1 INTRODUCTION

1.1 Background and Purpose

The concept of providing a fixed transportation link between the Island of Newfoundland and Labrador (and mainland Canada) across the Strait of Belle Isle has been the subject of discussion for many years. Recently, a renewed interest in the concept has developed as a means of making a direct connection with the national highway system and providing a greater degree of integration between the Island of Newfoundland and Labrador.

In early 2004, the Public Policy Research Centre of Memorial University, acting on behalf of the Government of Newfoundland and Labrador and in keeping with its mandate of studying and aiding in the formulation of social and economic public policy, requested a proposal from independent consultants to conduct a study of fixed link concepts at a pre-feasibility level. The objective of the study was "to undertake an independent examination of the economic and technical implications and viability of constructing a fixed transportation link across the Strait of Belle Isle between Labrador and the Island of Newfoundland."

In April 2004, the Policy Centre awarded a contract for the study to Hatch Mott MacDonald. The Atlantic Canada Opportunities Agency (ACOA) and the Government of Newfoundland and Labrador provided financial support for the study. The Policy Centre directed the study with advice from a Project Advisory Committee which consisted of Policy Centre representatives as well as representatives from ACOA, Transport Canada, Government of Newfoundland and Labrador, Newfoundland and Labrador Hydro, and an independent technical advisor.

In keeping with the Terms of Reference the study was undertaken in four distinct phases as follows:

Phase 1 – Background and Research involving a literature review of previous work in the study area as well as of related projects internationally.

Phase 2 – Engineering and Technical Feasibility Options Analysis that entailed the identification and evaluation of alternative fixed link configurations and associated infrastructure, costing, and schedule development. The alternatives to be considered were road and rail tunnels (drill and blast and bored); immersed tube tunnel; bridge and causeway; or various combinations of these alternatives. The relative risks of these alternative concepts were assessed in this feasibility analysis.

Phase 3 - Economic and Business Case Analysis requiring economic analysis, business case analysis, and sectoral analysis of the preferred fixed link option from Phase 2. This phase also required additional analysis encompassing considerations of the economic implications of installing a high voltage direct current (HVDC) transmission, and a preliminary identification of the potential environmental implications of a fixed link. This phase further required the analysis of an upgraded ferry as an alternative to a fixed link.

Phase 4 - Financing encompassing an assessment of potential public and private sector options to develop and operate the proposed infrastructure and the financing arrangements and implications associated with these options

Figure 1.1 is a map of eastern Canada showing the existing transportation connections as well as a proposed fixed link connection to the Island of Newfoundland. The location of the link on this map is the shortest route across the Strait and follows the proposed route in prior power transmission studies. The primary existing

connection that would be affected by a fixed link is the ferry service across the Strait of Belle Isle, which is currently seasonal. The route of this service, as well as the ferry services from Nova Scotia to the Island of Newfoundland, is also shown.

Figure 1.1 – Location Map

1.2 Overview of Previous Work

The most relevant work in the study area is that carried out over a 10-year period in the 1970's and early 1980's by the Lower Churchill Development Corporation (LCDC). This comprehensive program of site investigations and engineering studies related to the crossing of the Strait for the purposes of electricity

transmission from proposed hydroelectric developments on the Lower Churchill River in Labrador. In the early work, the proposed method of carrying the high voltage cables was in a tunnel that would be constructed in the deep Precambrian granite underneath the Strait. At that time, holes were drilled on both the Newfoundland and Labrador sides of the Strait in the locations of proposed tunnel shafts to the depth of this granite layer to obtain geological information. The tunnel was to be created through drill-and-blast methods and by being in this zone; potential problems with water ingress and fragmented rock in the upper sedimentary layers would be avoided. Also, the risk of damage to submarine cables laid on the sea bottom from iceberg scour would obviously be avoided.

By late 1979, however, as more sophisticated studies of the risk associated with iceberg scour problems were conducted and ditching technology became more advanced, it was concluded that a cable crossing route could be selected such that the risk associated with scour of a submarine cable could be reduced to an acceptable level. Additional engineering studies were then conducted for such a cable crossing over a more circuitous route than the straight-line tunnel route from Pointe Amour in Labrador to Yankee Point in Newfoundland.

Throughout the period of these studies, climatic, oceanographic, seismic, and geological/geotechnical data were collected, and detailed engineering assessments, schedules and cost estimates were developed. Some 40 reports were produced. Information obtained from these reports, which were made available to the study by Newfoundland and Labrador Hydro, together with information obtained from other studies done by Newfoundland and Labrador Hydro in the late 1990's and public sources, formed the basis of much of the study background as well as for the development of an understanding of the geology of the Strait and the physical environment of the study area.

1.3 Study Approach

The work was conducted generally according to the phases identified above. On completion of each phase, a meeting was held with the Project Advisory Committee to review progress before proceeding to the next phase. The initial step was to review the prior work conducted by LCDC and Newfoundland and Labrador Hydro, as well as other information in the public domain, in order to understand the study environment and the potential problems inherent in any fixed link across the Strait. Concurrently, a review of relevant fixed link concepts worldwide was undertaken, and potential traffic volumes on a fixed link across the Strait were projected in order to broadly size the link capacity and configuration.

All of the potential concepts for a fixed link were assessed in a preliminary manner, and based on knowledge of the most up-to-date technology, design and costing were taken to a level sufficient to determine whether each concept was practicable and technically and economically viable. Information required for the business case and economic analysis of a fixed link was developed from the relevant sectors of the economy through discussions with government officials, transportation company representatives and Statistics Canada and provincial government department data. Using this information and the engineering estimates associated with the preferred concept, the study team then conducted various financial and economic analyses to determine the overall feasibility of the concept. Potential methods of financing the implementation of such a concept were also addressed.

All of the work was then brought together in this report. The report is structured generally according to the phased approach of the study. Following this Introduction, a review of relevant fixed links worldwide is presented in Section 2; the geology, physical environment of the study area and associated design criteria, as well as a preliminary development of fixed link traffic potential as a basis for link capacity sizing, are

addressed in Section 3; the engineering assessment for various link alternatives along with preliminary costing and construction schedules are developed in Section 4; details of the estimate and implementation schedule for the favoured alternative are presented in Section 5; a discussion of the potential regulatory and environmental assessment requirements for the favoured alternative is presented in Section 6; the results of the business case and economic analyses are discussed in Section 7; potential financing approaches are discussed in Section 8; and conclusions are presented in Section 9. Cost estimates and other details are attached as appendices.