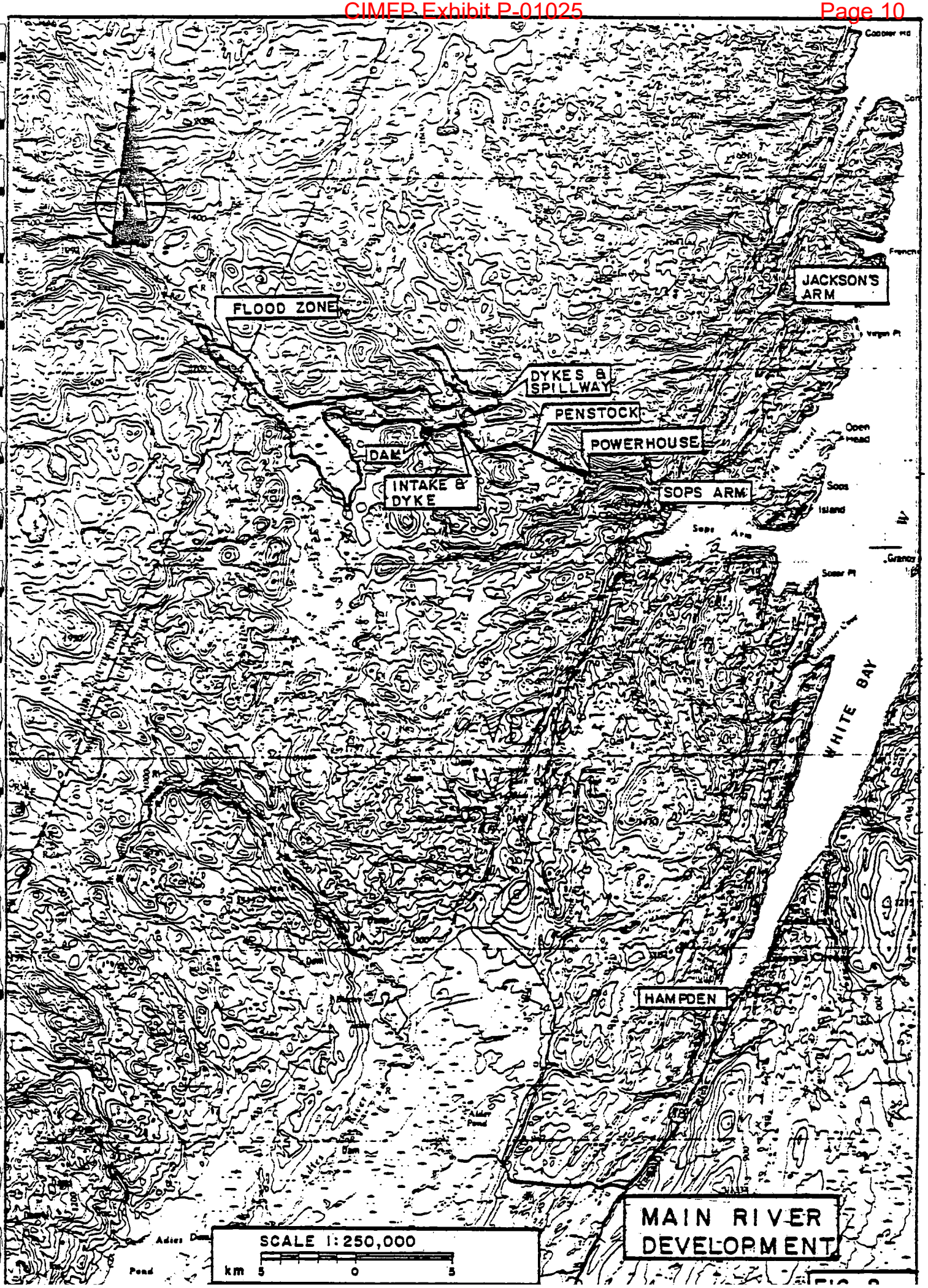
This large river flows south from its headwaters in the southeast portion of the Island to Fortune Bay on the south coast (Figure 1). It is made up of three distinct sections:

FIGURE I



POTENTIAL HYDRO ELECTRIC SITES




FLOOD ZONE
JACKSON'S ARM
DYKES & SPILLWAY
PENSTOCK
POWERHOUSE
DAM
INTAKE & DYKE
SOPS ARM
WHITE BAY
HAMPDEN
MAIN RIVER DEVELOPMENT
SCALE 1:250,000
km 5 0 5

1) The upper section is a vast system of lakes and ponds on an elevated plateau.

2) The middle section between Meddonegonex Lake and Smokey Falls is comprised of steadies and narrow ponds joined by short sections of boulder/rubble bottomed stream.

3) The lower section from Smokey Falls to its outlet near the abandoned community of Bay du Nord is deep, slow-flowing and surrounded by high forested hills.

The scheme of development, presented to the Newfoundland and Labrador Power Commission in a report by ShawMont Newfoundland Ltd. in January 1966, involves the provision of storage on Meddonegonex Lake and a series of dykes to lead the water some 13 km to a point adjacent to the Bay du Nord River valley where about 147.5 m of head can be developed (Figure 3). The total drainage area of the Development is 107,488 ha and it would have a total regulated flow of 28.61 m^3/s. It will have a full supply level of 165.2 m above sea level (asl), a low supply level of 163.2 m a.s.l and a tailwater level of 17 m a.s.l. The continuous power available is 62 MW. Northwest Brook, which lies in a valley adjacent to the Bay du Nord River, would have some of its upper drainage area diverted into this Development.

4. ENVIRONMENTAL REVIEW

4.1 Main River

4.1.1 Fisheries

The Main River is an important Atlantic salmon river for the province both in terms of smolt production and the angled catch of returning

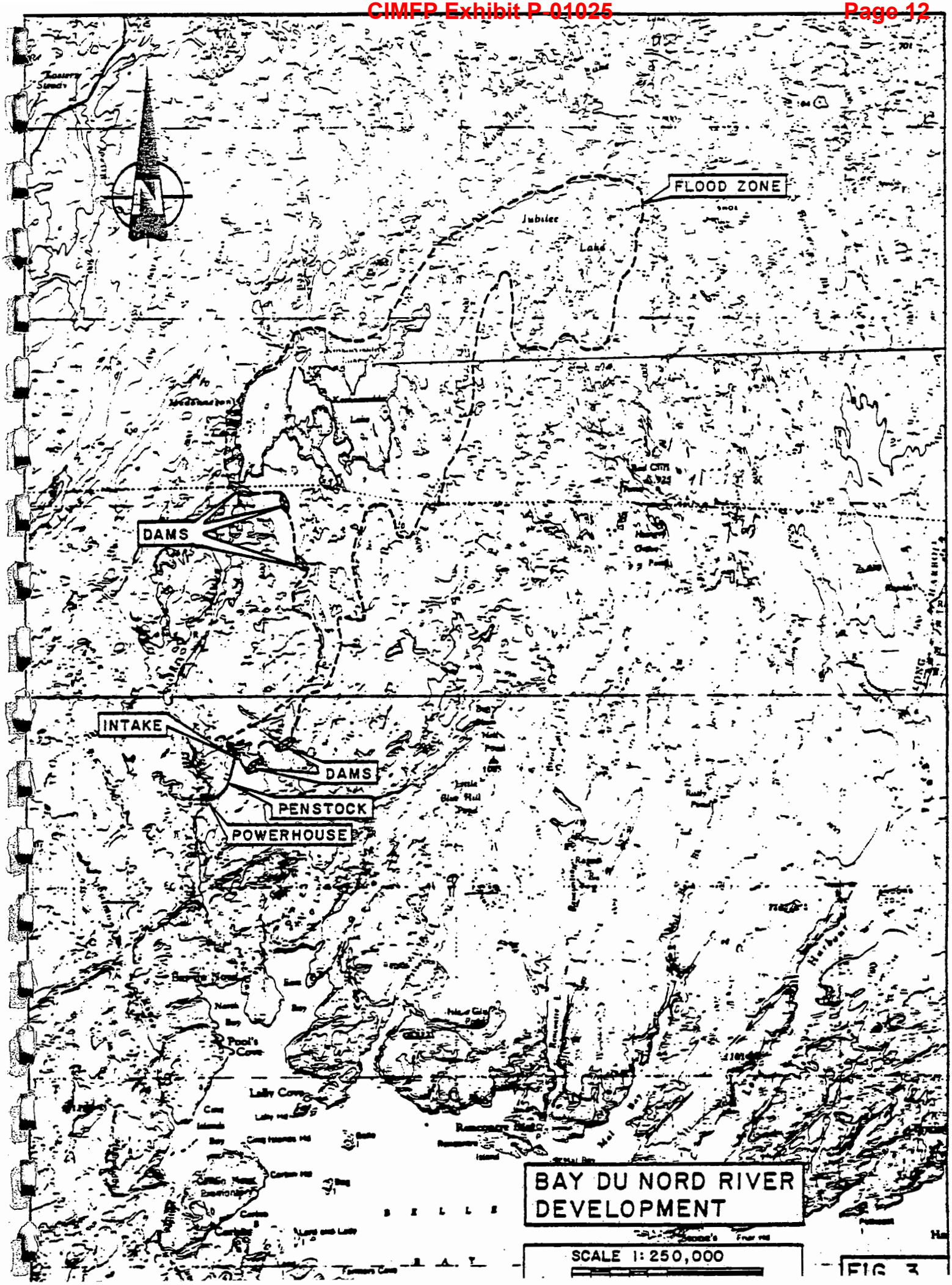

FLOOD ZONE
Jubilee
Lake
DAMS
INTAKE
DAMS
PENSTOCK
POWERHOUSE
BAY DU NORD RIVER
DEVELOPMENT
SCALE 1: 250,000

FIG 3

salmon. In 1980, the last year for which statistics are available, the total number of salmon and grilse angled on the Main River was 1,011 which was 2.7 percent of the total angled in insular Newfoundland. The catch-per-unit-effort (CUE-number of fish angled per rod day; a rod day is defined as any day or part thereof on which an individual angles) for this river was 1.1 in 1980 as compared to an average CUE of 0.36 for insular Newfoundland. In general, catches and the CUE have been increasing on this river since 1953. The number of rod days fished on this river have increased from 17 in 1953 to 916 in 1980 (Moores et al. 1978, 1979, 1980 and 1981).

Fisheries and Oceans surveyed Atlantic salmon spawning and rearing habitat in the Main River and its tributaries in 1971. They estimated that 20,547 units of rearing habitat and 5,480 units of spawning habitat were available in the system. Assuming two smolts produced per unit of habitat they estimated an annual production of 41,094 smolts. With an assumed 15% adult sea survival rate the adult return was estimated at 6,164 fish (Riche et al. 1981).

Not all salmon rivers in Newfoundland have been surveyed for salmonid spawning and rearing habitat so a comparison cannot be made between that available in the Main River and that in Newfoundland in general. However, Porter et al. (1974) do present habitat survey data for three other Atlantic salmon rivers on the eastern side of the Great Northern Peninsula; these include Beaver Brook with an estimated 4,375 units of accessible rearing habitat, Cloud River with an estimated 5,605 units accessible and Cat Arm River which Beak (1980) estimated as having 160 units accessible.

The information noted above gives an indication of the relative importance of the Main River for Atlantic salmon production in this province. However, much more detailed studies are required to provide the information required for an assessment of the impacts of this hydroelectric project. Studies are needed to determine more accurately the actual smolt production and salmon run on this river. As well we need to

know the relationship between salmon production and the hydrology, water quality, invertebrate populations, and other fish populations (i.e. trout) in this river.

4.1.2 Wildlife

The Main River valley is part of the range of the two caribou herds which occupy the Great Northern Peninsula, the Humber herd and the Northern Peninsula herd (Northland Associates, 1980). The former herd is believed to number about 350 animals and the latter about 1850 (Northland Associates 1980, MacLaren Plansearch 1982).

The Main River is within Caribou Management Area No. 69. In 1981 the Newfoundland Wildlife Division set a quota of 100 resident licences (50 either-sex and 50 male-only) for this area. No non-resident licences were issued for this area (M. Strapp pers. comm.).

The lower section of the Main River is within Moose Management Area 4 and the headwaters are within Area 3. The last year of census for Area 3 was 1973 and the estimated population was 4200 moose for an estimated density of 1.08 moose per km^2. In 1979 this area had a total of 603 licences issued and a hunter success rate of 51%. The last census for Area 4 was in 1978 and the estimated population was 1560 moose for an estimated density of 0.39 moose per km^2. In 1979 this Area had a total of 800 licences issued and a hunter success rate of 44% (M. Strapp pers. comm.). The overall hunter success rate for moose management areas on the Island in 1979 was 54% and the highest success rate for that year was 84%, recorded for Area No. 29, the Bonavista Peninsula.

There is a lack of published information on both furbearer and avian populations and habitat along this river. I. Goudie, Canadian Wildlife Service, has studied the area and indicated that it is important to waterfowl, particularly Canada Geese, which use the area in the summer and fall for brood rearing and molting.

Hydro has contributed a great deal to the knowledge of wildlife resources on the Great Northern Peninsula as a result of studies undertaken for the Cat Arm and proposed Lake Michel Hydroelectric Developments. However, information is lacking regarding wildlife use of habitat in the development area. This information is necessary of the impacts of this development are to be predicted and mitigated.

4.1.3 Hydrology

The Department of Environment has provided Hydro with detailed quidelines entitled "Hydrologic Descriptions of Hydro Projects for Environmental Impact Statements". The main headings include:

1) Basin Description
2) Historical Data
3) Generalized and Simulated Data, and Data Acquisition
4) Hydrologic Regime Analysis (Main River System, Major Tributaries, Proposed Diversion)
5) Project Description and Hydrologic and Hydraulic Design
6) Hydrologic Impacts (Upstream and Downstream Impacts, Main River and Tributaries)

Very little of this information is available for the Main River Development and none is available in the detail requested.

4.1.4 Forestry

The Department of Forest Resources and Lands has mapped the forest cover along this river at scales of 1:50,000 and 1:15,840. Much of the area affected by the Main River Development is classified as productive forest land. Bowater Newfoundland Ltd. holds the timber rights in this area.

The actual amount of merchantable timber that would be impacted in the flood zone or right-of-ways of the development can only be determined by detailed inspection of aerial photographs with some ground truthing. Bowater is apparently very interested in accessing merchantable timber along the Main River at this time (G. Small pers. comm.).

4.1.5 Social and Recreational Concerns:

A major archaeological site has been identified and investigated at Sop's Island near Sop's Arm, White Bay. These studies indicate that the site has at least two components, one of which belongs to the Dorset Eskimo culture and another to an Archaic culture (Linnamae 1975).

The Dorset are believed to have used this area for exploiting three major food resources; seals in White Bay, salmon in the Main River and caribou. Therefore, there is a high probability that other archaeological sites exist along the Main River. An investigation by a professional archaeologist should ensure all features of archaeological signigicance are identified.

Sop's Arm provincial park is located at the mouth of the Main River and statistics on its use are available from the Parks Division.

The main appeal of the Park has been the good salmon angling available in the nearby river (G. Ryan pers. comm.).

The Main River has been recommended to canoeing enthusiasts by Parks Canada in its 1977 publication "Wild Rivers; Newfoundland and Labrador". The canoe route extends approximately 50 km from Four Ponds Lake in the Main River headwaters to its mouth at Sop's Arm.

The Main River is under consideration by the Wilderness and Ecological Reserves Council for designation as an Ecological Reserve. While a formal proposal has not yet been made, data collection is expected to begin early in 1983 (K. Curnew pers. comm.). The basis for ecological reserve status is related to the extensive flood plains in the Big Steady section of the river whichhave ecologically significant plant communities and are important to wildlife and waterfowl. The flood plains are extremely attractive, forming natural parklands which are rare in Newfoundland (B. Greene pers. comm.).

Some of the impacts associated with these resources can be mitigated. For example, if an archaeological site is identified it can be studied, detailed and classified to allow for removal of discovered artifacts. However, this could take a long time and result in delays to construction and production schedules. Mitigation to preserve the salmon resource would also mitigate impacts on the Provincial Park. The other two resource conflicts do not appear to be mitigatable. The canoe route would not be as attractive to lovers of pristine wilderness after construction of a hydro dam. The Big Steady area will be eliminated by the Development and that habitat cannot be preserved without a large reduction in the planned flood zone.

4.1.6 Miscellaneous:

Information on bedrock geology, mineral potential and mineral occurrence is available on 1:250,000 scale maps from the Department of Mines and Energy. Information on surficial geology has been collected but has not yet been mapped. Mineral claims are available on 1:50,000 scale maps. A description of surficial and bedrock geology at all structure locations would be required for assessment of potential conflicts with aggregate and mineral resource potentials.

A thorough socio-economic study of the area was conducted in 1980 during the Cat Arm Development impact assessment. Data from the 1981 Canada Census have been compiled and are now available. Information would be required on the actual impact of the Cat Arm Hydroelectric Development.

4.2 Bay du Nord River

4.2.1 Wildlife:

The Bay du Nord River is within the range of the Middle Ridge caribou herd which numbers approximately 3,000 animals (J. Hancock pers. comm.). Information about this herd and its utilization of the Bay du Nord area is very limited. The Wildlife Division has only in the last two years commenced a study of these animals involving radio-collaring and tracking about 30 caribou (J. Hancock pers. comm.).

In terms of caribou the Bay du Nord Development would be much like starting the Upper Salmon Development all over again. We know the caribou use the area but we don't know how critical the area is to them. Long term studies, such as those instituted at the Upper Salmon Development, would be required to define the relationship of caribou with the Development area.

The total numbers of caribou hunter licences issued for this area between 1974 and 1982 are as follows: 49 in 1974, 59 in 1975, 50 in 1976, 100 in 1977, 200 in 1978, 200 in 1979, 50 in 1980, 23 in 1981 and 75 in 1982. Despite the difference in numbers of licences issued the hunter success rate has remained fairly constant with rates of 52% in 1976, 59% in 1978, 49% in 1979 and 40% in 1981.

Moose are apparently not as numerous in this area as they are near the Main River. Moose Management Area No. 26, which includes the Development area, was last censused in 1978 and the estimated population was 803 animals. The estimated density is .21 moose per km^2. In 1979 there were 432 licences sold for this area and the hunter success rate was 47% (M. Strapp pers. comm.). This was close to the Island success rate of 54% recorded in that year.

There is no published information on either furbearer or avian utilization of the Development area. The Conne River natives are reported to trap in the Development area (J. Hancock pers. comm.).

Little is known of the present use of the Development area by wildlife. Field studies are required to provide the information necessary for potential impact assessment. I would compare the wildlife aspects with that of the Upper Salmon Development in which extensive studies and mitigation have been required pre-, during and post-development.

4.2.2 Fisheries:

Both the Bay du Nord River and Northwest Brook were surveyed by Fisheries and Oceans in 1978 for spawning and rearing habitat for Atlantic salmon. They found 2,908 units of accessible rearing habitat in the Bay du Nord River and 300 accessible units in Northwest Brook. Complete obstructions to salmon migration are located 9.9 km and 3.3 km from the mouths of these rivers, respectively. With an estimate of 2 smolts produced per unit of habitat, Fisheries and Oceans estimate the yearly smolt production of both rivers at some 5,816 and 600 respectively. The adult return is estimated at 872 and 90 fish respectively based on an adult sea survival of 15% (T.R. Porter pers. comm.). Other salmon rivers in Fortune Bay which have had salmonid habitat surveys include Garnish river with an estimated 9,283 units of accessible rearing habitat, and Terrenceville Brook with an estimated 867 units of accessible rearing habitat (Porter et al 1974).

Annual angled catch statistics have been kept on the Bay du Nord River since 1953. No statistics are available for Northwest Brook. In 1980 the number of grilse and salmon angled in the Bay du Nord River totaled 134 fish and the CUE was 0.38 (Moores et al.1981). Although the total catch was a very small percentage of the Island total, the CUE was similar to that for the province. It should be noted that both the Bay du Nord River and Northwest Brook are relatively inaccessible rivers and may be more important to the local commercial salmon fishery than to the Newfoundland sports fishery. Other salmon rivers in Fortune Bay for which angling catch statistics were kept in 1980 include Garnish River, Long Harbour River and Simmons Brook. The total number of fish angled for these rivers were 1,032, 594 and 150 respectively. The CUE for each was 0.51, 1.40 and 0.31 respectively.

In addition to Atlantic salmon, sea run trout and smelt also use this river although the size of populations is apparently not known. The large area of streams, lakes and tributaries above the obstructions

on the Bay du Nord River and Northwest Brook reportedly support populations of brook trout and ouananiche; however, no information on their abundance is available (T.R. Porter pers. comm.).

The potential for conflict with fisheries resources is high in this Development, as it is with the Main River. Any change in river flows or characteristics below the obstructions on the Bay du Nord River or Northwest Brook could impact migratory fish populations. The daming of the headwaters of Northwest Brook could impact fish habitat along the length of this brook. The daming of the Bay du Nord River below Medonnegonex Lake could impact fish habitat and populations between there and the power-house location some 50 km downstream. The flooding of existing lake shores and tributary streams could impact present fish populations. The studies which would be needed to accurately predict impacts and identify potential mitigations are extensive.

4.2.3 Social and Recreational Concerns:

There are a variety of social concerns which can arise as potential conflicts with this Development. These include archaeological sites, recreational use, a proposed Wilderness Area which includes the Development area and consideration by regulatory agencies to have the Bay du Nord River declared a Canadian Heritage River. All but the archaeological sites do not appear to be compatible or mitigatable if the hydro development went ahead.

Gerald Penny (1981) reported finding three archaeological sites of Micmac Indian origin on the headwaters of the Bay du Nord River. The first is about 3 km south of Middle Ridge and approximately 15 km inland from Conne River. The other two sites are located in the same general area. Further study would be necessary to determine whether any archaeological sites would be affected by the Development.

The Bay du Nord River has been described in very glowing terms in the Newfoundland and Labrador Canoe Route Inventory (1975). It is said to be "---an exceptional canoeing river with its many attributes as a wilderness trip through very enthralling topography and its diversity both in scenery and river characteristics." This report also mentions a cabin on Kepenkeck Lake, several cottages on Jubilee Lake, a cabin on Meddonegonex Lake and a lodge on Kaeguedek Lake, all part of the Bay du Nord River system. Daming the River at Meddonegonex Lake will take away the pristine nature of the canoe route, will greatly reduce the value of the lower river and could reduce the value of the upper river because of flooding.

In 1981 the Wilderness and Ecological Reserves Advisory Council proposed that an area of the southeast coast of Newfoundland which includes the potential Development area be given Wilderness Reserve Status under the Wilderness and Ecological Reserves Act. No decision has been made on this proposal as yet. The area of direct impact of the potential hydroelectric Development represents about one fifth of the proposed Wilderness Area with obvious reduction of its potential. Parks Canada and Provincial Parks Division have cooperated in funding a study of the Bay du Nord River system to determine its potential for inclusion in the Canadian Heritage River System. The final report has been presented by McLaren Plansearch Ltd. but has not yet been made public. Parks Canada has published proposed criteria for inclusion in the Canadian Heritage River System (G. Ryan pers. comm.). They are as follows:

"1) Heritage rivers or designated sectors of rivers will be outstanding representations of the major river environments of Canada, with particular attention given to their role in Canadian history; and

2) Heritage rivers will satisfy the following physical criteria;
   i) free of impoundments within designated sector; and
   ii) shorelines essentially natural; and
   iii) the water relatively free of man-made pollutants; and
   iv) inaccessible by road except at occasional crossings; and
   v) river flow sufficient to support low intensity recreation activities; and

3) Heritage rivers and their associated lands will exist as an environmental unit so as to:

   i) provide visitors with a natural experience by preserving the lands seen from the river surface and the shorelines as much as possible in an unaltered state; and

   ii) adequately portray the scale, character, and themes of the river regime and associated lands; and

   iii) ensure the ecological integrity of the river and associated lands; and

4) Consideration will also be given to:

i) the degree of threat to the natural environment; and

ii) the geographic distribution of Canadian Heritage Rivers; and

5) In addition to meeting the above criteria, before a river will be formally included in the Canadian system, provision will be made for the long-term protection of heritage rivers through legislation, regulations, policies and management plans."

A Heritage River and a hydroelectric development are obviously not compatable developments.

4.2.4 Miscellaneous:

Information on bedrock geology, mineral potential and mineral occurrence is available on 1:250,000 scale maps from the Department of Mines and Energy. Information on surficial geology has been collected but has not yet been mapped. Mineral claims are available on 1:50,000 scale maps. A description of surficial and bedrock geology at all structures would be required for assessment of potential conflicts with aggregate and mineral resource potentials.

The hydrologic and hydraulic design information requested by the Department of Environment in their guidelines "Hydrologic Descriptions of Hydro Projects for Environmental Impact Statements"

would have to be provided for the Bay du Nord Development. The Inland Water Directorate, Environment Canada, has operated a hydrometric gauging station at Big Falls on the Bay du Nord River since 1952. The data from this source would have to be tabulated and combined with detailed structure design information to fulfill the Department of Environment guidelines.

The Department of Forest Resources and Lands has mapped the forest cover in the area at scales of 1:50,000 and 1:15,840. Much of the area is classified as productive forest land to which the Crown holds all timber rights. The province is developing plans for accessing merchantable timber in the area but no schedule has been set (G. Small pers. comm.). The actual amount of merchantable timber that would be impacted in the flood zone or right-of-ways of the Development can only be determined by detailed inspection of aerial photographs with some ground truthing.

The latest socio-economic study of the Bay D'Espoir area was done in 1979 as part of the Upper Salmon Hydroelectric Development environmental assessment. No socio-economic studies are available for the Belleoram or Harbour Breton areas.

5. DISCUSSION

Both Developments would have a high potential for conflict with other valuable resources. Both can be expected to be expensive in terms of assessment, monitoring and mitigation relative to other developments, such as Cat Arm. Also both have the potential to attract a great deal of public attention and opposition.

1) Assessment:

Without going into detail regarding the actual studies which would be required to adequately assess the overall environmental impact of these Developments, Table 1 provides, under general headings, a comparison of the relative costs estimated for assessment studies of these Developments.

TABLE 1

COST OF ENVIRONMENTAL ASSESSMENT

Study Topic	Main River	Bay du Nord
1. Fisheries, Water Quality & Invertebrates	$500,000	$300,000
2. Wildlife	$ 60,000	$250,000
3. Forest Inventory, Reservoir Preparation and Biophysical	$100,000	$200,000
4. Archaeology	$ 20,000	$ 20,000
5. Socio-economic	$ 25,000	$ 30,000
6. Public Hearings and Related Items	$ 50,000	$ 50,000
TOTAL	$755,000	$850,000

As part of the fisheries studies for the Main River we would have to update the stream and tributary habitat data, establish at least one fish fence on the river for counting the numbers of smolt passing downstream to the ocean and the numbers of salmon returning successfully to the river, study invertebrate populations in the system, collect water quality data and study the importance of headwater lakes and ponds to fish production in the system.

The fish studies required for assessment of the Bay du Nord Development are similar except that the salmon and smolt studies are less intensive and more emphasis must be placed on fish populations in upstream flooded areas and dewatered areas below the main dam.

The difference in the cost of wildlife studies for the two projects is reflective of the fact that Hydro's studies, for Lake Michel and Cat Arm, have already provided information on caribou in the Main River area. At Bay du Nord we have to start from scratch. Also it is felt that wildlife studies for the Main River Development can be completed in one year whereas the need for caribou telemetry information at Bay du Nord will likely stretch those studies over at least two years.

The timing of Environmental Impact Statement preparation for the two Developments is illustrated in Table 2.

TABLE 2

TIME REQUIRED FOR ENVIRONMENTAL ASSESSMENT

Activity	Main River	Bay du Nord
1. Registration	1.5 months	1.5 months
2. Terms of Reference for E.I.S.	1.5 months	1.5 months
3. Studies and E.I.S. Preparation	14 months	24 months
4. Review of E.I.S. by Minister (assume no addendum required)	2.25 months	2.25 months
5. Public Hearings	6.5 months	6.5 months
TOTAL	25.75 months	35.75 months

These can be interpreted as minimum time periods since any complication which could delay or extend component studies would extend the E.I.S. preparation.

2) Monitoring:

The costs and complications of hydroelectric developments associated with environmental concerns do not stop with the completion of impact assessments. Monitoring programs are required to ensure that construction techniques cause minimum

environmental damage and that the impacts of the project on other valuable resources are not excessive.

The cost of environmental monitoring can be quite high depending on the resource conflicts. For example approximately $880,000 will be spent on overall caribou studies and monitoring programs at the Upper Salmon Development. An additional $330,000 will be spent in monitoring fish resources at this Development.

Given the information available at this time it appears that a major fisheries monitoring program would be necessary during development of the Main River. Given the much higher value of the resource in comparison to the Upper Salmon the studies would be much more intensive. I would estimate the need for a fish counting fence study each year during construction to monitor the effects on each year's smolt production. This amounts to a cost of about $100,000 per year. A counting fence study would also likely be required for a period post-construction, but the duration cannot be estimated at present.

The Bay du Nord Development could have a major impact on both fisheries and wildlife. Again a fish counting fence study for each year of construction and for a period post-construction may be required as well as ongoing caribou telemetry studies. These overall costs could be about $250,000 per year.

3) Mitigation & Compensation:

In the past, resource regulatory agencies such as the Wildlife Division and Fisheries and Oceans have required, as part of Cabinet approval of hydroelectric developments, that, wherever

possible, mitigation be implemented to reduce potential impacts. For example, mitigation by hydro to try and minimize the impact of the Upper Salmon Development on brook trout and ouananiche is estimated to cost about $4,100,000 over the 60 year life of the Development.

Not all impacts of hydroelectric developments are mitigatable. In the past some resource agencies such as Fisheries and Oceans, have been willing to discuss compensation for unmitigatable loss of resources or resource potential to enable developments to proceed.

The paucity of information regarding development design and baseline environmental information for both the Main and Bay du Nord Rivers makes it impossible to discuss mitigation in any more than general terms. The following comments can be offered:

a) Main River:

- water release will be required year round to protect fish habitat below the dam and permit the Atlantic salmon migration to continue. Water release at the Upper Salmon Development is estimated to cost about $2.2 million over the life of the Development.

- mechanisms will have to be put in place to allow Atlantic salmon passage over or around the dam and to allow smolt passage in the spring. Fisheries and Oceans has estimated the cost of a fish elevator at a similar existing dam at Red Indian Lake to be $1,200,000 (J. Pratt pers. comm.). It may be possible to reduce costs by incorporating a fish elevator into the design of the proposed dam.

- a hatchery facility will likely be required to compensate for habitat lost to flooding above the dam. Studies carried out for the Upper Salmon Development indicate that the minimum cost of such a facility would be $3,000,000.

- mitigation during construction, especially of the main dam, is a very likely requirement. This could entail extensive siltation control mechanisms, modification of the construction schedule and provision for fish passage.

- it is possible that Hydro could be asked to compensate for any lost moose or waterfowl habitat.

- salvage of all merchantable timber is also a likely mitigation requirement.

- compensation for loss of productive forest potential is also a possibility.

- if an archaeological site is found, all construction which could impact the site would have to be delayed until the completion of all investigation and classification and the careful removal of all artifacts. In the case of a large find this could take years.

b) Bay du Nord:

- continuous water flow will have to be assured below the powerhouse to permit the Atlantic salmon run to continue.
- water release may be needed on Northwest Brook.
- a fish hatchery will likely be required to compensate for fish habitat lost to flooding and dewatering.
- it is possible that compensation would be required for lost wildlife habitat.
- salvage of all merchantable timber is also a likely mitigation requirement.
- compensation for loss of productive forest potential is also a possibility.

6. CONCLUSION AND RECOMMENDATIONS

As can be seen from the discussion,both projects are very complex and potentially expensive from an environmental standpoint. Also it can be seen that some impacts of these developments on the social and recreational aspects of the rivers ie: canoeing routes, Ecological Reserves, Wilderness Area, Heritage River etc., are nonmitigatable. Organized groups and individuals such as the Wilderness Society, the Wildlife

Federation, SPAWN and SAEN who are concerned about the destruction of natural ecosystems by development, will likely oppose these two projects. Reaction from an Environmental Assessment Committee would, I believe, be mixed. Table 3 illustrates the conflicts with resource agencies on the Assessment Committee which would be expected with these Developments. This illustrates that because of the potential for impact on other resources, the Main River Development is expected to meet with disapproval from three government agencies. The Bay du Nord River Development is expected to meet with disapproval from two agencies.

Assessment of the Bay du Nord Development is expected to cost about $100,000 more than that of the Main River Development to complete. It is also expected to take about 10 months longer to complete and to cost about $600,000 more to monitor during construction. However, mitigation and compensation costs for the Bay du Nord Development are expected to be at least $1,200,000 less than those for the Main River and may be much more depending on water release requirements for both. Also development of the Bay du Nord River with acceptable mitigation proposals should have about a 60% chance of getting an acceptable recommendation from the Assessment Committee. The Main River Development can only be given a 50:50 chance of getting such an acceptable recommendation. Both Developments can be expected to meet with opposition from public groups organized to protect wilderness areas in Newfoundland and Labrador.

It is the recommendation of this report that the Bay du Nord Development is the more attractive of the two Developments discussed and should be proposed for development before the Main River.

TABLE 3

EXPECTED RESOURCE/REGULATORY AGENCY

REACTION TO THESE POTENTIAL DEVELOPMENTS

	MAIN RIVER			BAY DU NORD		
	May Approve	May Disapprove	May Approve with Mitigation	May Approve	May Disapprove	May Approve with Mitigation
Canadian Wildlife Service		X				X
Environmental Protection Service			X			X
Department of Fisheries and Oceans			X			X
Canadian Forestry Service			X			X
Department of Fisheries			X			X
Department of Municipal Affairs	X			X		
Department of Labour & Manpower	X			X		
Department of Social Services	X			X		
Department of Mines and Energy			X			X
Department of Education	X			X		
Department of Forest, Resources & Lands			X			X
Rural, Agriculture & Northern Development	X			X		
Wildlife Division		X			X	
Parks Division		X			X	
Historic Resources Division			X			X

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