



National Energy Board

Comprehensive Study Report

**Trans Québec & Maritimes
Pipeline Inc.**

PNGTS Extension

GH-1-97

February 1998

CSR

National Energy Board

Comprehensive Study Report

In the Matter of

**Trans Québec & Maritimes Pipeline
Inc.**

PNGTS Extension

Application dated 30 April 1997

GH-1-97

CSR

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Cat. No. NE23-74/1998E
ISBN 0-662-26509-2

This report is published separately in both official languages.

Copies are available on request from:

The Publications Office
National Energy Board
311 Sixth Avenue S.W.
Calgary, Alberta, T2P 3H2
E-Mail: orders@neb.gc.ca
Fax: (403) 292-5503
Phone: (403) 292-3562
1-800-899-1265

For pick-up at the NEB office:

Library
Ground Floor

Printed in Canada

© Sa Majesté la Reine du Chef du Canada 1998 représentée par l'Office national de l'énergie

N° de cat. NE23-74-1998F
ISBN 0-662-82609-4

Ce rapport est publié séparément dans les deux langues officielles.

Exemplaires disponibles sur demande auprès du:

Bureau des publications
Office national de l'énergie
311, sixième avenue s.-o.
Calgary (Alberta) T2P 3H2
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Bibliothèque
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Imprimé au Canada

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Abbreviations

Agency	Canadian Environmental Assessment Agency
BAPE	Bureau d'audiences publiques sur l'environnement [bureau of public hearings on the environment]
CEAA	<i>Canadian Environmental Assessment Act</i>
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPTAQ	Commission de protection du territoire agricole du Québec [Quebec's agricultural land protection board]
CSA	Canadian Standards Association
CSST	<i>Commission de la Santé et Sécurité au Travail du Québec</i> [Quebec's occupational health and safety board]
CWS	Canadian Wildlife Service
DFO	Department of Fisheries and Oceans
EMH	Environmental Management Handbook
Gaz Métropolitain	Gaz Métropolitain and Company, Limited Partnership
ha	hectare
km	kilometre
m	metre
MEF	<i>ministère de l'Environnement et de la Faune du Québec</i> [Quebec Department of Environment and Wildlife]
Minister	Minister of the Environment
MRC	<i>municipalité régionale de comté</i> [municipal regional county]
NEB or Board	National Energy Board
NEB Act	<i>National Energy Board Act</i>
NO _x	nitrogen oxides
PNGTS	Portland Natural Gas Transmission System
TQM	Trans Québec & Maritimes Pipeline Inc.
TransCanada	TransCanada PipeLines Limited
UDA	Urgel Delisle & associés inc.
UPA	<i>Union des producteurs agricoles</i> [Agricultural Producers Association]
WMMMO	Waste Management Manual for Mainline Operation

Glossary

ecotone	transitional zone between two ecosystems
fragmentation	reduction of large habitats into smaller areas through development
GH-2-97	NEB hearing order regarding the construction of new pipeline facilities proposed by TransCanada PipeLines Limited
lentic	of, or pertaining to, stagnant or slowly flowing fresh water
lotic	of, or pertaining to, rapidly flowing fresh water
mitigative measures	in respect of a project, the elimination, reduction or control of the adverse environmental effects of the project, and includes restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means
Responsible Authority	a federal authority that is required, under the <i>Canadian Environmental Assessment Act</i> , to ensure that an environmental assessment of the project is conducted
right-of-way	legal right of passage over public or private lands, or, the area in which this right is exercised
sustainable development	development that meets the needs of the present, without compromising the ability of future generations to meet their own needs

Chapter 1

Summary

Trans Québec & Maritimes Pipeline Inc. ("TQM" or the "Company") is proposing to construct and operate natural gas transmission facilities that would extend its current system from Lachenaie, located east of Montreal, to East Hereford, near the Canada-U.S. border between Quebec and New Hampshire. At that point, TQM would connect to the facilities of the Portland Natural Gas Transmission System ("PNGTS") to serve the markets of the U.S. Northeast. The facilities would also reach the existing market of Gaz Métropolitain Inc. ("Gaz Métropolitain") through a new delivery point at Waterloo, Quebec. TQM expects to be able to provide the new service effective 1 November 1998.

Because the project involves the construction of a pipeline more than 75 kilometres ("km") in length on a new right-of-way, and pursuant to a decision of the Responsible Authorities under the *Canadian Environmental Assessment Act* ("CEAA"), the project was made subject to a comprehensive study.

The National Energy Board (the "Board" or the "NEB") conducted an oral public hearing to obtain evidence and views of interested persons on TQM's application, pursuant to the *National Energy Board Act* (the "NEB Act"), in respect of the installation of the proposed facilities. The hearing also provided a forum for public participation in the comprehensive study. The hearing lasted 19 days, beginning on 17 November 1997 and ending on 17 December 1997, and was held in Montreal and Orford, Quebec.

Through the services of Urgel Delisle & Associés Inc. ("UDA") consultants, TQM carried out a study of the environmental and socio-economic impacts of the project. The environmental components studied by UDA were, among other things, agroforestry, archaeology and heritage, vegetation, wildlife, and watercourse crossings. The study also included the identification of mitigative measures to ensure that the project is not likely to cause significant adverse environmental effects.

In selecting the route it submitted for approval, TQM began by defining a study area and then identifying elements within that area that it considered environmentally sensitive. It then developed corridors, including sections where it was considered necessary to develop technically and economically feasible alternatives means to carry out the project. The last step involved selecting the route and identifying alternative routes. For instance, TQM asked the Board to approve, in addition to the proposed route, two alternative routes it suggested in the Memphrémagog MRC area.

Before filing its application, TQM undertook an early public consultation program, the primary objective of which was to inform and consult persons and groups likely to be affected by the project. Other objectives of the program were to enable the public to comment on and express concerns about the project, and to decide on measures to address those concerns and to ensure follow-up.

The NEB review process has also involved public participation. Thus, the public was consulted as part of the scoping exercise to determine the scope of the environmental assessment and was given the opportunity to express views and opinions in the public hearing.

During the NEB hearing, and with respect to the comprehensive study, intervenors focused on the following matters: agriculture; watercourse crossings; rare plant and wildlife; groundwater for domestic, agricultural and fish-farming-related use; wetlands; heritage resources; and project alternatives. Certain intervenors were concerned as well with the recreational, tourism and visual impacts of the project on the affected areas. Disruption of hunting activities and increased noise levels in areas adjacent to the proposed facilities were among the issues raised.

The NEB concluded that the PNGTS Extension project is not likely to cause significant adverse environmental effects, provided that the mitigative measures identified during the proceedings are implemented and enforced.

Should the Board find that the TQM project is required by public convenience and necessity, a series of environmental conditions would be included in the certificate.

Chapter 2

Project and Environmental Assessment Process

2.1 Overview of Project

On 30 April 1997, TQM applied to the Board for a certificate of public convenience and necessity under Part III of the NEB Act authorizing the construction of transmission facilities that would extend its existing system from Lachenaie, located east of Montreal, to East Hereford, near the Canada-U.S. border between Quebec and New Hampshire (Figure 2.1).

The facilities proposed in the first year of operation consist of approximately 213.2 km¹ of 610 mm outside-diameter pipe, one 7.0 MW electric motor-driven compressor unit at Lachenaie and two meter stations, one at Waterloo and the other at East Hereford. In the second year of operation, one additional 3.2 MW electric motor-driven compressor unit would be installed at East Hereford and one gas aftercooler unit would be installed at Lachenaie.

The cost of the proposed facilities is estimated at \$273.8 million in 1997, including the allocation for funds used during construction.

Through the services of UDA, TQM carried out a study of the environmental and socio-economic impacts of the project. The environmental components studied by UDA were, among other things, agroforestry, archaeology and heritage, vegetation, wildlife, and watercourse crossings.

UDA delimited a study area within which it gathered data from existing elements and on-site surveys. This approach made it possible to identify potentially sensitive elements in the environment. It then developed corridors, including sections where it was appropriate to identify alternative routes. Based on the selected corridor, TQM decided on a primary route. Over fifty route variations within the study area were examined until, finally, one route was submitted to the Board for approval, along with two alternative routes in the Memphrémagog MRC which TQM said it preferred.

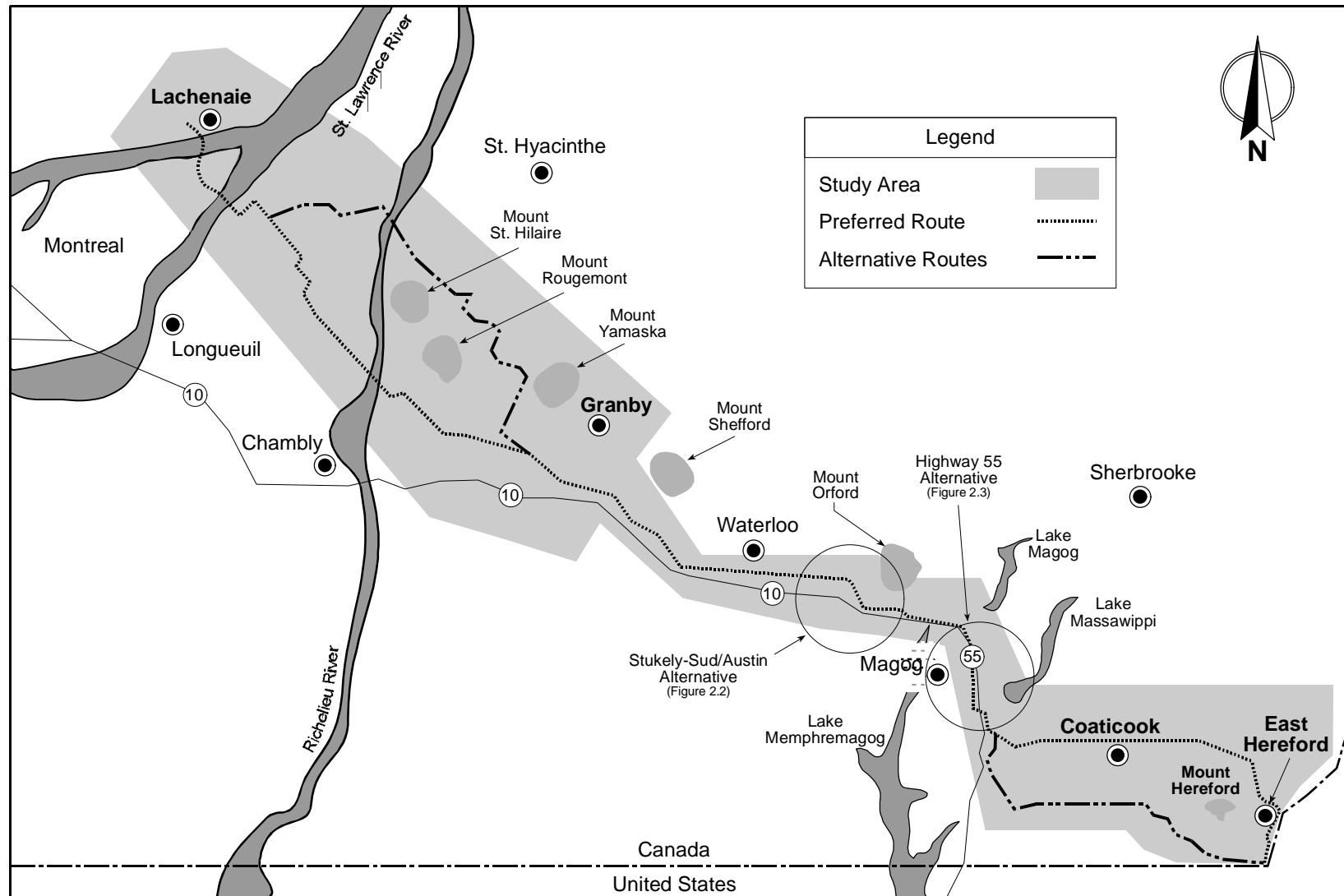
The TQM application, exhibits and evidence filed during the hearing provide a complete environmental description.

2.2 Purpose and Need

The purpose of the TQM Extension is to provide TransCanada Pipelines Limited ("TransCanada") with natural gas transmission from western Canada to two pipeline systems. The first system is the gas pipeline proposed by PNGTS in the United States to serve the U.S. Northeast markets. The second is Gaz Métropolitain's, which would be accessed through a new delivery point at Waterloo.

¹ This figure does not include the length of the two modifications affecting Stukely-Sud and Austin, and Highway 55 (refer to section 2.8).

Figure 2.1
Study Area, Preferred Route and Alternative Routes



The TQM Extension would give western Canadian natural gas producers increased access to the New England market. It would also fulfil Gaz Métropolitain's needs in the Eastern Townships region.

The U.S. Northeast natural gas market is currently supplied in part by a converted oil pipeline for which the lease will expire on 1 November 1998 and will not be renewed. Indeed, the owners of the Canadian and U.S. sections of the pipeline—Montréal Pipe Lines Limited and Portland Pipe Line Corporation—intend to convert it back to transporting crude oil when the lease is over.

Effective 1 November 1998, TQM expects to deliver a volume of 4.31 million cubic metres per day (152.2 MMcf/d) to East Hereford and 0.96 million cubic metres per day (33.7 MMcf/d) to Waterloo. In the second year of operation, these delivery needs are expected to increase to 5.95 million cubic metres per day (210 MMcf/d) at East Hereford and 1.38 million cubic metres per day (48.7 MMcf/d) at Waterloo. Approximately 90% of the yearly volumes shipped through the pipeline would be exported to the United States.

2.3 Environmental Assessment Process

Because TQM's PNGTS Extension project involves the construction of a pipeline more than 75 km in length on a new right-of-way, it is subject to the *Comprehensive Study List Regulations*, specifically paragraph 14(a) of the Regulations, under the terms of the CEAA. Pursuant to paragraph 21(a) of the CEAA, therefore, the project would either have been subject to a comprehensive study to be conducted by the Responsible Authorities or referred to the Minister of the Environment for referral to a mediator or a review panel.

Pursuant to paragraphs 5(1)(c) and 5(1)(d) of the CEAA, it was determined that the Board, Environment Canada and the Department of Fisheries and Oceans (Canadian Coast Guard) were Responsible Authorities. The Responsible Authorities decided that a comprehensive study report would be prepared and filed with the Minister of the Environment and the Canadian Environmental Assessment Agency (the "Agency"). Environment Canada later indicated that it was considering carrying out its own environmental assessment of the effects of the project on île aux Fermiers.

On 10 October 1997, the Board decided to hold an oral public hearing in respect of TQM's application, not only to gather evidence and the views of interested persons regarding the certificate of public convenience and necessity, but also to promote public participation in the comprehensive study and collect information for the preparation of this report.

The NEB's GH-1-97 hearing began on 17 November 1997 and ended on 17 December 1997. It was held at Montreal and Orford in the province of Quebec. This comprehensive study report takes into consideration the environmental information filed by TQM in its application, as well as comments and additional information submitted by federal, provincial, regional and municipal departments, ministries and agencies, the public, intervenors and TQM itself during the GH-1-97 hearing.

2.4 Other Assessment Processes

Before the project was submitted to the Board, it was the subject of two proceedings conducted by Quebec government authorities, namely, the *Commission de protection du territoire agricole du Québec* ("CPTAQ") and the *Bureau d'audiences publiques sur l'environnement* ("BAPE").

CPTAQ is an organization that, by virtue of the Quebec *Act to Preserve Agricultural Land*, governs the use of land in agricultural zones for purposes other than farming; approximately 175 of the 213.2 km of right-of-way required by the TQM project is on agricultural land. CPTAQ held three days of public hearings in early September 1997 at Longueuil and Magog, and rendered its decision on 10 November 1997. It authorized the use of the land under its jurisdiction for non-agricultural purposes, subject to two modifications to the route originally proposed by TQM. Following the CPTAQ's decision, TQM modified its route accordingly.

BAPE's function is to inquire into and hold public hearings on any matter relating to environmental quality in Quebec entrusted to it by the provincial Minister of Environment and Wildlife and to report back to the Minister with its findings and analysis. The Minister then submits his proposal to the *Conseil des ministres*, which has final decision-making power. BAPE conducted 16 days of hearings from mid-June to early July 1997 in a number of municipalities along the proposed route. On 9 October 1997, it issued its report on the project.

The *Conseil des ministres* then authorized, by order, the issuance of a certificate of authorization approving the TQM project pursuant to the Quebec *Environment Quality Act*. The certificate contains a number of conditions dealing with, among other things, the width of the right-of-way, drinking-water supply, emergency measures, watercourse crossings and provisions relating to the route through the Memphrémagog MRC.

Still at the provincial level, TQM must obtain permits from the *Ministère des Transports du Québec* to cross highways under its jurisdiction.

The project would require crossing the St. Lawrence and Richelieu rivers, as well as using île aux Fermiers as an intermediate point for the directional drilling required for the St. Lawrence River crossing. As owner of île aux Fermiers located in the St. Lawrence River, Environment Canada, through the Canadian Wildlife Service, must authorize the disposal of any interests in this land, and, under the CEAA, an environmental assessment of the project is required before that power of authorization can be exercised.

The crossing of navigable waters requires authorization from Fisheries and Oceans Canada, Canadian Coast Guard, under the *Navigable Waters Protection Act*. Fisheries and Oceans Canada, Fish Habitat Management, has a role as well in the protection of fish and their habitat. Certain watercourse crossings may require an authorization under section 32 or subsection 35(2) of the *Fisheries Act*. If such an authorization were required, under the CEAA, an environmental assessment of the project would also be required before that power of authorization could be exercised.

Furthermore, the Canadian Transportation Agency may be called on to issue authorizations for crossings over national railways rights-of-way, but only if the national railways and TQM disagree with respect to the crossings. In such a case, under the CEAA, the issuance of a Canadian

Transportation Agency authorization would have to be preceded by an environmental assessment of the project.

Finally, under the NEB Act, a certificate of public convenience and necessity must be issued in respect of the project, subject to the approval of the Governor in Council. Under the CEAA, an environmental assessment of the project is also required before the certificate can be issued.

2.5 Scope of the Assessment

The Board undertook a scoping determination process for the environmental assessment of the PNGTS Extension in accordance with the *Regulations Respecting the Coordination by Federal Authorities of Environmental Assessment Procedures and Requirements* in order to fulfil its obligations under the CEAA. Prior to making its final scoping determinations, the Board solicited comments from the public on a draft scope of the environmental assessment prepared in consultation with other federal departments and agencies.

The Board reviewed the comments it received following the public consultation and, in a letter dated 10 September 1997, provided the final scope of the environmental assessment of the PNGTS Extension project.

The scope of the project includes the activities and undertakings considered to make up the project. The factors to be assessed are those identified in subsections 16(1) and 16(2) of the CEAA. The scope of the factors includes a determination of the environmental components which are assessed, as well as the spatial and temporal boundaries associated with those components. The final scoping determinations provide a framework for the environmental assessment. For more information on the final scope of the environmental assessment, see Appendix II.

2.6 List of Activities, Location and Schedule

TQM proposes to construct the gas pipeline simultaneously over three work zones. The first zone would cover the first 15 km of the route, from Lachenaie to Boucherville, including Montreal Island and the surrounding area. The second zone would cover the next 88 km, from Boucherville to Waterloo. The third zone would cover the 110 km separating Waterloo from East Hereford.

The gas pipeline would be installed within the limits of a 23-metre-wide permanent right-of-way. To facilitate the construction work, a temporary ten-metre-wide right-of-way, adjacent to the permanent right-of-way, would be required along the entire route. Additional work areas would be required at more or less regular intervals along the route during the construction phase to account for soil-drainage systems and to facilitate the crossing of obstacles, like watercourses, highways, railways and other infrastructures.

The pipeline would be installed under a depth of cover of at least 1.2 m on agricultural land and 0.9 m in forested areas. Under watercourses, the pipeline would be installed 1.5 m below the prescribed profile, and a minimum cover of one m would be ensured beneath the improved bottom of boundary ditches or other large ditches.

Cathodic protection fields would be installed to protect the pipeline against corrosion. The exact location of these underground structures would be determined following analysis of the soil and a detailed engineering study.

The project would also require the construction and operation of above-ground facilities, namely, a compressor station, two metering stations and block valves in the first year of operation. In the second year, another compressor station and a gas aftercooler would be added.

In addition to these facilities, TQM plans to upgrade its Control and Communication System to enable it to monitor and control the new compressors and metering stations.

The project would also require: the construction and operation of a number of access roads and temporary work areas; the modification of existing TQM facilities so they can be connected to the new facilities; and other structures upstream of the TQM system (notably on TransCanada's system, for example) to enable TQM to receive the gas volumes required for the operation of its system, including the PNGTS Extension.

Directional drilling is planned under Highway 40, three major watercourses—Rivière-des-Prairies, the St. Lawrence River and the Richelieu River—and under a number of other smaller watercourses, such as the Yamaska and Magog rivers.

The construction of the proposed facilities is scheduled from April to October 1998, with operations commencing on 1 November 1998. The East Hereford Compressor Station and the gas aftercooler at the Lachenaie Compressor Station would be constructed from April to October 1999 and put into operation on 1 November 1999.

The start-up date of 1 November 1998 is the result of two constraints: the lease expiration date with Montréal Pipe Lines Limited and Portland Pipe Line Corporation; and the scheduled operation date of the project's American counterpart, i.e., the PNGTS gas pipeline in the United States.

2.7 Routing and Site Selection

2.7.1 Routing Description

TQM carried out a three-stage environmental assessment of the routing: the assessment of corridors within the study area; the assessment of alternative routes within the selected corridor; and the detailed assessment of the selected route, in which site-specific environmental effects and applicable mitigative measures were analyzed.

The overall study area (Figure 2.1) was delimited based on factors related to the project itself and the receiving environment. The principal technical and economic factors were the selection of the supply point in the municipality of Lachenaie northeast of Montréal, various potential natural gas delivery points such as East Montréal, Granby and Waterloo, and the interconnection point with the PNGTS pipeline in East Hereford on the Québec/New Hampshire border. Other significant factors were related to the receiving environment to be crossed or avoided, such as watercourses, hills and mountains, urban centres, and existing infrastructures.

TQM took a number of factors into consideration in formulating selection criteria for the location of the pipeline. The Company adopted the principle of following existing rights-of-way where available, technically possible, and economically feasible. The Company considered both paralleling and joint use of existing rights-of-way. In addition, TQM used the recommendations of the 1980 Quebec interdepartmental committee which developed a set of principles that, when applied to a linear development project, were meant to minimize adverse effects on the environment, agriculture and urban development. These recommendations include, but are not limited to, the following principles:

- follow the limits of cultivated fields;
- follow existing infrastructure and utility rights-of-way;
- avoid maple groves;
- route through marginal forest areas to avoid cultivated lands;
- route through stream headwaters to reduce drainage impacts;
- minimize corridor length;
- avoid slopes to minimize erosion;
- avoid sensitive environmental areas;
- avoid high value archaeological zones;
- minimize changes to the visual milieu;
- respect municipal zoning;
- limit crossings of existing infrastructure; and
- avoid residential zones.

Table 2.1 provides a summary of the extent to which existing rights-of-way would be followed.

Of the 117 km of route adjacent to existing rights-of-way, approximately 50 km would be through forested area. Of the 96 km route in new right-of-way, approximately 25 km would be through forested area and would require removal of trees.

TQM divided its corridors into three sections (Figure 2.1): Lachenaie to Granby; Granby to Magog; and Magog to East Hereford. The following paragraphs discuss the general location of the route, land uses, key environmental constraints, and the rationale for the alternative corridors and routes that were considered.

Table 2.1
Approximate Percentage of Proposed Route Adjacent
to Existing Rights-of-Way and in New Right-of-Way

	% of total route
Route Adjacent to an Existing Right-of-Way	
Pipeline	20
Roads	20
Powerlines	<u>15</u>
<i>Sub-total</i>	55
Route in New Right-of-Way	<u>45</u>
Total	100

Total Length of Right-of-Way for Proposed Route¹	213 km
--	---------------

The Lachenaie to Granby section commences in an agricultural area, crosses parklands in the northern part of the Montréal Island and île aux Fermiers, before reaching the south shore of the St. Lawrence River. Only a few hundred metres out of the 11 km traversed between Lachenaie and the south shore intersects built-up areas. However, the route intersects four major highways and involves four river crossings. From the South Shore of the St. Lawrence River to Sainte-Julie, a distance of some nine km, the corridor trends east-southeast through agricultural lands, small towns and satellite residential communities. Within the corridor, the route avoids residential areas and parallels a railway line and a Hydro-Québec right-of-way for part of the distance.

From Sainte-Julie to a point half way between Saint-Césaire and Granby, TQM studied two corridors over a distance of approximately 30 km. The east corridor is located north of Mount Saint-Hilaire and Mount Rougemont, and east of Mount Yamaska. The west corridor follows a valley between Mount Saint-Bruno and Mount Saint-Hilaire, and runs south of Mount Rougemont bypassing the urban settlements of Saint-Mathias-sur-Richelieu, Marieville, Sainte-Angèle-de-Monnoir, and L'Ange-Gardien.

TQM stated that it chose the west corridor on the basis that it was determined to cause the least overall impact. The west corridor took advantage of existing right-of-way for 80% of its length. It was judged preferable to the East corridor on the basis of a relatively lesser impact on agriculture, forestry, vegetation and wildlife, and length (seven km shorter). The eastern corridor was judged superior in that fewer aquifers and wells were encountered, and that it was marginally less likely to encroach on heritage and urban areas. TQM indicated that it was the balance of the above factors rather than any one or two specific factors which resulted in a decision. No specific weighting was given to particular factors and the decision was based on a qualitative assessment.

¹ Total excludes length of two alternatives at Stukely-Sud and Austin and at Highway 55 (see section 2.8).

In the 60 km chosen corridor between Sainte-Julie and Granby, some 90% of the land use is agricultural. The selected route within the corridor is on cultivated lands for the most part, although the proportion of forested land crossed increases toward Granby. The route parallels the Montréal Pipe Line Limited and Gaz Métropolitain rights-of-way for 5 and 38 km, respectively.

The Granby to Magog section covers a distance of 53 km through a forested landscape. The route, which commences two km south of Granby, proceeds easterly through rolling topography for 13 km where it enters the rugged Appalachian region. From that point until Magog, some 40 km further on, the route crosses an area that is bordered by a chain of mountains creating a natural barrier, such that, according to TQM, only a few valleys allow for the construction of a linear infrastructure such as a pipeline or a highway.

Following TQM's routing criteria, TQM favoured twinning existing rights-of-way and, in particular, the Gaz Métropolitain pipeline right-of-way. TQM maintained that this routing posed a lesser degree of environmental impact than if the Company were to clear a new swath through forested area between Granby and Magog.

Given the physical impediments of the mountains, the presence of an existing pipeline right-of-way, and its assessment of a lesser adverse environmental effect, the Company elected not to identify any other alternative routes in this corridor.

The route passes just south of Waterloo where a delivery point into the Gaz Métropolitain system and a metering station are planned. At Lake d'Argent, midway between Waterloo and Magog, the initially preferred route turned south between Lake d'Argent and Lake Orford. However, following consultation with the MRC of Memphrémagog, an alternative route (i.e., Stukely-Sud and Austin route) was proposed, primarily to address concerns with potential adverse effects to the recreation and tourism vocation of the region. The alternative route turns south three km west of Lake d'Argent, crosses Highway 10 and then turns east about one km south of the Highway (Figure 2.2). At the south end of Lake Orford, the route parallels Highway 10 to Magog.

The section between Magog and East Hereford covers a distance of 81 km through hilly countryside with mixed forested and cultivated lands. Immediately north of Magog and for a distance of 11 km, TQM proposed an alternative route bordering Highway 55 in response to the MRC of Memphrémagog's requirement to take into account the visual impact of the route on the recreation and tourism vocation of the region. Rather than going cross-country as the initially-preferred route did, the alternative route is adjacent to Highway 55 (Figure 2.3). It rejoins the initially-preferred route south and east of Lake Massawippi, where it follows an abandoned Hydro-Québec right-of-way for about four km, to a point south of Ayer's Cliff. In this segment of the corridor, Bunker Hill is transected.

Two separate corridors were considered for the 65 km route between Ayer's Cliff and East Hereford. TQM chose the northern corridor over the southern one because, in its opinion, it had a lesser impact. It assessed the northern route as having a relatively lower potential impact on agriculture, forestry, watercourse crossings, heritage, and socio-economic considerations. According to TQM, the south route would have a clear advantage on the vegetation and wildlife criteria and a marginal advantage on the aquifers and wells criteria. Neither route was preferred from the point of view of the length of the route or the availability of existing rights-of-way.

The northern corridor runs from Ayer's Cliff for a distance of 45 km to a point east of Coaticook. The route follows municipal boundary lines for most of the distance, and a secondary roadway for 13 km. Two-thirds of this route passes through cultivated lands and one-third through forested lands. The corridor turns south at a point 22 km east of Coaticook, and follows valleys to join the New Hampshire connection point approximately five km south of the settlement of East Hereford. A compressor and metering station are located within one km of the connection point. The main land uses encountered in this area are agriculture (two-thirds) and forestry (one-third).

2.7.2 Above-Ground Facilities Site Selection

Compressor stations would be located at the initial and end points of the pipeline to facilitate the receipt and transmission of gas. The proposed Lachenaie Compressor Station would be situated on a 5 000 m² (255 m x 255 m) forested site north of Montréal Island and east of Highway 640. The site is zoned industrial with the nearest residential neighbourhood being approximately one km from the site.

The proposed site of the East Hereford Compressor Station is located on the east side of Highway 253, approximately five km south of the settlement of East Hereford and less than one km from the U.S. border. Neighbouring a local cemetery and a sawmill, the site is located inside a wooded area and surrounded by agricultural land. There are three residences approximately 200 m from the proposed station. The site, which is zoned industrial, would occupy 40 000 m² (200 m x 200 m) of land.

A metering facility would be constructed to measure the export gas flow. This facility would be placed within the limits of the East Hereford Compressor Station site to take advantage of economies of co-location and reduce potential environmental impacts.

Another proposed metering facility would be required at Waterloo for the delivery of gas to Gaz Métropolitain. The site would be located directly south of the proposed route in a densely wooded area. The site would require 2 500 m² of land (50 m x 50 m) and contain two facilities, a meter building, and a control building.

TQM indicated that sectioning valve sites would be located between eight and 25 km apart. The specific number and locations of valves have yet to be determined. Typically valves would be installed closer together in urban areas and further apart in rural areas. The valve sites would be built on the right-of-way. Valve sites would occupy approximately 25 m² (5 m x 5 m) with the perimeter being fenced. Land for these valve sites would be purchased rather than leased.

Figure 2.2
Preferred Route and Alternative Route - Stukely-Sud/Austin

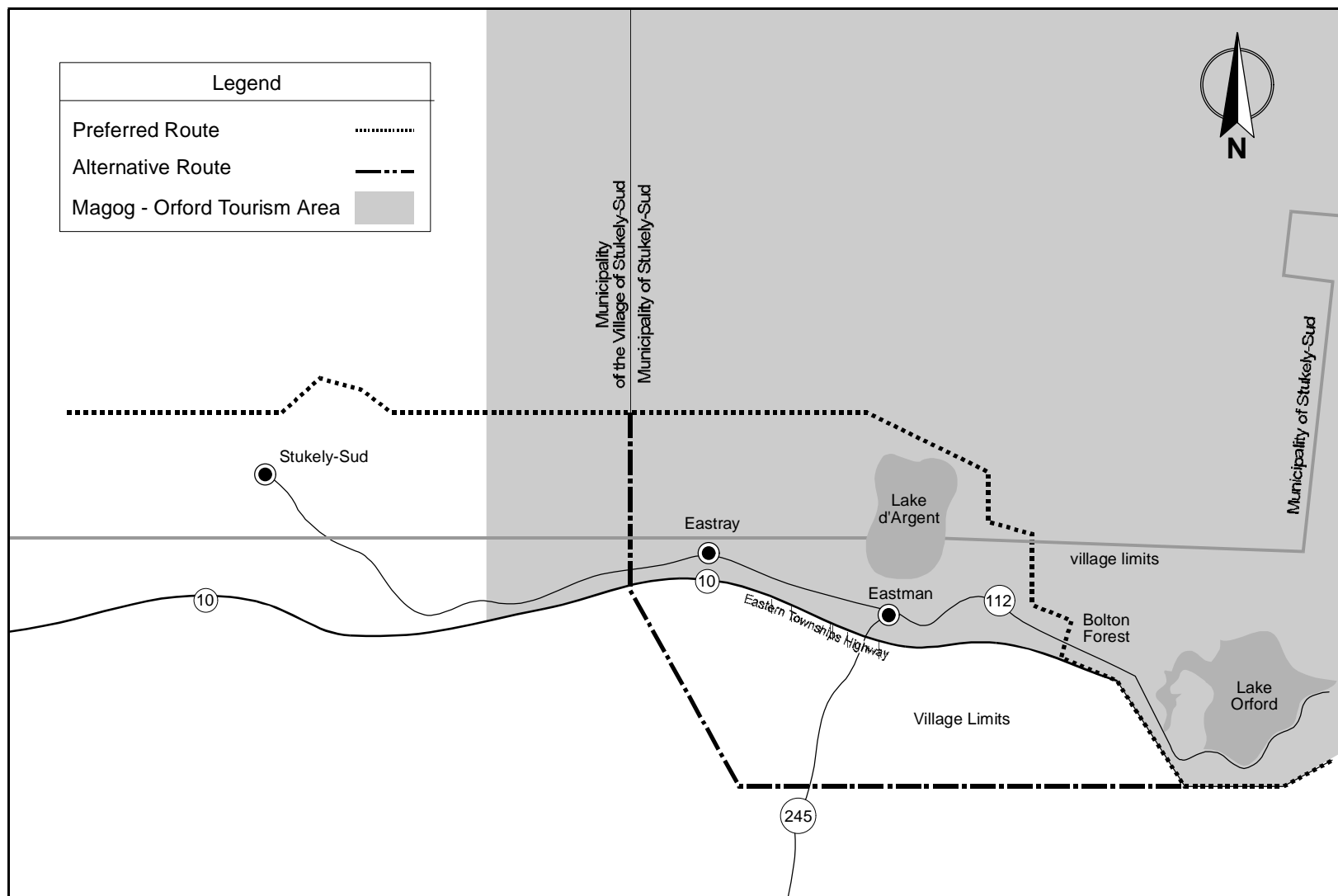
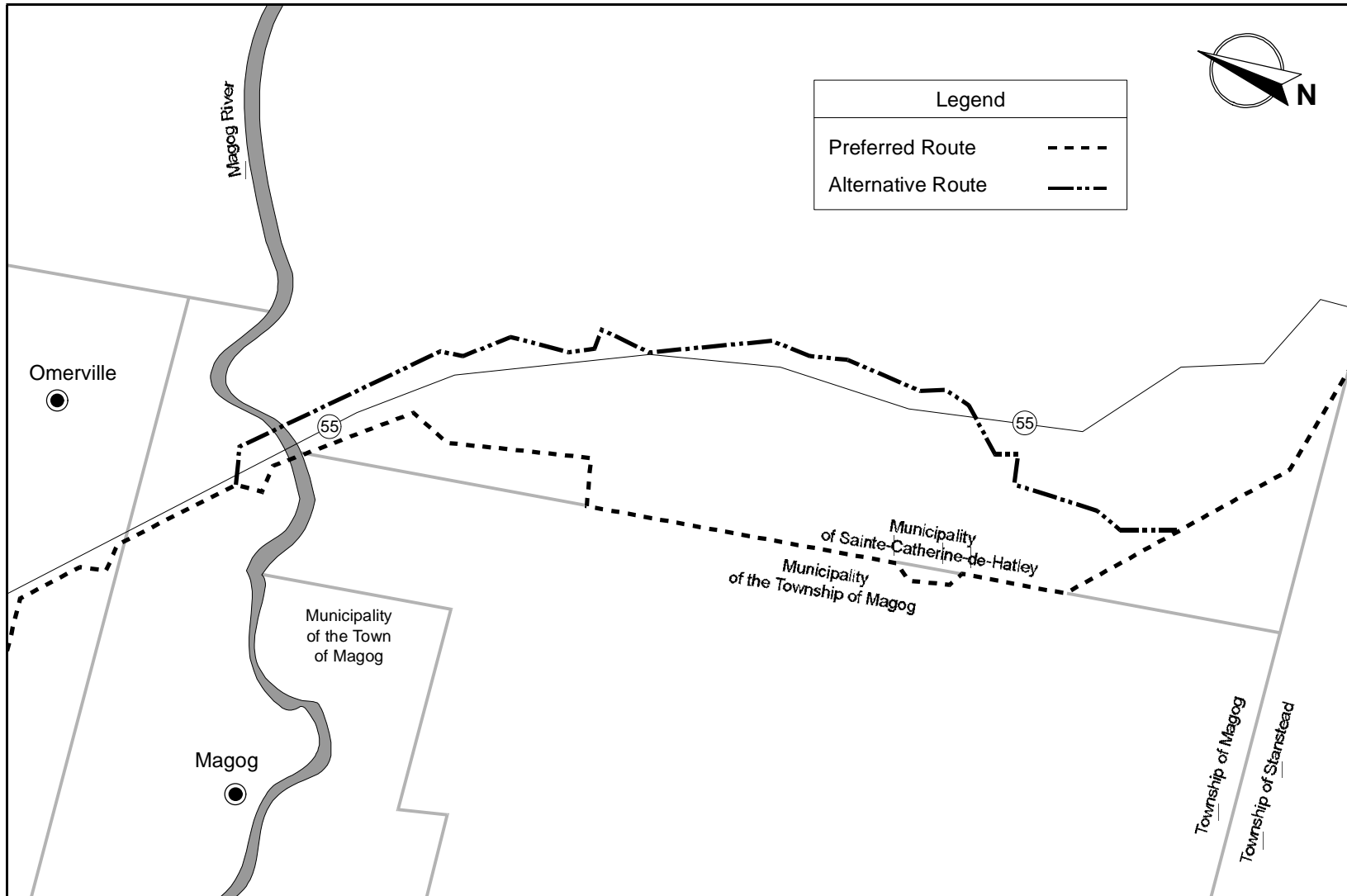


Figure 2.3
Preferred Route and Alternative Route - Highway 55



2.8 Alternative Means of Carrying Out the Project

Paragraph 16(2)(b) of the CEAA provides that every comprehensive study of a project shall include a consideration of alternative means of carrying out the project and the related environmental effects. In the final Scope of the Environmental Assessment, the project was to start at Lachenaie and end at East Hereford. Therefore, alternative routes for carrying out the project are considered in this section as those routes starting at Lachenaie and ending in East Hereford. Potential routes involving different starting and terminal points are discussed in Section 2.9 - Alternatives to the Project.

"Alternative means" of carrying out the project within the CEAA refers to methods which are technically and economically feasible and must consist of methods that are within the scope and control of the proponent of the project under review.

TQM considered two alternative corridors, for a 30 km section of route from Sainte-Julie to Granby and for a 65 km section of route from Ayer's Cliff to the village of East Hereford. Factors taken into consideration were the physical environment, agriculture, forestry, river bank stability, vegetation and wildlife, archaeology and heritage, engineering, socio-economic matters, and technical and economic feasibility. In each case, the competing corridors were analyzed and ranked according to these criteria to arrive at an overall decision. Also considered was the use of existing rights-of-way. At the end of the process, TQM made a determination on the basis of a qualitative assessment as to which corridor, in its view, was preferable in the balance.

In terms of the routes within corridors, TQM proposed over 50 modifications, two of which received considerable attention during the hearing. These two route modifications are for Stukely-Sud and Austin and Highway 55 and were described previously.

In respect of this application, sufficient information was provided by TQM regarding alternative routes. Therefore, the requirement that there be evidence on alternative means of carrying out a project has been met.

2.9 Alternatives to the Project

The meaning of "alternatives to" in the context in which it is placed in the CEAA incorporates not only a functionally different method for the transportation of gas but also any other feasible method for the transportation of gas, including the option of not undertaking the project.

Alternatives to the project were included in the factors to be assessed in the final Scope of the Environmental Assessment.

The following potential alternatives to the project were considered:

- not undertaking the project;
- liquefied natural gas;
- Montréal to Portland pipeline;
- Lachenaie to Highwater and Saint-Sébastien to Highwater corridors; and
- Sabrevois to Highwater and Sabrevois to East Hereford corridors.

At the hearing, some intervenors challenged the abandonment by TQM of the Sabrevois to Highwater route, the Lachenaie to Highwater route, and the Highwater export point.

In assessing alternatives to the project, the Board has decided to adopt the methodological approach used by the Joint Review Panel in the Sable Gas GH-6-96 proceeding. Therefore, having reached the conclusion in this instance that the project under study is not likely to cause significant adverse environmental effects after appropriate mitigative measures have been applied, the Board is of the view that the CEAA does not require it to make specific findings of fact or to conduct an environmental assessment with respect to the various alternatives described above.

Chapter 3

Public Consultation Program

3.1 Introduction

Public consultation is a process for identifying and incorporating public concerns and values into project planning. Public involvement is a central objective of the CEAA. The CEAA aims at ensuring that there is an opportunity for public participation in the environmental assessment process. Similarly, the *NEB's Guidelines for Filing Requirements* require that, prior to filing a facilities application, an applicant carry out a public information program which explains the potential environmental and social effects of a project, allows opportunity and time for public comment and responds to issues raised. The Board conducts a public hearing to solicit public input in deciding on the public convenience and necessity, including the environmental and socio-economic effects, of a pipeline project. The purpose of this chapter is to assess and report on the effectiveness of the consultation program in respect of TQM's proposed project.

3.2 TQM's Early Public Consultation Program

TQM submitted that its early public consultation program was designed to:

- inform and consult, as a priority, all those directly or indirectly involved in the pipeline project (landowners, the general public, municipal officials, MRCs, professional associations, representatives of the *Union des producteurs agricoles* ("UPA"), the *Québec Ministère de l'Environnement et de la Faune* ("MEF"), and other provincial and federal regulators;
- enable all those with comments or concerns regarding the project to provide input into the process;
- identify actions needed to effectively respond to the various concerns expressed by stakeholders within a reasonable time; and
- ensure follow-up.

TQM took the following steps to seek the involvement of interested parties:

- it distributed information kits to mayors, MRC representatives, federal Members of Parliament and provincial Members of the National Assembly, and local and regional offices of the UPA;
- it sent a written, personalized invitation to a Landowners Information Session to 420 directly affected landowners and followed up with information kits;
- it established a 1-800 dedicated telephone line to facilitate the receipt of public comments on the project;
- it sent information kits to all who requested them; and
- it published announcements of Open Houses in 24 local and regional newspapers.

The public consultation program for the proposed pipeline facilities commenced on 28 August 1996. It was conducted in three phases: a corridor study phase, an alternative route study phase, and a detailed study of routing and mitigative measures phase.

At the corridor study phase, the principal intervenors consulted were the planning specialists of the MRCs of Les Moulins, Montréal Urban Community, Lajemmerais, la Vallée-du-Richelieu, Rouville, la Haute-Yamaska, Memphrémagog, Coaticook, and le Haut Saint-François, as well as other municipalities, cities and towns located along the proposed corridor. The UPA and its key local syndicates were also consulted as principal intervenors.

At the alternative route study phase, affected local municipalities and the UPA were again consulted. As well, local organizations in the areas affected by the project were consulted.

At the preferred routing level, landowners as well as members of the general public affected by the proposed routing were identified, informed, and consulted. Representatives of TQM were present at public information sessions to describe and explain the criteria for route selection, the methods and materials to be used during construction, the mitigative measures, the Company's policy regarding environmental protection, and the compensation methods. As well, landowners were consulted on an individual basis. These consultation processes resulted in some 50 modifications to the route.

Table 3.1 identifies the topics raised during Landowner and Open House Information Sessions and in calls to the dedicated telephone line.

Table 3.1
Topics Raised During Public Consultation Program

Topics	Frequency
General Information	586
Land Use Planning	34
Land Ownership	16
Environment	12
Agriculture	6
Regulatory Requirements	6
Gas Supply	4
Public Consultation Process	4
Economic Impacts	3

The most frequently raised topic was the need for information on the project. The initial information supplied was designed to provide general knowledge of the project and the consultation process. Supplemental information was supplied on request and distributed at landowner meetings and Open House Information Sessions.

The topic receiving the second greatest attention was that of land development and land use. Municipal representatives expressed the largest number of concerns on this issue. Some of the issues mentioned by municipal representatives related to impacts on existing and planned infrastructure in the proposed corridor, for example sewage systems, water supply systems, drinking-water wells, a cemetery, a sewage treatment plant, and a golf course. There were also concerns related to planned development projects for residential, park, hospital, and hotel projects. Municipal representatives stressed the need to protect lands with a specific vocation. Among the lands to be protected were the lands that could be zoned for residential use, urban centres or agriculture. Lands around lakes Magog and Massawippi, as well as land at the foot of mounts Shefford and Orford, were considered as lands to be protected. Finally, they had concerns about the appearance and location of the above-ground facilities required for a pipeline system (compressor stations, metering stations, pressure regulating stations, and main line valves).

Land ownership matters were the subject of the next highest number of queries. Most queries on these matters had to do with plots of land belonging to a third party (e.g., Québec Government Ministries and Hydro-Québec). Some landowners raised concerns over the loss of ownership or control of their lands, and in particular the need for the pipeline to cross their land and the undesirable effects of enhanced access to their property.

Environment as a topic was fourth in frequency. The Montréal Urban Community questioned the planned clearance of trees for the right-of-way, the protection of trees between Notre-Dame and Sherbrooke Streets, the protection of two ponds, and minimizing the general impact of the project. Two representatives from other localities spoke of the need to protect maple groves, and two others noted the importance of protecting wildlife habitats. Landowners also raised a number of environmental issues.

Other topics raised, albeit infrequently, were: the protection of agricultural land; regulatory requirements; the supply of natural gas; the adequacy of public consultations; and the project's economic impacts.

Two major alternative routes were introduced and considered during the NEB proceedings. Those were located in the MRC of Memphrémagog in the municipalities of Stukely-Sud and Austin and along Highway 55. To advise landowners of these alternatives, TQM distributed a notice during the week terminating 22 November 1997. Landowners were invited to an Open House Session in Orford on 7 December 1997 to discuss the proposed alternatives. Approximately 40 landowners attended the meeting where a presentation was made by TQM. Issues raised included: emergency response; devaluation of property; the manner of notifying all affected landowners; compensation for adjacent owners; damages due to surveys; right-of-way maintenance; and the Board's requirements for a 30 m controlled area on either side of the right-of-way.

3.3 NEB Process

For major pipeline applications, as in this case, the Board is required to hold public hearings at which applicants and interested parties have full rights of participation in order for the Board to hear all sides and points of view prior to making decisions.

During public hearings for new facilities, the Board has regard to all considerations that it determines to be relevant and may have regard to the following:

- the availability of oil or gas to the pipeline;
- the existence of real or potential markets;
- the economic feasibility of the pipeline;
- the financial responsibility and financial structure of the applicant; and
- any public interest, including landowner rights and the environment, that in the Board's opinion may be affected by its decision.

With respect to the NEB public consultation process for this project, a number of initiatives were taken to ensure the broadest access possible. The Board took steps at the outset of its review to ensure that the public was aware of the NEB process and the public's right to participate. A public consultation exercise was initiated on 28 July 1997 to solicit views on the scope of the environmental assessment for this project. An announcement was placed in 23 newspapers and the Canada Gazette. Scoping packages were delivered to federal departments, provincial governments, industry associations and interested parties. At that time, the public was informed that a public registry for the project, as required by the CEAA, was accessible through the Board's library. In addition, a copy of the project application and related documents was made available for public viewing at TQM's office in Montréal, the community centre at Pointe-aux-Trembles, and at libraries in Montréal, Sainte-Julie, Granby, Magog, and Coaticook. Board staff also held pre-hearing seminars in Sainte-Julie, Granby, Orford, and Coaticook to further facilitate public understanding of the NEB process and its right to participate.

For the project, the Board carried out public hearings in both Montréal and Orford. The hearings ran from 17 November to 17 December 1997 and lasted 19 days. Those hearings, conducted in both official languages, ensured that the public had the opportunity and the right to fully participate in the hearings. Hearing documentation was on the public record, and available to participants, including verbatim transcripts. After receiving this Comprehensive Study Report, the Agency will initiate a process by which comments on the conclusions and recommendations of the report may be made.

A number of intervenors raised concerns with respect to TQM's process and the information provided. Those included, but were not limited to:

- lack of proper notification of the 30 m controlled area;
- discrepancies in local benefits information;
- information provided but no meaningful consultation;
- failure to comply with the Board's filing requirements on early public consultation;
- majority of affected landowners absent from public meetings;
- affected landowners not informed of route crossing their land; and
- the public lacked required information.

3.4 Analysis of Effectiveness

An effective public consultation program informs the public about the nature of a proposed project, identifies potential adverse effects, provides an opportunity for the public to influence the project design so as to overcome adverse effects, and ensures ongoing consultation if the project is approved.

Four questions are useful in evaluating effectiveness:

- Did the consultation program result in broad public awareness of the project early in the planning process? In other words, was the project advertised in such a way that interested and affected persons would reasonably be expected to know the nature and the scope of the proposed project at the outset?
- Did the public have an opportunity to be informed of the project's potential impacts, to comment on these and to influence the project design?
- Were the results of the consultation program fully and accurately placed on the public record?
- Is there a plan for an ongoing public communications and awareness process through the life of the proposed project?

TQM's consultation program included media advertisements, newsletters, public meetings, personal mail, and personal contacts. In addition, there were two other public reviews that preceded the NEB hearing. These were the CPTAQ and BAPE hearings, both of which were widely advertised and well attended. Finally, the NEB hearing was advertised widely and the public was actively involved.

With respect to the public having an opportunity to provide input into the project, numerous individuals and interest groups made their views known through the CPTAQ and BAPE processes. TQM's communication program also included personal meetings with affected landowners, open houses and meetings with municipal officials. These processes resulted in some 50 modifications to the proposed route.

Participants in the NEB's public hearings included 18 associations, 35 companies, 35 private individuals, and 12 government departments, in addition to the applicant. Numerous Letters of Comments, approximately 50, were also received and form part of the record of the NEB proceedings. Two major pipeline route modifications in the MRC of Memphrémagog were raised and discussed at the hearing.

Finally, with respect to ongoing consultation during project construction and operations, the matter to be assessed is the adequacy of the plan or approach, which is discussed in Section 4.17, Commitments. TQM has undertaken to meet regulatory requirements for a public awareness process, and has committed to promote ongoing public involvement in the further phases of the project, if it is approved.

Conclusions

The Board concludes that the consultation processes on the proposed project were effective as measured by the four questions raised above.

First, broad public consultation occurred early in the project planning stage and resulted in broad public awareness of the project. The public had ample opportunity to review the potential impacts, provide comments and influence project design. The NEB public hearing process provided all those who chose to participate full opportunity to provide evidence, and examine and challenge TQM's evidence. Letters of Comment were also filed. The significant extent of public involvement supports this conclusion. Thirdly, the record was publicly available and was open to public scrutiny in the

form of the NEB hearing transcripts and exhibits. Lastly, TQM has proposed a satisfactory program for ongoing consultation.

This is not to say that there were no flaws in the consultation program, or that all pertinent issues were resolved to everyone's satisfaction. A consultation program cannot guarantee that all issues can be resolved, and it can always be improved. The judgement on effectiveness has to be made on a global basis, as was done in this instance.

Chapter 4

Environmental Assessment

4.1 Physical Environment

The project study area includes the St. Lawrence plain and the rugged Appalachian terrain of the Eastern Townships.

Types of soil and soil depth vary across the project area. The St. Lawrence plain generally has deep, clay-based soils which give way to sandy soils in the terraced uplands. In the area from east of Granby to Magog, glacial tills are the predominant soil type, although sandy soil and gravel are common in valley bottoms where the pipeline route is planned. The rocky substrate is close to the surface and soil depth can be minimal. In the Magog to East Hereford area, the soils are glacial in origin with areas of till, sand and gravel. In the eastern part of this area, the soil cover can be minimal.

In the St. Lawrence plain, the principal aquifers are on the periphery of Mount Saint-Hilaire, Mount Saint-Bruno and Mount Yamaska, and south of Mount Rougemont. These aquifers have been a reliable supply of domestic and commercial water. The hydrology of the Appalachian region is complex, variable, and localized. Individual wells are a significant source of both domestic and commercial water. Since hydrological structures in the area are at times in zones of fractured rocks, the quantity of water produced from these wells is vulnerable to disturbance.

The project area falls in the temperate, continental, subhumid zone, and experiences cold winters and warm summers with precipitation spread throughout the year. The Eastern Townships are generally cooler than the St. Lawrence plain, with longer winters and greater snow cover.

A detailed description of the physical environment is contained in the Project Application, Volume 1, "Rapport principal".

4.2 Soil and Agriculture

Potential Adverse Environmental Effects

The primary concerns with pipeline construction through agricultural lands include potential conflicts with existing land use practices, loss of soil capability from soil mixing, soil loss through erosion, loss of soil structure through compaction or rutting, disruption of surface and subsurface drainage, weed contamination of topsoil, and increased surface stoniness.

The mixing of organic and nutrient-rich topsoil with mineral subsoil, which is generally less fertile, can occur during construction. The physical loss of topsoil would lower the soil capability and crop productivity. Pipeline construction, depending on when it is scheduled, could lead to lost harvests for one or more growing seasons. Soil erosion can occur when soil piles are exposed to wind and rain, resulting in reduced future crop productivity. Compaction and rutting can reduce the size of the soil

interstices and destroy the soil structure, resulting in the reduction of root mass, plant size and harvests. This is particularly true of clay soils.

Construction may also interfere with farm surface and subsurface drainage, creating irregular wet or dry conditions within cultivated fields. Excavation of the trench and movement of equipment increases the potential for the introduction of weed species onto cultivated fields. The weed plants could potentially dominate cultivated crops, reducing crop yields or increasing the effort and costs required to eliminate these nuisance plants. Construction activities such as trenching and grading can bring rocks to the surface. Large or excessive quantities of stones at the surface of a field can result in damage to farm implements, reduce agricultural capability and increase operating expense to farmers.

TQM established the burying depth of the pipeline for agricultural and forested land at 1.2 m and 0.9 m, respectively. The representatives of the UPA *Provençale* agricultural producers, on behalf of the members who would be affected by the proposed pipeline, requested that the pipeline be covered by 1.8 m (approximately 6 ft) in both agricultural and forested land. They intend to use the newly-cleared forest areas for agricultural production. They report that, in the past, where the burying depth was less than 1.2 m, farm operations have been inconvenienced and drainage systems have been adversely affected. Added depth of cover over the pipeline also decreases the risk of third-party mishaps when farming or other activities are conducted over the pipeline.

An intervenor raised a concern regarding potential adverse environmental effects on agriculture operations because of the pipeline operating temperature of 50°C at the discharge side of the East Hereford Compressor Station. The intervenor expressed concern that the 50°C temperature would reduce harvest productivity over the pipeline and that the land could dry up.

Potential adverse environmental effects on conifer tree farms, an orchard, a tree nursery, and maple groves were identified. The Company identified five sugar maple groves in operations adjacent to the proposed right-of-way. The photomosaics indicate that less than 100 m² of sugar maple trees would be impacted due to pipeline construction.

Mitigative Measures

TQM committed to a number of general mitigative/reclamation techniques to minimize conflicts with farming operations and to ensure soil conservation, as per the following list¹:

- schedule main construction activities in the May to October window;
- strip and loosen topsoil;
- cease work and restrict traffic in excessively wet conditions;
- restore disturbed soil using seed and fertilizer according to landowner and environmental inspector recommendations;
- strip topsoil above the trench and subsoil storage area, the depth of removal of topsoil being determined by environmental inspectors;
- leave at least one m between topsoil and subsoil storage piles;

¹ The mitigative measures in this section and for all other sections of the report were obtained from TQM's Application and a number of specific TransCanada's manuals, which TQM has adopted for the purpose of its own operations.

- test thickness of soil compaction in most sensitive areas to determine the method and the depth to relieve compaction;
- remove stones larger than 10 cm and transport them off the right-of-way;
- minimize size of openings in bushes and windbreaks;
- minimize cutting bushes and windbreaks in temporary work areas;
- clean construction equipment before its transfer from an area with weeds to one without weeds;
- seed and fertilize non-cultivated sections of the right-of-way as well as trenches along roads using appropriate mixes;
- restrict work to the permanent and temporary rights-of-way;
- tag and fence sensitive trees close to the right-of-way;
- leave a passage way across open trenches, through topsoil and subsoil storage piles and over pipes parallel to the right-of-way for agricultural machinery and minimize the length of open trenches;
- construct temporary fences to secure livestock;
- advise farmers of the construction schedule to allow them, if possible, to harvest the right-of-way prior to construction and remove cattle as required;
- minimize disruptions to farmers by finalizing restoration of lands in the autumn following summer construction or as soon as possible depending on soil conditions; and
- brace fences prior to removal and replace with equivalent or better building materials.

TQM proposed to restrict clearing in conifer farms and the tree nursery, where possible. In the case of Christmas tree farms, normal business operations would continue except for a six m wide corridor centred over the pipe. This corridor must be kept clear of trees and shrubs. These trees would be removed and transplanted where necessary.

With respect to maple groves, TQM proposed a route which would mitigate the impacts upon these groves.

TQM undertook to carry out the following follow-up activities:

- post construction monitoring for five growing seasons to compare pre and post construction harvest and soil conditions; and
- take further mitigative action and continuing to monitor until conditions return to the preconstruction state, if it has not already done so in the initial five growing seasons monitoring period.

Conclusions

Soils and agriculture may be subject to cumulative effects due to pipeline construction. The mixing of soil, erosion, compaction, rutting, disruption of surface and subsurface drainage, weed contamination and increased stoniness can have adverse cumulative effects on soil and agricultural productivity. Using the appropriate mitigative measures would reduce the cumulative effects on soil and agriculture to an insignificant level. The project is therefore not likely to cause significant adverse cumulative effects on soil and agriculture.

With respect to the concern of heated pipelines potentially affecting agricultural productivity, pipelines in Canada, constructed to the appropriate standards, have not had adverse environmental effects on

soils or harvest. Therefore, the pipeline operating temperature is not likely to cause significant adverse effects on harvests.

The burying depth of 1.2 m over the pipeline is generally acceptable standard for Canadian agricultural land. However, to meet the needs of individual landowners, TQM may adjust this depth accordingly. With TQM's proposed mitigative measures, the pipeline construction is not likely to cause significant adverse environmental effects on soil and agriculture.

4.3 Vegetation

4.3.1 Rare, Endangered and Significant Plants

Potential Adverse Environmental Effects

The construction of the proposed facilities may lead to disturbance or loss of rare, endangered¹, and significant plants.

TQM established an agreement with the MEF, in cooperation with representatives from Environment Canada, to develop a methodology to carry out surveys for rare plant species along the proposed pipeline route. The MEF accepted the proposed methods to be utilized, the study teams, and the timing of the surveys. The biologists who conducted these surveys consulted the MEF data banks. These data banks identify the areas of Québec most likely to harbour rare plant species as well as those plants likely to be designated threatened or vulnerable². These data banks have been created using available scientific information collected by the MEF over time, but do not comprise an exhaustive inventory of all species in all regions of Québec.

TQM carried out surveys for rare plant species along 28 segments, measuring 8.8 km in total, of the proposed 213 km pipeline route. According to the information available from the data banks, the remaining 204.2 km of the proposed pipeline route were unlikely to harbour rare, threatened, or vulnerable plant species. The surveys were carried out in June, July and August of 1997 along a 100 m wide band centred over the pipeline route. Three of the 28 segments surveyed were found to harbour rare plant species.

One vulnerable plant, *Allium tricoccum* or wild leek, was found during the surveys. As well, two other species, *Strophostyles helvula*, wild bean and *Platanthera blephariglottis*, white fringed orchid, which are listed as candidate species to be designated threatened or vulnerable in Québec, were found.

Wild leek occupies rich, humid soils at the base of slopes in mixed deciduous forests, especially maple forests. The colonies in Québec contain several tens of plants to several million individuals. Seven colonies of wild leek, numbering from 100 to 70,000 individual plants, were located in a stream valley leading to a river. Without mitigation, these colonies of wild leek and their forest habitat would be adversely affected by construction activities of the pipeline on the proposed route. This particular area

¹ The term "endangered" also refers to "threatened" and "vulnerable" plant species.

² The list of threatened or vulnerable plant species in Québec is published, following the adoption in June 1989 of the *Loi sur les espèces menacées ou vulnérables* and modifying the *Loi sur la conservation et la mise en valeur de la faune et de la Politique québécoise sur les espèces menacées ou vulnérables*.

is already accessible by existing forestry roads, and the addition of new access to the area (the pipeline right-of-way) could lead to a cumulative environmental effect on these colonies. The area is also surrounded by a hydro-electric line, clear cut areas and rural roads. The proposed route would interconnect or pass closely to the existing pattern of clear areas for a distance of about 3.5 km. The proposed right-of-way would then traverse a wooded area of about 3.0 km where access is very limited.

Wild bean is found in open areas with rocky or sandy soils. It is only located along the banks of the St. Lawrence River, between Montréal and Cap Tourmente. A population of this species was located along the banks of the St. Lawrence River at one of the proposed crossing locations. Without mitigation, the population would be adversely affected during the pipeline construction activities.

White fringed orchid is found in bogs and fens with black spruce, shrubs or herbaceous plants. A population of this plant was located in a bog, along the proposed route. Seven thousand plants in excellent condition were identified within a 15 000 m² area of this bog. This population of white fringed orchid is located at the limit of the site where TQM proposes to construct a compressor station. Without mitigation, this population could be subject to a significant impact resulting from construction of the pipeline and the compressor station, or due to a modification of the natural drainage of the bog.

TQM identified a number of rare plants found in Québec that are associated with riparian habitat. The results of the Company's survey for rare plants did not specify the number of watercourse crossings that were included in the 28 segments studied. There is a possibility that rare plants could occur at any of the non-surveyed watercourse crossings.

Intervenors questioned the validity of the study conducted to find rare plants. The basis for their doubt is that the timing of the study was considered too late in the season in certain sectors. As well, an intervenor submitted that a colony of wild leek was missed during the survey. It is not clear if this colony would be affected by construction. TQM did not consider areas outside the 28 segments surveyed as having the potential for rare plants, based on the Québec data banks, and therefore did not conduct specific surveys in the remaining 204.2 km of the proposed route.

Mitigative Measures

To avoid the population of wild leek, TQM proposed a modification of the pipeline route to minimize the impact on the main colony of plants. In addition, TQM proposed that the work space in this region be considerably reduced. The colony would be delineated and contractors would be informed of the presence of this vulnerable plant. Any wild leek individuals, at present unquantified, that might be affected by pipeline construction would be transplanted to habitats favourable to their continued existence. TQM committed to monitor the condition of the transplanted wild leek population for a period of two years. In the event that the corrective measures are not satisfactory and new remedial measures are required, the Company would continue to try to resolve and correct the problems without any time limit.

With respect to the population of wild bean, TQM plans to use directional drilling at the St. Lawrence River crossing where this plant is known to be located, allowing the banks of the river to remain intact, and preserving the vegetation. No alternative crossing method is considered for the St. Lawrence River.

The population of white fringed orchid would be preserved by TQM's proposed reduction in size of the compressor station compound and by the maintenance of a buffer zone between the compound and the bog where this plant is found. With this size reduction, the compressor station would then only affect the border of trees alongside the bog and would not affect the bog itself. The Company proposed to change the point of entry of the pipeline to the compressor station to completely avoid the bog and to maintain a buffer zone of trees between the bog and the pipeline. In the event that future expansion of the compressor station is required, the enlargement would be in a southerly direction away from the bog and this plant community, thereby avoiding any potential future impacts.

Conclusions

The proposed route modification would avoid impacting the main colony of wild leek. However, some adverse environmental effects are possible on some of the transplanted wild leek individuals, if transplantation does not succeed. Given TQM's proposed mitigative measures and its commitment to monitor the condition of the transplanted wild leek population for a period of two years, any adverse environmental effect should be of short duration and affect a limited number of individual plants. The project is therefore not likely to cause significant adverse environmental effects on transplanted wild leek individuals.

Further, the population of wild leek would not likely be compromised by additional access to the area. Evidence shows that, even with the presence of existing forestry roads and utilities rights-of-way in the area, the population does not appear to be subjected to collection. An adverse significant cumulative environmental effect on the population at this location is therefore not likely to occur as a result of additional access to the area.

The proposed mitigative measures should eliminate any potential adverse environmental effects of construction and operation of the proposed facilities on the known population of wild bean and white fringed orchid.

In regard to the potential for rare plants at non-surveyed watercourse crossings that may not have been identified by TQM, it is difficult to assess the potential adverse impacts. TQM, in cooperation with the MEF, selected a method to survey the most probable sites that would harbour rare plants. Given the limited extent of this survey, it could not have encompassed all 227 watercourse crossings identified in the original Application and the alternatives in the MRC of Memphrémagog. Non-surveyed watercourse crossings may have less potential to harbour rare plants. There is a possibility that rare plants exist at such watercourse crossings. If TQM adopts the mitigative measures it proposed at sites known to contain rare plants: (i) directional drilling; (ii) avoidance or deviation; and (iii) transplanting to suitable habitats, the project is not likely to cause significant adverse effects on rare plants should these be encountered at any non-surveyed watercourse crossings.

4.3.2 Revegetation and Seed Mixtures

Potential Adverse Environmental Effects

The construction of the proposed facilities would lead to the loss of vegetative cover, which creates potential for soil erosion, a particularly important problem at watercourse crossings. Also, where the soil has been disturbed and lacks vegetative cover for a time, local weed species may become established.

In cases where rare plants may occur at watercourse crossings, utilization of standard seed mixture could result in adverse impact.

Mitigative Measures

TQM proposed several seed mixtures to revegetate the right-of-way and to prevent erosion after construction. These mixtures would be pre-established and could be as indicated in Table 4.1. These seed mixtures and application procedures may be modified after consultation with landowners and the MEF. Where the landowner does not select a particular seed mixture, the meadow seed mixture would be used by TQM. Seeding would be conducted at a rate of 40 kg/ha.

**Table 4.1
Seed Mixtures**

Meadow seed mixture	Meadow mixture with alfalfa	Fallow or abandoned lands, and areas along side highways
50% <i>Phleum pratense</i>	50% <i>P. pratense</i>	25% <i>Poa compressa</i>
25% <i>Trifolium pratense</i>	30% <i>Medicago sativa</i>	15% <i>P. pratense</i>
15% <i>T. hybridum</i>	15% <i>T. pratense</i>	10% <i>Festuca rubra</i>
10% <i>T. repens</i>	5% <i>T. repens</i>	10% <i>Agropyron Smithii</i>
		10% <i>Agrostis stolonifera</i> or <i>A. palustris</i>
		10% <i>T. album</i>
		10% <i>T. repens</i>
		10% <i>Melilotus alba</i>

At locations specified by landowners, green fertilizer (*Avena sativa* or *Polygonum Fagopyrum*) would be sown at a rate of 200 kg/ha. The seed mixture for fallow or abandoned lands, and areas alongside highways, would be sown at rates of 40, 60, or 120 kg/ha, depending on the method of seeding and the recommendations of agricultural specialists.

TQM undertook to monitor the first five growing seasons to examine soil and vegetation along the disturbed portion of the right-of-way. At locations where impacts persist beyond five growing seasons, the Company would resolve the problems and prolong the monitoring period.

TQM submitted that controlling of the spread of weed species from one area to another along the proposed pipeline route could be accomplished by washing all construction equipment prior to its transfer from site to site. TQM also proposed to seed and fertilize non-cultivated portions of the right-of-way and roadside ditches with an appropriate seed mixture in an effort to minimize the spread of weeds.

Conclusions

Forage seed mixtures as proposed in Table 4.1 serve to control erosion, fix nitrogen into the soil, and controls weeds. These ground cover species have a variable degree of persistence and would

eventually allow a natural vegetation cover to take over the disturbed area. When the appropriate seed mixtures are used and are applied in a timely manner, the project is not likely to cause significant adverse environmental effects caused by soil erosion or weed invasion. If the Company uses an effective method of rare plant identification and appropriately amends the seed mixture, the project is not likely to cause a significant adverse environmental effect on rare plants.

4.3.3 Vegetation Management

Potential Adverse Environmental Effects

The continued maintenance of the pipeline right-of-way using mechanical means may prevent the re-establishment of the natural vegetation, including rare plants.

Intervenors raised concerns about the use of herbicides for the control of vegetation. The use of herbicides could lead to adverse environmental effects if used in environmentally sensitive locations or inappropriately applied.

Mitigative Measures

TQM, as a policy, does not use herbicides to control vegetation along the right-of-way but does consider use of herbicides around above-ground structures, such as valve sites and compressor stations. Valves are generally located near public roads between eight and 25 km apart. TQM would position approximately ten valves along the route during the design stage.

Conclusions

The very limited use of herbicides by the Company would have only a minor effect on the environment. The vegetation management proposal is therefore not likely to cause a significant adverse environmental effect on vegetation.

If rare plants were to become established on the pipeline right-of-way, the vegetation management could adversely affect them. However, because of the limited numbers of rare plants expected to be on the pipeline right-of-way, the project is not likely to cause a significant adverse environmental effect.

4.4 Forest Communities

Potential Adverse Environmental Effects

The construction of the proposed facilities may lead to the loss of tree cover, merchantable timber, maple groves, and the loss and fragmentation of wildlife habitat.

The proposed pipeline route crosses an estimated 75 km of wooded area. This distance represents approximately 35% of the entire 213 km of the pipeline route. Within these wooded areas, TQM defined six classes of biotopes based on the composition of species present and the height of trees. A description and an estimate of the lost forest biotopes is summarized in Table 4.2.

Table 4.2
Class of Forest Biotope and Estimate of the loss of Forest Biotope

Class of Forest Biotope	Composition	Estimate
coniferous	spruce, larch, fir, and cedar in various proportions or as homogeneous stands and plantations of trees	50 ha
mixed	a heterogenous assemblage of trees, sometimes with an abundance of maple/birch or maple/beechn associations. This biotype is variable, however always contains conifers and a relatively high density of smaller trees.	62 ha
deciduous intolerant	a wide variety of tree species and tree sizes, predominately small, as well as open areas within a stand of trees	51 ha
deciduous tolerant(1)	high density of small trees which include a maple/birch mix dominated by red maple	37 ha
deciduous tolerant(2)	heterogeneous mix dominated by large mature sugar maple, with beech, yellow birch and eastern hemlock	17 ha
fallow or abandoned land	meadows, brush or meadows with young trees	44 ha
Total		261 ha

The alteration of the forest was a concern from several perspectives. A number of landowners and residents objected to the removal of tree cover on specific properties as it may adversely affect wildlife and deer in particular, either through reducing habitat or through fragmentation. A related concern was the threat to exceptional forest ecosystems of the region, and specifically old maple groves.

The proposed right-of-way opens up 25 km of new corridor through forested land. This would increase the fragmentation of habitats in forest ecosystems (see Section 4.8 - Wildlife and Wildlife Habitats). It is important to note that TQM proposed to follow existing rights-of-way where feasible. However, the Company modified its route in a number of cases to accommodate individual landowners. As well, TQM was requested by the MRC of Memphrémagog to keep a buffer zone of trees between highways and the proposed right-of-way to protect against visual impacts. These requests, if followed, would contribute to the fragmentation of forested areas.

Intervenors described the potential effects of removing vegetation and trees which act as windbreaks. They submitted that snow accumulation in unwanted areas due to the removal of shrubs and trees may cause difficulties with access to their property. Landowners and municipalities determined that tree removal would cause adverse noise and visual effects. These issues are dealt with in Section 4.11 - Acoustic Environment and Section 4.13 - Socio-Economic Matters.

A threat to the sustainable use of forestry resources was also perceived in that forested land would be unused while the pipeline is in operation. The potential loss of forested area must be considered in the very long term. This relates to the life expectancy of the pipeline and the recovery time of the lost forested areas to return to mature stands of trees. This impact can be expected to last for more than 50 years.

Since the proposed pipeline route parallels existing pipelines, hydro-electric lines, roads, and railways in a number of forested areas, there was a concern raised by intervenors that the increased width (and therefore greater open spaces, devoid of cover) may adversely and cumulatively affect white-tailed deer and their habitat.

Mitigative Measures

TQM proposed a number of general measures to address a range of potential adverse effects. TQM plans to mitigate the effects of lost forest resources using the following standard measures:

- restrict tree clearing;
- compensate according to actual commercial value of the forest resource;
- by-pass orchards and transplant nursery trees;
- ensure all construction activities remain on the right-of-way;
- mark or protect special trees adjacent to the right-of-way with fencing; and
- fell trees towards the right-of-way.

The Company proposed clearing trees on the right-of-way to a width of 18 m, instead of the width of the entire 23 m right-of-way, as is normally done. However, in the following situations TQM stated it may require clearing of more than 18 m of width:

- when the carrying capacity of the soil leads to further tree clearing;
- where space is required to properly manage the top soil and subsoil; and
- where additional space is required at road crossings in wooded areas, to permit horizontal drilling, or in wetlands¹.

TQM intends to avoid sensitive habitat areas and ensure that the regulations applying to the protection of wildlife would be enforced, such as not disturbing raptor nests and allowing snag trees to remain. There may only be a small amount of fragmentation of habitat because the majority of the pipeline would be in agricultural areas. Twenty-five km of the proposed pipeline would go through forested area that does not parallel existing rights-of-way. This would increase the fragmentation of forested area along these 25 km. The Company also noted that the proposed 18 m pathway within forest areas was not a significant obstacle for wildlife such as deer.

An adverse impact on old growth forest or exceptional forest ecosystems was not foreseen, because of the policy of avoiding these areas following consultation with the provincial regulatory authority on potentially sensitive areas. In one case, where it was suggested by an intervenor that old growth maples did exist, the Company stated that it intended to skirt the area in question and not cut within it.

The removal of trees and bushes would be discussed with individual landowners to avoid or minimize problems such as snow accumulation, sound or wind. Individual landscape plans made in consultation with each landowner may serve to rectify such problems. One possible measure to mitigate these problems is to plant trees along the right-of-way which would act as windbreaks and minimize the accumulation of snow.

¹ For a more in-depth discussion on wetlands, refer to section 4.7 (Wetlands).

TQM stated that, to reduce loss of the forest resources, Christmas trees and miniature apple trees may be permitted to be planted on the right-of-way. TQM plans to ensure the salvage and sale of merchantable timber. Nonetheless, the Company expects a loss of some forest resources.

TQM proposed to locate its route adjacent to existing rights-of-way where feasible. More than 42 km of the proposed right-of-way border the rights-of-way of Hydro-Québec, Canadian National, Gaz Métropolitain, and roads and highways. TQM submitted that parallelling existing corridors conserves forest resources otherwise lost by opening a new corridor, thereby reducing the net loss of wooded area from 170 to 152 ha.

Conclusions

There is no evidence of a threat to an exceptional forest ecosystem, based on the Company's commitment to use avoidance as a preferred technique. Therefore, the project is not likely to cause a significant adverse environmental effect.

Concerns about effects of cutting trees and bushes that serve as screening for different purposes would be addressed in the landscape plan worked out with individual owners. If this commitment was followed, many potential problems would be avoided. Should problems occur they would be localized and reversible in the medium term. Thus, the project is not likely to cause significant adverse environmental effects.

From a regional perspective, the loss of 152 ha of forest should not compromise the sustainable use of the resource. The project is therefore not likely to cause a significant adverse effect with respect to all forestry resources along the proposed right-of-way.

The Company proposed to follow existing rights-of-way for approximately 50 km of forested area. TQM has been asked in a number of cases to reroute through forested areas to decrease visual impacts or to avoid stands of maple trees. While the development of a new right-of-way would increase the degree of fragmentation of forest habitats, increased fragmentation due to pipeline construction is considered minor. The project is therefore not likely to cause significant adverse environmental effects on forest communities and wildlife.

Loss of forest habitat for some wildlife would be inevitable with the construction of a pipeline, especially when it passes through previously undisturbed forested areas. However, new habitat would be created which favours other forms of wildlife, including deer. Any adverse effect would be minor, localized, and partially reversible as vegetation would encroach the right-of-way not subjected to re-clearing. On balance, the project is not likely to cause significant adverse environmental effects.

If an accident occurs, the immediate adverse environmental effects would likely be confined to a relatively small area. Environmental damage may be significant in forested areas if secondary fire occurred. On the basis of TQM's design, there is a low probability for an incident to occur. Therefore, the project is not likely to cause significant adverse environmental effects.

4.5 Hydrology

Potential Adverse Environmental Effects

The main concerns associated with hydrology include effects on surface water and groundwater. Potential adverse environmental effects on municipal and private wells could result from pipeline construction. The effects include both the reduction in water flow or water quality, due to blasting or the movement of heavy machinery near wells. Hydrocarbon spills from construction vehicles could also find its way into ground aquifers and thus diminish well water quality. Important municipal wells which could potentially be affected are those of the communities of Saint-Jean-Baptiste, Sainte-Angèle-de-Monnoir, Saint-Césaire, Stukely-Sud, and East Hereford.

One area which is considered particularly vulnerable to pipeline construction is the fish-farm located at East Hereford which taps a local aquifer via five wells. The aquifer is sustained by the surface waters from the Hall River and Buck Creek and runoff from the surrounding mountains. Intervenors conducting fish farming operations in the area emphasized the excellent water quality available from the aquifer, as well as ample quantity, both of which are necessary to sustain the existing and any future growth in these enterprises. The proposed route crosses these two watercourses about one km upstream of the water pumping facilities for the five wells. There is also a pumping station at this location for the East Hereford municipal water supply. During the investigation of this aquifer, it was noted that the water table was close to the surface in a number of areas.

Construction activities may impact the quality of river water and thus adversely affect municipal water supplies from these sources. Potential adverse effects could include the introduction of sediments due to erosion and hydrocarbon spills resulting from accidents or improper construction practices. Moreover, when rivers are crossed by an open-cut method, bottom sediments could be disturbed. This could be significant if the bottom sediments were contaminated. The towns of Varennes, Otterburn Park, and Omerville obtain their municipal water from the St. Lawrence River, Richelieu River, and Magog River respectively.

During construction and restoration activities, modification of surface drainage and groundwater channels could lead to soil erosion and reduced water quality. The modified surface could also channel water away from areas where it is required for crops, or could cause water to pond, thus reducing productivity. Damage to tile drainage systems resulting from excavation, and to soil from erosion due to pumping water from the pipeline trench, could also reduce productivity.

Water intake for hydrostatic testing of the pipeline could reduce the water supply available for current users. TQM proposed to withdraw water for hydrostatic testing from: Rivière des Prairies and the St. Lawrence, Richelieu, Yamaska, Magog, and Hall rivers. The release of hydrostatic test water could also have adverse environmental effects, such as the erosion of soil if a watercourse is flooded or if the water is released on bare ground. Where hydrostatic water is treated with chemicals there are also risks to the water quality of receiving areas.

A rupture of the pipeline could create a crater and shock waves from an explosion. In either case, any disturbance of a well could negatively affect water supply and quality.

Mitigative Measures

TQM undertook to identify and locate all municipal and private wells within 100 m of the proposed route. By November 1997, the Company had identified more than 200 private wells. The Company proposed the following mitigative measures to prevent or correct the potential adverse environmental effects of the pipeline construction:

- develop preventive measures to counter accidental spills of fuel and oil;
- develop and apply an emergency control and restoration plan;
- use a pattern and size of explosive charge to reduce the potential of impacts on the aquifer and wells;
- control vibrations that could affect wells;
- evaluate the rate of flow and water quality of each well before and after blasting for all wells within 100 m of blasting site;
- supply the same rate of flow and quality of water before and after construction; and
- provide replacement water where the quantity and quality of a well is affected by pipeline-related activity.

Specific measures were proposed to prevent any spill of hydrocarbons that could contaminate the East Hereford aquifer as follows:

- select three sites for the construction of refuelling stations that would control all spills of hydrocarbons;
- use an impermeable membrane at refuelling stations;
- before each day's work, an authorized mechanic would inspect machinery to ensure that all hydraulic equipment and hoses are in good condition;
- make all necessary repairs to ensure that an accidental spill of hydraulic fluids does not occur;
- produce daily inspection reports dated and signed by a mechanic and indicating that necessary repairs were performed prior to the reemployment of machinery;
- a traffic control officer would control the movement of all vehicles to prevent accidents;
- the traffic control officer would report all violations in written form to TQM;
- defoliants and pesticides would not be used since these chemicals could seep into the groundwater; and
- verify periodically the water quality in Buck Creek and the wells to determine whether or not the pipeline has had an effect on the water quality downstream of the pipeline.

The mitigative measures listed above would reduce the possibility of contamination from construction equipment. TQM proposed to lower the water table of the aquifer at East Hereford by installing well points and pumping out the water. This action would facilitate construction and site restoration.

To avoid disturbing bottom sediments and the possibility of sedimentation from erosion, TQM proposed to directionally drill the St. Lawrence, Richelieu and Magog Rivers. The Company's proposal to directionally drill the aforementioned rivers would prevent the suspension of contaminated sediments in the water column. This would prevent the potential contamination of the municipal water sources at Varennes, Otterburn Park, and Omerville.

The Company proposed the following mitigative measures to prevent or correct the potential adverse environmental impacts on surface and subsurface drainage due to pipeline construction:

- identify tile drainage system prior to construction;
- modify existing and future tile drainage systems to incorporate changes on drainage by the pipeline;
- anticipate the passage of future tile drainage systems;
- repair tile drainage systems and verify repairs;
- facilitate and maintain surface drainage;
- install temporary surface ditches;
- return the surface drainage to original conditions;
- install trench plugs to prevent movement of water along the pipeline;
- pump water from trench onto vegetation to avoid erosion;
- use diffusers or other means to minimize erosion; and
- obtain authorization to release water into watercourses.

It is standard procedure to withdraw water for hydrostatic testing of large diameter pipe from large rivers. The rivers previously identified to supply hydrostatic test water are medium and large rivers with the necessary flows to test sizeable, extensive pipelines, without reducing the remaining volume of water to an unacceptable level. Other mitigative measures to avoid or limit adverse environmental effects include:

- limit water withdrawal to 10% of stream flow or volume of a water body;
- obtain the necessary permits and authorizations from the MEF and municipalities to withdraw and discharge hydrostatic test water;
- do not add biocides or chemicals to the test water;
- spray spent test water in areas of thick vegetative cover;
- discharge hydrostatic test water into same drainage basin;
- use diffusers to reduce the risk of erosion; and
- use fish screens.

TQM did not specify any particular mitigative measures for dealing with the possible effects of malfunctions and accidents on aquifers and wells, other than dealing with hydrocarbon spill mitigation in a global sense.

Conclusions

The mitigative measures proposed by TQM are considered standard practice for dealing with the potential loss of supply or reduction of water quality from municipal and private wells. Assuming that no accidents or unforeseen events occur, the project is not likely to cause significant adverse environmental effects. Even if a problem were to arise, it would likely be local in extent and the effects would be reversible through providing a new water supply source or decontaminating the existing source. In the case of the fish-farm at East Hereford, the quantity and quality of water that would have to be replaced may be too great for the Company to provide a new suitable water supply.

With respect to decontaminating the existing source, there are methods to clean contaminated groundwater: (i) pumping of water to remove hydrocarbons; (ii) using activated charcoal filters to recover hydrocarbons; and (iii) installing water treatment systems. Depending on the substance spilled and the permeability and other local characteristics of the site, these methods may not be fully or

always effective. In the event of an accidental spill, TQM indicated that it would be responsible for rectifying the situation.

Because of the specific measures to prevent spills at the East Hereford aquifer which TQM has undertaken to implement, the probability of an accidental spill is low and, therefore, the project is not likely to cause significant adverse environmental effects.

Pumping out the water in order to lower the water table of the aquifer at East Hereford is not expected to have an adverse effect on the quantity or quality of water available to other users. Pumping would be localized and of short duration, and, therefore, should not cause significant adverse environmental effects.

With the directional drilling of major rivers, the project is not likely to cause significant adverse environmental effects on the water supply of communities using these rivers. The construction-related mitigation commitments should prevent spills, surface runoff, and erosion. The contingency planning would provide for effective and rapid clean-up in most circumstances if problems arise. Overall effects are likely to be minor, localized, infrequent, and short term; the project is not likely to cause significant adverse environmental effects.

The proposed mitigative measures for drainage issues are standard ones which, when properly applied, should reduce problems to a minimum. Any residual problems that could arise after land is recontoured to its natural surface and subsurface drainage is re-established would be local and minor; they could be corrected in the short term and should not recur. Overall, the project is not likely to cause significant adverse environmental effects.

Hydrostatic testing should not pose a problem if the prescribed measures are followed. Consequently, hydrostatic testing is not likely to cause significant adverse environmental effects.

There is a potential cumulative effect due to construction activities when these activities cross through or over groundwater and surface water resources. Activities such as blasting, excavation, and accidental spills may act cumulatively if they should all occur in the same area. These events may modify soil permeability, drainage patterns, groundwater movement, and water quality, thus having a cumulative effect on individual wells or an aquifer. However, based on the mitigative measures proposed by the Company, construction is not likely to cause significant adverse cumulative effects.

An explosion and fire could leave residues in the soils and water and may have the potential to affect the transmissivity of the aquifer. Except in the case of the fish-farming operation, the pipeline would be relatively shallow compared to the usual depth of aquifers and thus this effect is unlikely. On the basis of TQM's design, there is also a low probability for an incident to occur. Consequently, the project is not likely to cause significant adverse environmental effects.

The sustainable use of water resources is not expected to be adversely affected by pipeline construction within a regional context. However, given the number of aquifers and wells identified by the Company, the potential for effects upon individual aquifers or individual wells must be considered as a possibility. If the effects were to affect municipal wells or commercial wells, such as those used by fish-farming, the sustainable use of groundwater resources in the immediate vicinity of the wells could be in doubt. TQM has the responsibility to rectify such situations or provide an alternative water source. The sustainable use of the aquifer at East Hereford would only be compromised if a

major spill of hydrocarbons occurred. However, since such effects would be local in scale, infrequent and reversible, and, in the case of a major hydrocarbon spill, unlikely, the project is not likely to cause adverse environmental effects on the renewable use of water resources.

4.6 Fisheries and Fish Habitat

Potential Adverse Environmental Effects

The proposed pipeline route crosses a number of watercourses which may be adversely affected by construction-related activities. These activities include clearing and grading, trenching, installation of flow diversions, streamflow interruption, back-filling, and related activities such as equipment maintenance and waste disposal. One of the most serious adverse environmental effects on fisheries and downstream water users could result from increased concentrations of suspended sediment and bedload, which increases sedimentation downstream of the crossing. As well, inadvertent mud returns due to directional drilling operations could occur, increasing the sediment and thus introducing pollutants in the water column. With respect to fisheries, pipeline construction could result in flow disruption, direct fish mortality, and the disturbance and loss of existing and potential fish habitat at the stream crossing points, as well as downstream. Streambank erosion, sedimentation, and toxic spills decreases water quality and further reduces fish populations. Further, in-stream activities interfere with navigation on navigable waters.

TQM's original facilities Application proposed 213 watercourse crossings. Subsequently, TQM proposed two alternate route modifications for portions of the pipeline. These two modifications are found within the MRC of Memphrémagog and contain 14 watercourse crossings in total. TQM indicated that some of the proposed watercourse crossings for the project are considered as sensitive streams and require specific crossing designs to deal with particular environmental, construction or engineering concerns. Relying on information from MEF data banks, analysis of aerial photographs and site visits, TQM categorized the watercourse crossings according to fisheries resources and fish habitat sensitivity using the following criteria:

- the distribution of salmonids (cold water);
- presence of salmonids in a tributary;
- presence of a spawning ground within 100 m of a watercourse crossing;
- presence of a spawning ground for warm water species within 100 m of a watercourse crossing;
- presence of an endangered or threatened species;
- presence of a spawning migration;
- sensitive spawning and nursery habitat downstream; and
- risk of sediment transport.

Within the entire study area, the general characteristics of the fish populations indicate three distinct zones of relative homogeneity. The first is the St. Lawrence plain, Lachenaie to Granby sector, which is characterized by warm water fish species; the second is the Granby to Coaticook sector, which is characterized by a mix of warm and cold water species; the third is the Coaticook to East Hereford sector, which is characterized by salmonids, cold water species.

Seven large and important rivers are located in the Lachenaie - Granby sector in addition to numerous smaller watercourses highly impacted by agricultural activities. The important rivers include three

channels of the St. Lawrence River, Rivière des Prairies, Richelieu River, and Yamaska River, all to be crossed by directional drilling. Many species are found in these rivers, some of which are in the process of being considered threatened such as the *Acipenser fulvescens*, the lake sturgeon, *Alosa sapidissima*, the American shad, *Moxostoma hubbsi*, the copper redhorse, and *Esox americanus americanus*, the redbfin pickerel. These rivers serve as spawning grounds and are used as migratory corridors.

The Hudson and Saint-Louis Rivers are also considered sensitive because of their proximity to lotic spawning habitat and possible occurrence of rare species such as the copper redhorse and the redbfin pickerel, whose occurrence is confirmed in the Chambly basin. The occurrence of these rare fish species, however, has never been confirmed in these rivers nor is it considered likely given the poor water quality.

There are five large rivers in the Granby to Coaticook sector, namely the Rivière aux Cerises, Tomifobia, Niger, Magog, and Coaticook Rivers. These rivers are generally inhabited by warm water species spawning in lotic and lentic conditions, as well as brown and rainbow trout. The numerous small streams found within the hilly region of this section are frequented by *Salvelinus fontinalis*, the brook trout.

No large river is found in the Coaticook to East Hereford sector and only one medium-sized river, the Hall. Several streams are found in the mountainous portion of this area, where the fish population is dominated by the brook trout.

TQM also categorized the 14 watercourses to be crossed in the two MRC of Memphrémagog alternatives. Only one large river, the Magog, is crossed by these proposed alternatives.

During the directional drilling process the drill bit requires a drilling mud called bentonite, a naturally-occurring clay, to facilitate the drilling of the pilot hole and the boring for the full diameter of the pipeline. This material, if leaked into watercourses, has effects similar to an increase of sedimentation. Its potential adverse effects depend on how much material was released and the sensitivity of the watercourse and habitats affected.

Mitigative Measures

TQM proposed three types of watercourse crossings: (i) directional drilling; (ii) open trench-dry crossing; and (iii) open trench-wet crossing. Directional drilling employs a directional bit to drill a pilot hole under a watercourse. A boring tool, slightly larger than the diameter of the pipe, is pulled back under the watercourse, pulling with it the pipe to be installed. The bentonite used in directional drilling is contained within impermeable basins at the drilling site. These containment basins when constructed prevent the overflow of the bentonite into ditches and watercourses. To avoid the contamination of soil by drilling muds, the Company proposed to dispose of the bentonite in authorized sites or on land as approved by landowners. As bentonite is basically inert, if spread on cultivated fields, it may decrease the soil productivity of the land.

The open trench-wet crossing method employs in-stream equipment to excavate a trench in open water before laying the pipe in the open trench. The open trench-dry crossing method employs similar equipment to the wet crossing technique. However, coffer dams are installed on either side of the

trench line, the watercourse is diverted, and the water is removed along the trench line. The equipment is then able to work on a dry river or stream bed.

TQM outlined in its Application a number of standard mitigative measures to be followed for all watercourse crossings, in an effort to limit potential adverse environmental effects associated with wet and dry crossing techniques.

Bank Stability

- minimize clearing of trees and maintain brush on the slopes;
- conserve the vegetation on the banks and shorelines for transplanting;
- stabilize the slopes and banks using: mulch, wood chips, rip-rap, grass sod, willow stems, geotextile, and brush;
- prohibit the use of wheeled vehicles on steep slopes;
- limit the levelling of shorelines and banks; and
- grade banks to respect natural profile or contour.

Sedimentation

- conserve a 10 m buffer of vegetation and trees along the streambanks until just before in-stream work begins;
- strip and conserve the topsoil and prevent the removal of roots outside of the trench width;
- place topsoil and subsoil piles on level ground, away from the slope;
- use temporary erosion measures such as silt fences, erosion control blankets, slash, etc.;
- maintain trench plugs until just before in-stream construction;
- prohibit the placement of spoil material within the watercourse;
- install sediment barriers;
- suspend work during periods of rain, high water levels and flooding;
- minimize in-stream work time (6 hours for a 5 m crossing, up to 15 hours for a 30 m crossing);
- use soil type as one selection criterion for the watercourse crossing technique; and
- where feasible, use a dry crossing, during summer low flow, and ensure the free movement of fish.

Water Quality

- refuel and maintain equipment at least 30 m from watercourses;
- prohibit storage of petroleum products within 30 m of a flood zone;
- report spills and skim floating contaminants or use absorbants;
- place contaminated material in drums and dispose according to provincial procedures;
- advise the Board of all spills of petroleum products greater than 100 litres;
- prohibit washing of vehicles in a watercourse;
- inspect all vehicles prior to coming into contact with water;
- remove all wood and brush which finds its way into the watercourse; and
- burn woody debris at least 100 m away from watercourses.

Fish Habitat

- restore fish habitat and in-stream conditions to pre-construction state;
- backfill and re-contour banks, river and stream beds with original material;
- install adequate diameter temporary culverts to allow proper water flow and temporary fish passage;
- respect construction windows;
- distance fish away from blasting sites and conduct blasting immediately;

- observe the MEF conditions; and
- adhere to the requirements and conditions of the *Fisheries Act* in regard to the harmful alteration, disruption and destruction of fish habitat and the destruction of fish other than by fishing as authorized by the Minister.

Navigable Waters

- adhere to all conditions of the *Navigable Waters Protection Act* as issued by the Canadian Coast Guard.

By letters dated 15 and 22 December 1997, the Department of Fisheries and Oceans ("DFO") provided its expert opinion on the status of each watercourse crossing under the *Fisheries Act*. Based on available information, DFO determined that certain watercourse crossings, included in Series A in Appendix I, are not subject to the *Fisheries Act*. DFO indicated that construction activities would not cause significant adverse environmental effects on the watercourses included in Series B in Appendix I if TQM complied with the following conditions:

- carry out work activities outside of the critical sensitive periods for fish found in these watercourse crossings;
- take all steps required to limit the disturbance and transport of sediments;
- implement all mitigative measures specified in Addenda 2 and 4 of the Impact Study (UDA, November 1997), in the *Analyse complémentaire des traversées de cours d'eau pour la faune ichthyenne* (UDA, November 1997), and in UDA's undertaking at pages 215 and 216 of the GH-1-97 transcripts;
- minimize the width of the right-of-way within the watercourses;
- keep machinery in good working order so as to avoid leakage of oil, grease or fuel;
- perform general maintenance and refuelling of engines and vehicles as well as handling and storage of hydrocarbons at least 15 m from riverbanks, on a site where contamination risks to aquatic fauna may be insignificant;
- keep adequate supplies of absorbents on hand at work sites to deal with accidental spills; and
- adhere to DFO's *Guidelines for the Use of Explosives in Canadian Fisheries Waters* (Wright, 1997).

If TQM does not adhere to the *Guidelines for the Use of Explosives in Canadian Fisheries Waters*, it would have to make an application pursuant to Section 32 of the *Fisheries Act*. This application has to be sent to Fish Habitat Management, DFO, at least 28 days before the use of explosives. As well, the issuance of this authorization triggers the CEAA, pursuant to paragraph 5(1)(d).

With respect to the watercourses included in Series C in Appendix I, DFO requested that the following supplemental information be provided in order to complete its assessment pursuant to the *Fisheries Act*:

- exact locations and surface area of spawning grounds found within 100 m at the watercourse crossing site;
- percentage of the spawning ground that is affected by construction;
- species spawning at these sites;
- exact dates of construction;
- detailed description of the crossing method and the mitigative measures to be used;
- estimates of expected losses of habitat and productivity; and

- appropriateness of development of a follow-up program on spawning grounds productivity after construction.

During the hearing, TQM agreed to comply with DFO's proposed conditions, to carry out the necessary surveys during the spring of 1998, and supply DFO with the required information.

The Canadian Coast Guard analyzed the information received from TQM in regard to the proposed project. The Canadian Coast Guard indicated that TQM still has to submit the technical plans and specifications to DFO for each navigable water crossing to conform with the *Navigable Waters Protection Act*.

Conclusions

The directional drilling technique that would be used for selected watercourses crossings identified in Appendix I would likely prevent the adverse environmental effects associated with the open-trench techniques. The possibility for inadvertent mud returns up through the river bed is a potential adverse environmental effect from directional drilling. However, inadvertent mud returns are unlikely. Crossing these rivers using the directional drilling technique is therefore not likely to cause significant adverse environmental effects.

Some sedimentation of stream habitats may occur in both wet and dry open-trench crossings during construction. The impact of sedimentation would be site-specific and would depend on factors such as streambank stability and sediment particle size, flow characteristics of the stream sections affected, and sensitivity of the species present. TQM proposed to reduce the effect of pipeline construction on stream bank stability and sedimentation by minimizing the removal of trees along the river and stream banks, prohibiting the use of wheeled vehicles on steep slopes, and limiting the levelling of banks and shorelines. Stabilizing the banks and slopes using mulch, wood chips, grass sod, willow stems and geotextile, and conserving and replanting shoreline vegetation, would reduce the risk of post-construction bank instability, erosion, and sedimentation. With the mitigative measures to minimize the time the trench is open, and with the immediate restoration of banks and watercourse beds after construction, the construction of the pipeline is not likely to cause significant adverse environmental effects related to stream bank stability and sedimentation.

TQM indicated the type of soil present at each watercourse crossing. TQM also indicated the rate of flow, the presence of fine material such as clay and loam, and the risk of transport of these sediments downstream. Where TQM selected the open-trench method to cross a watercourse, it indicated that the dry crossing technique needs to be evaluated where there is a risk of sediment transport, i.e., where the banks and stream bed have a high degree of fines. Using open-trench dry crossing technique reduces but does not eliminate the release of sediments into the water column. The reduced release of sediments in turn reduces the size of the sediment plume and its influence downstream of the open-trench dry crossing site. With use of the mitigative measures proposed, the project, with respect to the open-trench technique, is not likely to cause significant adverse environmental effects on fish and fish habitat.

TQM's proposed mitigative measures to control construction waste, fuel and oil spills, and the burning of woody debris would reduce the risk of contaminating the water quality at each watercourse crossing to an insignificant level, such that the project is not likely to cause significant adverse environmental effects.

The proposed mitigative measures to maintain bank stability, reduce sedimentation, maintain water quality, protect and restore fish and fish habitat, and to select the appropriate watercourse crossing method would reduce the area that is affected and the duration and intensity of the effect on the environment. Thus, the project is not likely to cause significant adverse environmental effects.

The potential adverse environmental effects of pipeline construction on the various components which make up the aquatic environment are cumulative. Bank instability, sedimentation, blasting, and diminished water quality may have a cumulative effect on fish and their habitats. The proposed mitigative measures and restoration of each watercourse crossing would reduce the extent and intensity of the individual effects and the cumulative effect of all effects on the environment. The results of the proposed general five-year monitoring program should reveal the degree of success for each corrective measure taken. TQM would be responsible for correcting any deficiencies until the effects are insignificant. Consequently, the project is not likely to cause significant cumulative adverse effects on the environment.

TQM committed to monitoring potential fish kills during blasting operations. The results from monitoring of fish kills is meant to indicate the success of the techniques used to distance fish from the work area, and indicate the significance of effects due to the blasting charges and sequence of blasting. This procedure is intended to reveal the effectiveness of the mitigative measures employed to reduce the fish kills and determine any residual effects of the project.

The fish resources in the study area are extensive and varied according to the available data. Each of the adverse environmental effects analyzed are foreseen to have a minor to moderate impact upon fish and fish habitats in the short term due to the relatively small area effected and the short duration of the environmental effect. Because of the relatively minor area affected compared to the size of the territory within the study area and the extensive aquatic habitat in the region, the effects on the sustainable use of fishery resources are not likely to be significant. Similarly, in terms of each individual stream or river crossed using the open-trench technique, there should be no long-term significant adverse environmental effects on fish and fish habitat if the proposed mitigative measures are employed. By respecting the construction windows, restoring the stream and river banks immediately after construction, and monitoring the residual effects for five years or until the residual effects are not significant, the pipeline construction is not likely to cause significant adverse environmental effects on the sustainable use of fisheries resources in individual streams.

A malfunction or accident at a watercourse crossing could have an adverse effect on the fish and fish habitats. The degree of the impact would depend upon the extent of the malfunction, sensitivity of the stream, the season, the sensitivity of the habitat, and the presence or absence of fish. While the effects could be significant, the risk of a malfunction or an accident would be low, based on established engineering standards for pipeline construction. TQM would restore the vegetation and in-stream habitats to reverse the impact of the malfunction or accident. Overall, the project is not likely to cause significant adverse effects on fish and fish habitat.

DFO, Fish Habitat Protection Branch, analyzed the information received to date on the locations and techniques to cross watercourses along the proposed route for this project. DFO stated that it requires additional information on 18 of the watercourses before it can assess their potential effects on fish resources pursuant to *Fisheries Act*. The Company undertook to conduct supplemental surveys and give the results to DFO in a timely manner. Based on this information, DFO issues a letter of advice

or an authorization pursuant to the *Fisheries Act* requiring mitigation, or compensation that would guarantee the protection of fish habitat within the 18 watercourses identified in Series C in Appendix I.

DFO, Canadian Coast Guard, submitted that this type of project is not one which causes significant effects upon navigational safety or affects the right of the public to navigate on navigable waters. DFO reserved the right to revise this decision for all modifications to the proposed project.

For all watercourse crossings, decisions, if favourable, are conditional on the project being carried out at the locations indicated and following the techniques and schedule submitted by TQM. All modifications would be subject to reassessment pursuant to the *Fisheries Act*, the *National Energy Board Act* and the CEEA.

In regard to the 18 watercourse crossings which require further information, TQM committed to restoring fish habitat and in-stream conditions to pre-construction levels. If the appropriate crossing method and mitigative measures are implemented, crossings may be unlikely to cause significant adverse environmental effects. Prior to any in-stream construction activities, the crossing method and the proposed mitigative measures would require Board approval.

4.7 Wetlands

The Federal Policy on Wetland Conservation: Implementation Guide for Federal Land Managers defines wetland as "land where the water table is at, near, or above the surface or which is saturated for a long enough period to promote such features as wet-altered soils and water-tolerant vegetation. Wetlands include organic wetlands or "peatlands", and mineral wetlands or mineral soil areas which are influenced by excess water but produce little or no peat."¹

The Canadian Wetland Classification System describes wetland according to class, form, and type. The five wetland classes are bog, fen, marsh, swamp, and shallow open water. Wetland forms are described according to their surface form, surface pattern, water type and underlying mineral soil. Wetland types are classified according to the physical appearance of the vegetation, such as hardwood treed, tall rush, or floating aquatic types.

Potential Adverse Environmental Effects

TQM carried out its wetlands inventory along the proposed pipeline route using the criteria set out in the Canadian Wetland Classification System. Seven wetlands were identified in TQM's survey. Five of them originate from organic soils and two from mineral soils. The wetlands were identified from MEF data banks along with observations made in the field at each of these seven sites. A systematic survey of the proposed route was not conducted.

The wetland in the region of Varennes contains mineral soils and has lost its natural characteristics as a wetland due to grazing. The wetlands at Saint-Ange-Gardien and Saint-Alphonse arise from organic soils and have been partly drained and cultivated, as well as being disturbed by an existing

¹ The Federal Policy on Wetland Conservation, published by the Canadian Wildlife Service, Environment Canada, 1996.

Hydro-Québec right-of-way. In Granby, the wetland is a bog within an enclosed basin. This area is somewhat disturbed by drainage activities and clear-cutting; however, this wetland maintains its natural characteristics.

The wetland located within the municipality of Stukely has a mineral soil base. The riparian area has been disturbed by clear-cutting and the installation of a Hydro-Québec right-of-way.

Two natural wetlands are located in Sainte-Catherine-de-Hatley and East Hereford. Both areas contain organic soils within small closed drainage basins. The bog at Sainte-Catherine-de-Hatley would be crossed by pipeline construction for a distance of approximately 90 m. The bog at East Hereford is 2.8 ha in area and contains *Sphagnum sp.* throughout. This bog also contains a rare plant species, *Platanthera blephariglottis*, the white fringed orchid. The designated status of this species is discussed in the Section 4.3 - Vegetation.

The Company also identified a single marsh located on île aux Fermiers during its surveys of the proposed route.

During the hearing, intervenors identified areas which they described as "wetlands" and expressed concern as to whether TQM's survey of wetlands was comprehensive. They referred to one particular area at Bunker Hill as a wetland. However, no evidence was provided as to what criteria were used to make this finding. TQM did not have information on the existence of a potential wetland at Bunker Hill or a small pond near Stukely-Sud. As well, other intervenors questioned the Company's survey of wetlands. TQM submitted that other areas described by intervenors may not constitute a wetland by the above definition.

With respect to the watercourses to be crossed by the proposed pipeline route, approximately 50 watercourses have one or both banks at an elevation of less than or equal to 0.5 m above the water level. The lands surrounding these 50 watercourses would not be classified as wetlands, using the description and definition adopted by TQM. Many of the 50 watercourses with shallow embankments may be subject to seasonal flooding which could give rise to areas that have similar characteristics to wetlands. As such, these watercourses could provide seasonal wildlife habitats similar to those of a well-defined wetland and therefore may be subjected to similar environmental impacts.

Pipeline construction activities in wetlands have the potential to cause permanent changes in the drainage patterns of the wetland and surrounding area. Without mitigation, disturbances of wetlands could have an adverse environmental effect on the structure and function of the ecosystem contained within its boundaries. The watercourse crossings with shallow banks could be subject to similar impacts.

Pipeline construction activities within a previously affected wetland could lead to cumulative effects on the vegetation loss, habitat modification, drainage pattern changes, and function of the wetland.

In the event of a malfunction or accident such as an explosion, potential effects on wetlands would be a change in the drainage and a resulting change in associated habitats. Leaking natural gas is not expected to cause adverse impacts on a wetland. However, vegetation in the immediate vicinity of the leak could be disturbed or destroyed.

Mitigative Measures

TQM proposed to incorporate drainage provisions into the project design, such as the placement of spoil piles and the placement of access roads and ramps, to minimize the interference with the natural drainage of the wetland. As well, the Company would re-establish the natural drainage patterns once construction is completed by recontouring the modified topography to preconstruction conditions. TQM would use trench plugs on rights-of-way through wetlands to ensure that the trench line and pipeline do not create a preferred channel for the movement of water.

In wetland areas, TQM proposed to reduce clearing of trees on the right-of-way, where possible. Tree stumps would be left in place where possible and cut flush with the ground. The Company also proposes to conserve the organic soils excavated from the trench and conserve and transplant the natural vegetation that forms riparian habitat. TQM indicated that no fertilizers would be applied. Allowing vegetation to re-establish naturally is effective in promoting the regeneration of natural vegetation.

TQM's proposed pipeline route and proposed compressor station would completely avoid the East Hereford bog, thus eliminating any potential adverse environmental effects. Similarly, the proposed routing to the northern point of île aux Fermiers would also completely bypass the marsh identified to the south of this area.

TQM's proposed standard techniques listed below would mitigate the potential adverse environmental effects on habitats at watercourse crossings with shallow banks, in an effort to maintain surface and subsurface water quality:

- minimize removal of trees along the banks;
- stabilize the banks;
- conserve the vegetation on the banks and along the shoreline;
- conserve a 10 m band of trees the entire width of clear-cut on the right-of-way until watercourse crossing is imminent;
- limit levelling of shoreline;
- strip and conserve topsoil on the banks;
- place topsoil and subsoil on level surface away from the banks;
- use sediment barriers;
- reseed riparian zone with an approved seed mixture;
- refuel machinery at least 30 m from surface water;
- use measures to prevent fuel spills;
- install a container at each construction site for solid waste;
- daily removal of construction waste; and
- dispose of waste at approved site.

Without specifying what mitigation TQM proposed for the wet area at Bunker Hill, the Company submitted it would protect this area. TQM submitted that restoration would reduce any impacts on this wet area.

Conclusions

No adverse environmental effects are expected on the bog at East Hereford and the marsh at île aux Fermiers since both would be avoided with the proposed route.

TQM, by incorporating mitigative measures during construction, would minimize the potential adverse environmental effects due to construction within the wetlands. The resulting adverse environmental effects would be moderate in the short term and insignificant in the medium to long term. Overall, with appropriate identification of specific wetland sites and mitigation, pipeline construction is not likely to cause significant adverse environmental effects, including cumulative effects, on the other wetlands.

In addition, watercourse crossings with shallow banks are not likely to cause significant adverse environmental effects with the use of TQM's proposed mitigative measures during construction and restoration.

In regard to the potential "wet areas" not surveyed by TQM, the potential adverse effects are the same as those the Company did identify for "wetlands". If TQM adopted the same mitigative measures for wetlands and watercourse crossings as for unidentified potential wet areas along the proposed route, the project should not be likely to cause significant adverse environmental effects.

With the proposed mitigative measures, the project is not likely to cause significant adverse environmental effects on the sustainability of wetlands.

Should an accident occur, the immediate adverse environmental effects would likely be confined to a relatively small area. Environmental damages could be significant in wetlands. On the basis of TQM's design, there is low probability for an incident to occur; hence, the project is not likely to cause significant adverse environmental effects.

Environment Canada provided specialist advice on wetlands and indicated that TQM should favour the directional drilling technique in wetland areas where there are significant signs of disturbance and signs of erosion within these ecosystems, and that TQM should demonstrate vigilance and cautions in the event that the pipeline needs to cross wetlands.

4.8 Wildlife and Wildlife Habitats

The potential adverse environmental effects on wildlife associated with the construction and operation of the proposed facilities include:

- habitat loss, alteration or fragmentation;
- interference in nesting, breeding or migrating activities;
- sensory disturbance and habitat alienation;
- blockage of daily or seasonal movements; and
- project-related wildlife mortalities.

TQM surveyed 22 segments, for a total of 7.6 km, along the selected route extending 30 m on either side of the right-of-way, deemed to have a high potential for wildlife habitat. The objective of these surveys was to verify the presence of precarious species within selected segments. However, these surveys were not meant to constitute a comprehensive study of all vertebrates along the entire 213 km of the proposed route. Particular attention was given to birds, reptiles and amphibians.

Six of the segments surveyed were selected for their potential to harbour rare amphibians. Five other segments along the route correspond to probable locations for rare birds. Seventeen segments in

forested areas favourable to precarious bird species were also investigated. Île aux Fermiers, an island located in the St. Lawrence River, was examined during this study. Some sites were judged favourable for more than one environmental component.

4.8.1 Mammals

Potential Adverse Environmental Effects

No specific mammal surveys were conducted; however mammals observed during the survey of rare plants, birds, reptiles and amphibians were recorded. Impacts on some small mammals would be the permanent loss of forest habitat and its associated cover from predators and food sources for small mammals. Small mammals frequenting open areas may be temporarily disturbed due to construction activities and loss of ground cover but may benefit in the medium to long term from increased availability of open habitat. Other small mammals could be disadvantaged by increased exposure to predation in open spaces

No candidate species of mammals susceptible to being designated threatened or vulnerable in Québec were observed while conducting the rare birds and plants surveys along limited parts of the proposed route. Direct observations were made of white-tailed deer and moose. Indirect observations of these species were made via scat and tracks. White-tailed deer were seen in Montérégie and Estrie. Signs of moose were observed near the American border. Eastern cottontail, red and grey squirrels, and chipmunks were also noted along the proposed route.

The proposed pipeline route crosses a deer yard at Mount Shefford for a distance of 1.9 km. The habitat affected is a grove of white pine, hemlock groves, and other mixed species or conifers for half the 1.9 km length. The size of these groves has not been determined. However, fragmentation of the groves by the proposed pipeline should not pose a problem since the route goes through this area parallel and adjacent to the existing Gaz Métropolitain right-of-way. The other half is made up of maples and intolerant deciduous trees. The Mount Shefford deer yard is officially recognized by the MEF and is subject to protection pursuant to Québec legislation. The loss of deer yard area at Mount Shefford due to the project is estimated at 1.35% of the total area of the yard.

Residents of Stukely-Sud submitted that TQM's proposed route traverses another deer yard in their region. They declared that deer browse in stands of cedars on their property during the winter months. Residents estimated that almost two-thirds of the cedar stands could be lost by pipeline construction activities in this region. The amount of loss has not been quantified in relation to the total area of the yard or the total area of cedars associated with this deer yard. The Company undertook to treat this deer yard in the same manner as the one at Mount Shefford, as if it were protected under Québec legislation.

The Company identified another deer yard in the MRC of Coaticook. This deer yard would be impacted for a distance of 300 m in a zone that was previously clear-cut. The impacted area has only partially regrown.

One cumulative effect which stems from pipeline construction is the possible fragmentation of habitats. Fragmentation refers to habitats and wildlife that are functionally separated. Fragmentation may have different impacts depending on the size of the habitat patch that is divided by the pipeline clearing, the proximity of the cut-off patches to neighbouring larger habitat areas, the habitat requirements of the

wildlife species involved, and other site-specific factors. The degree of fragmentation in terms of the width of the right-of-way and the number of gaps along that right-of-way often dictate which species frequent this type of fragmented landscape, i.e., favouring certain species and detrimental to others. This is of particular concern in regard to critical habitat such as deer yards. There also may be a cumulative effect on the deer population resulting from the widening of the existing rights-of-way.

Local residents of Stukely-Sud indicated the presence of *Martes pennanti*, or fisher, in the vicinity of the right-of-way. This species has no specific conservation status in Québec.

Mortalities of wildlife may occur from road kills by project vehicles driven on the right-of-way or on local roads.

If an accident occurs, immediate adverse environmental effects may significantly affect deer populations in the event of a forest fire. Similarly, all the species dependent on forest habitats may be significantly impacted by such an event.

Mitigative Measures

TQM proposed the following general mitigative measures to protect wildlife:

- remove daily all domestic waste during the construction period so as not to attract wildlife;
- collect all plastics, metal and other material potentially harmful to wildlife;
- prohibit the recreational use of all-terrain vehicles on the right-of-way; and
- limit the size and duration of the trenching wind-row;

With respect to deer yards, TQM proposed the following additional measures:

- where possible, limit tree-removal to a minimum;
- carry out clearing operations between May and December;
- in the event that clearing can only be carried out in the winter, execute it between February and the end of March and leave cut branches on the ground so that the deer concentrated in the yard can use the branches for browse during the critical winter months;
- when possible, avoid activities during hunting season; and
- locate the right-of-way outside of forested areas.

TQM indicated that, when there is a conflict in the recommended period for clearing to reduce the impacts on nesting forest dwelling birds (between 1 September and 1 April), and the recommended period for clearing to reduce the impacts on the deer yard at Mount Shefford (between May and December), the deer at Mount Shefford are favoured.

Conclusions

With respect to wildlife in general, habitat loss, alteration or fragmentation may benefit some species and disadvantage others. Those species preferring forest/field ecotone benefit from the clearing of forests, whereas species that prefer or require continuous forest habitat and mature forest are deprived. There may, therefore, be a change in relative abundance of species.

The deer yard at Mount Shefford is protected under Québec legislation. This legislation restricts clearing to no more than the 2% of the yard over a period of ten years. This restriction allows a

period of regrowth providing the regeneration of browse for deer in the long term. However, the deer yard in Stukely-Sud is not protected under the same legislation. It is possible that there are other deer yards which have not been identified. A number of intervenors discussed or mentioned deer hunting as an important activity in their areas. For unprotected deer yards, even if TQM has committed to respect the spirit of the Quebec legislation, there are no guarantees of other parties carrying out activities in the affected areas refraining from clearing more than 2% of the yard over ten years.

The areas supporting deer populations are under continued effect from human activities. Designation of areas like Stukely-Sud deer yard as an official yard protected by legislation helps in maintaining these population in the future. If the Québec government recognizes the Stukely-Sud deer yard officially and designate other areas for protection of deer and deer habitat, this would also reduce the pressure from development on deer populations.

Since only approximately 25 km of the proposed pipeline route through forests does not parallel an existing right-of-way and the clearing of trees is to be kept to a minimum, the project is not likely to cause significant adverse environmental effects due to the loss, alteration, and fragmentation of the deer habitat.

TQM submitted results of studies regarding the effects of a right-of-way on white-tailed deer movements in New York State. These results suggested that there was no difference in movements or utilization between a 46 m and 90 m right-of-way within winter deer yards. These studies also demonstrated that both rights-of-way widths were equally utilized in the spring during snow-melt. On the other hand, these studies indicated that a 100 m right-of-way may be prohibitive to the movement of deer across the right-of-way. The proposed twinning of TQM's right-of-way with that of Gaz Métropolitain's, within the Mount Shefford and Stukely-Sud deer yards, would increase the width from 50 m to approximately 75 m, as estimated from TQM's photomosaics. This would eliminate any adverse effect with respect to deer movement.

A number of small mammal populations frequenting forest habitats are abundant and widespread throughout Québec. The effect on these populations through the loss of 152 ha of forest habitat is minor compared to the overall forest resource available in the study area. The regional populations are likely not at risk. Therefore, the project is not likely to cause significant adverse environmental effects on small mammal populations.

The risk of a malfunction or accident is low, based on established engineering standards for pipeline construction. A potential major risk to terrestrial wildlife is the effect on habitat, if a pipeline explosion caused a forest fire. This has a major effect upon bird and mammal habitats in particular. However, since the risk of an explosion and forest fire is low, the project is not likely to cause significant adverse environmental effects.

4.8.2 Birds

Potential Adverse Environmental Effects

A systematic survey of birds of prey was conducted for a period of four days, towards the end of May on segments of the route totalling 7.6 km. The best time to conduct these surveys is during the reproductive period, April and May. Indications of the presence of birds of prey were sought via the identification of nests, scat, feathers, and remains of their prey. A tape recorder was also used to

prompt a response from rare species such as the Coopers Hawk and the Wild Turkey. No rare species was either observed or heard.

Species of birds other than birds of prey were surveyed between 15 June and 15 July, generally before 9:00 am. One hundred and four species were logged during the course of the survey. Eighty-two were observed on the route and 22 other species were located in the surrounding environment. Two species that were identified on île aux Fermiers are listed as potential candidates to be designated threatened or vulnerable in Québec, namely the *Ammodramus caudacutus*, the Sharp-tailed Sparrow and *Ixobrychus exilis*, the Least Bittern. The Least Bittern is also classified as vulnerable by the Committee on the Status of Endangered Wildlife in Canada ("COSEWIC"). Construction activities may have potential environmental effects on Sharp-tailed Sparrows' feeding habitat located on the eastern part of the île aux Fermiers. The environmental effects of pipeline construction on this species are discussed in Section 4.9 - Environmentally Significant Areas. There was no discussion of use of habitats as staging areas along the proposed route by spring or fall migrants.

The greatest impact upon the bird populations surrounding the proposed right-of-way occurs during their reproductive and nesting periods, generally June and July for all species. Nests may be destroyed if construction activities were carried out during this period. Tree-clearing during the nesting period may have the greatest impacts upon the bird population associated with each biotope.

The critical period for waterfowl is during May, June, and July when they are nesting and tending their young. The preferred habitat of waterfowl species at this time is close to water, along lakes, rivers, streams, and marsh land. This affords easy access for goslings and ducklings to water when they are ready to leave the nest. Watercourse and wetland crossing activities potentially have the greatest impacts on waterfowl through the destruction of nests or the disturbance of nesting pairs especially over a longer time period if wetlands-draining or hydrological alteration occurs.

The schedule for many watercourse crossings stretches from May to October. All watercourse crossings in May and June could potentially impact waterfowl nesting sites. As well as the direct impacts, construction at watercrossings could destroy waterfowl and its habitat. Without mitigation, local populations may be adversely affected.

All the species observed during the study, except for the Sharp-tailed Sparrow and the Least Bittern on île aux Fermiers, are abundant and widely distributed in Québec. Some nesting structures noted during the study may be used by the Great Horned Owl. This species often uses the nests of other species of birds or grey squirrels.

Migratory birds and their staging and nesting areas are regulated through federal legislation, the *Migratory Birds Convention Act*. It is prohibited to interfere with migratory birds or destroy their habitat.

Mitigative Measures

TQM proposed that the following procedures be carried out to avoid any environmental effects on birds, including waterfowl:

- clear trees between 1 September and 1 April to reduce the impacts on nesting forest dwelling birds;

- limit the width of tree removal in forested areas;
- avoid construction during nesting periods, to the extent possible, so as to protect important waterfowl habitats or populations; and
- in waterfowl breeding and staging areas, restore original drainage and configurations to watercourses and wetlands.

Environment Canada provided specialist advice on migratory birds. Environment Canada acknowledged the two principal mitigative measures proposed by TQM:

- clearing where possible between 1 September and 1 April; and
- limit clearing to the 23 m right-of-way as much as possible in mature stands.

As well, Environment Canada is of the opinion that clearing should not be carried out during the critical reproductive period for birds, during June and July.

Conclusions

TQM submitted that the loss of forest habitat favours raptors since they hunt in open areas and along forest/meadow ecotone. As well, the meadow or field conditions favourable to rodents and other small mammals serve to increase the prey population of birds of prey.

Tree-clearing during the period between 1 September and 1 April would reduce the adverse effects on nesting birds in impacted forest regions. While the loss of habitat may be inevitable, direct loss of nests is not likely to be significant.

Within the deer yard at Mount Shefford, the tree-clearing schedule would avoid the preferred period for deer, December to May, potentially forcing clearing operations during sensitive periods for nesting forest-dwelling birds. However, if clearing is conducted in April, it is not likely to cause significant adverse effects on birds and deer.

The impacts upon waterfowl would generally be localized to the width of the right-of-way at each watercourse or wetland crossing affected by pipeline construction activities. In the event of effects on wetland drainage, the effects on waterfowl would be more extensive. The exact timing of each watercourse and wetland crossing has not been determined. However, with the proposed mitigative measures of watercourse and wetlands crossings, the effects on waterfowl habitats would be expected to be minor to moderate in the short term and insignificant in the medium to long term. Consequently, the project is not likely to cause significant adverse environmental effects on waterfowl.

If construction activities avoid the critical nesting period of May, June and July, they are not likely to cause significant adverse environmental effects on nesting waterfowl.

Although conflicts in scheduling construction around sensitive nesting periods may prove difficult, not all areas would necessarily be impacted during the most sensitive periods. The relatively small areas of habitat affected, the proposed mitigative measures, and the abundance of the bird species surveyed indicate that the project is not likely to cause significant adverse environmental effects on the population level.

There are two primary human uses of bird resources: hunting and bird watching. Hunting is restricted to certain game species of waterfowl and upland birds. The pipeline project is not likely to cause

significant adverse environmental effects with respect to either group. The non-consumptive use of bird resources centres around bird watching. All bird species contribute to this form of recreation, although the rarer birds are highly sought after. With the exception of the two rare bird species on île aux Fermiers, none of the other 102 species logged during the surveys have specific conservation status in Québec. The project is therefore not likely to cause significant adverse environmental effects on these species or on the sustainable use of the avian resource.

4.8.3 Reptiles and Amphibians

Potential Adverse Environmental Effects

With respect to rare reptiles and amphibians, TQM conducted a survey along 7.6 km at streams, ponds, and other wet areas that would be crossed by the proposed route simultaneously with the surveys of rare birds and plants. According to the data banks, five species of rare amphibians and six species of rare reptiles were potentially present in the areas where the surveys were conducted. No rare species of reptiles or amphibians were discovered along the surveyed route segments. Five common species of amphibians were noted during the course of the field work. The Company submitted that given the fact that the field work was conducted late in the season (end of the summer) and given the discreet behaviour of these animals, some caution needs to be exercised with respect to interpreting these surveys.

Intervenors raised concerns regarding amphibians. The presence of *Desmognathus fuscus fuscus*, the Northern dusky salamander, a species listed as a potential candidate to be designated threatened or vulnerable in Québec, was observed on Bunker Hill by one intervenor. Individuals of this species may be adversely affected by construction activities that would occur in the area of Bunker Hill. An intervenor reported the presence of another amphibian, *Rana sylvatica*, the Wood frog, in a pond along the proposed right-of-way in Stukely-Sud. However, this species has no specific conservation status in Québec.

Mitigative Measures

Since many reptiles and amphibians are associated with wetlands, flood plains, and lotic environments, the Company suggested that caution be exercised at watercourse crossings. However, in TQM's evidence, there is no mention of what form of caution would be exercised, other than being vigilant in implementing the mitigative measures required at all watercourse crossings. No additional reptile and amphibian surveys were proposed by TQM.

TQM mentioned the possibility of directional drilling or horizontal boring under the pond at Stukely-Sud, if the pond were not too deep, as possible mitigative measures.

Conclusions

TQM proposed mitigative measures to be implemented at watercourse and wetland crossings that make unlikely any significant adverse environmental effect of construction activities on reptiles and amphibians.

The preferred habitat of the Northern dusky salamander is mature woods, trees greater than 30 years of age. Clearing along the right-of-way would be confined to maples no more than 10 year old. This

amphibian also inhabits wet areas during the winter months. Since construction activities on Bunker Hill is to be confined to immature maple stands and construction is not scheduled for the winter months through the wet area and stream near Bunker Hill, the project is not likely to cause significant adverse effects on the Northern dusky salamander.

TQM did not find rare amphibians or reptiles within the study segments. However, it recognizes the potential for these animals to be located at watercourse crossings. The Company committed to be vigilant and cautious at watercourse crossings to avoid the potential adverse effects on rare reptiles and amphibians. In addition, the Company proposed to implement the standard mitigative measures as outlined in Section 4.6 - Fisheries and Fish Habitat. Reptiles and amphibians will generally flee from the approach of an intruder. Construction activities are expected to cause these animals to leave the immediate area. Due to the narrowness of the right-of-way, the scarcity of rare animals, and their tendency to flee disturbances, the construction of the pipeline is not likely to cause significant adverse environmental effects on these species. Similarly, significant adverse environmental effects are not likely to occur with respect to the more common species of reptiles and amphibians.

4.9 Environmentally Significant Areas

Two environmentally significant areas were identified along the proposed pipeline route, île aux Fermiers and Bunker Hill.

Île aux Fermiers

Potential Adverse Environmental Effects

Île aux Fermiers is owned and managed by the Canadian Wildlife Service ("CWS") of Environment Canada. Environment Canada has recently stated its intention to designate île aux Fermiers and the adjacent Grande-Île as a bird sanctuary, with the eventuality of giving them official status. Environment Canada, as a Responsible Authority under CEAA, indicated that it was considering conducting an independent environmental assessment of the effects of the proposed project on île aux Fermiers.

Île aux Fermiers is located in the main channel of the St. Lawrence River. The island is flat and lacks any pronounced slopes. The total area of the island is approximately 1.2 km long and 500 m wide. There are no watercourses draining the island, however there is a pond located near its centre. There are no particular constraints to using directional drilling or other construction activities due to the island's physical characteristics, although the island is subject to continuous erosion due to the passage of ocean liners.

The primary concerns for pipeline construction activities across île aux Fermiers include:

- potential conflicts with land use practices, such as agriculture activities;
- loss of significant plants and their habitat;
- reduction or modification of wildlife habitat;
- interference in nesting, breeding or migratory activities; and
- shoreline and pond disturbance.

Agriculture and conservation are the two primary activities on the island. A potential environmental effect of pipeline construction activities on grazing animals could be the reduction in foraging area, by preventing access to the construction area during construction and site restoration. The potential adverse environmental effects and proposed mitigative measures for soil and agriculture are discussed in Section 4.2.

TQM proposed to use directional drilling techniques to cross the two channels of the St. Lawrence River on either side of île aux Fermiers. TQM's preferred route across the island is, from a technical and environmental perspective, the northern route. The directional drill site, required for receiving and sending the drill, would necessitate a work area of 60 m x 190 m. The Company would excavate a 50 m trench to accommodate the two tie-ins on the island. A landing site, approximately 80 m away from the directional drilling site would be used to bring equipment to the island. A temporary access road would be installed between the two sites using geotextile covered by 30 cm of crushed stone.

During the directional drilling process the drill bit requires a drilling mud called bentonite, a naturally-occurring clay, to facilitate the drilling of the pilot hole and the boring for the full diameter of the pipeline. This material, if leaked into the St. Lawrence River, could have the same effects as an increase of sedimentation. Potential adverse effects would depend on how much material was released and the sensitivity of the watercourse and habitats affected.

The installation of the access road and directional drill site could have adverse environmental effects upon the pond located in the centre of the island, along the proposed pipeline route. As well, pipeline construction activities could adversely affect the vegetation and slopes of the shoreline of the island and result in sediment release into the St. Lawrence River.

The preferred northern route on île aux Fermiers was inventoried for rare plants. No candidate species susceptible to be designated threatened or vulnerable in Québec were identified. The vegetation along the preferred route is made up of *Spartina sp.*, *Salix sp.*, *Scirpus sp.* and *Phalaris sp.* The extent of the natural vegetation within the impacted area is unknown. An estimated 1.5 ha area would be potentially adversely impacted by construction activities.

TQM included île aux Fermiers in the target area of the rare birds study. It surveyed six stations on the island. Two species of rare birds were found: *Ammodramus caudacutus*, the Sharp-tailed Sparrow, a candidate species susceptible to be designated threatened or vulnerable in Québec, and *Ixobrychus exilis*, the Least Bittern which is classified as vulnerable by COSEWIC.

Construction activities could have an impact upon the Sharp-tailed Sparrow's feeding habitat located on the eastern portion of île aux Fermiers. The potential adverse environmental effect of the project on the Sharp-tailed Sparrow feeding habitat should be confined to an area of approximately 1.5 ha, containing pasture and cultivated land. The extent and duration of this impact have not been discussed; nevertheless, this adverse effect could occur during construction and continue until the vegetation is restored.

A spring construction schedule could disturb waterfowl during their nesting period, causing nesting pairs to leave their nests. Construction activities may also lead to the direct destruction of nests located on the proposed right-of-way. The CWS indicated that île aux Fermiers would be subject to future wildlife management projects throughout the island, except on its northern point. Ducks

Unlimited holds a 40 year lease to manage waterfowl breeding habitat on île aux Fermiers, until the year 2035.

The northern part of the island is at a significantly higher elevation than the southern part. As a result the northern part is better drained and less favourable for waterfowl. Environment Canada indicated that the whole of the island with the exception of the northern point is favourable for waterfowl management and that pipeline construction in the southern part of the island could be an obstacle to future waterfowl projects.

Access to île aux Fermiers for hunting is permitted between 21 and 30 September. Construction during this period would disrupt hunting activities.

Mitigative Measures

TQM undertook to maintain a minimum 10 m buffer zone between the directional drilling site and the shoreline to prevent adverse effects such as disturbance of vegetation, erosion and sedimentation along the shorelines of the St. Lawrence River which would be crossed by directional drilling. Where specific constraints are encountered, such as roads, between the drill site and the shoreline, this buffer zone would be increased by the width of the constraint. TQM proposed to comply with the mitigative measures to restore shorelines and banks outlined in Section 4.6 - Fisheries and Fish Habitat.

The bentonite used in directional drilling would be contained within impermeable basins at the drilling site. These containment basins would be constructed to prevent the overflow of the bentonite into ditches and watercourses. To avoid the contamination of soil by drill muds, the Company proposed to dispose of the bentonite in authorized sites or on land as approved by landowners.

In order to conduct work on the island in 1997 and 1998, CWS requires the establishment of a landing site. TQM would be permitted to use this landing site during its construction period. CWS indicated that TQM would be permitted to remove the landing site structures after construction, as CWS would not use these facilities subsequently. TQM committed to revegetate the landing site and to restore the banks of île aux Fermiers to the satisfaction of CWS.

TQM undertook to install the pipeline at a depth which would permit the installation of a sea wall over the pipe by CWS in the future.

The right-of-way is located more than 130 m from the pond, at its closest point. The Company proposed to install the temporary work space approximately 10 m from the pond, at its closest point. The CWS requires that all construction activities take place at least 30 m from this pond. TQM stated that the pond located near the right-of-way would not be disturbed by construction activities and that water levels would be maintained in the pond by pumping water from the St. Lawrence River, if required.

TQM undertook to revegetate areas affected by construction activities on île aux Fermiers with seed mixtures recommended by Environment Canada. Seeding would be carried out in the fall or the following spring, depending on when construction was completed. All mitigative measures to be applied to agricultural land would be employed on île aux Fermiers (see Section 4.2). These measures include the protection of topsoil, the removal of stones, and the decompaction of the right-of-way.

The CWS requires that no work be carried out on the island between 15 May and 15 July. This time frame would minimize the impacts on nesting migratory birds. TQM committed to commencing work on the island after 1 July and completing work prior to 15 September, thereby completely avoiding the hunting season. The Company submitted that this construction window should be adequate to carry out directional drilling from île aux Fermiers and the related pipeline construction activities on the island. The proposed date to start work is two weeks earlier than the CWS requires (15 July).

The Sharp-tailed Sparrow's preferred habitat is marsh land, however, the marsh on île aux Fermiers would be bypassed by the proposed routing to the northern point of île aux Fermiers. The majority of the Sharp-tailed Sparrow's preferred habitat appears to be located on the southern part of the island. To mitigate the impact upon the Sharp-tailed Sparrow's feeding habitat, TQM proposed to replant the vegetation required by this bird species.

Conclusions

The mitigative measures proposed for soil and agricultural land would make unlikely any significant adverse effect which could result from the installation of the drill site, the temporary road, and the pipeline. In addition, the project is not likely to cause significant adverse effects on cattle grazing, crops, and soil productivity as environmental effects on agriculture would be expected to be reversible and of short to medium term.

The proposed mitigative measures to be used during the directional drilling activities make unlikely the occurrence of any significant adverse environmental effects as a result of this activity being carried out.

Prior to construction, an authorization from Environment Canada would be required to cross île aux Fermiers. Two areas where the CWS and TQM have not yet reached agreement are: the exact timing of construction on île aux Fermiers; and the distance the directional drill site would be located from the pond on the island. These issues should be resolved prior to commencement of any construction on île aux Fermiers.

The only shoreline that could be affected is the proposed landing site. The effects on this shoreline could last for the duration of directional drilling and the clean-up operations. This could be from two months to one year, depending on the technical ease of the directional drilling and the time required to complete clean-up operations. The Company proposed to restore the vegetation and shoreline at the landing site to the satisfaction of the CWS. The effects of pipeline construction on the shoreline are moderate in the short term and minor in the medium term, and overall, the construction of the pipeline is not likely to cause significant adverse environmental effects.

TQM's pipeline construction activities would not directly impact the pond at the centre of the island. However, the Company proposed to maintain water levels in the pond if it were indirectly affected by pipeline construction activities. With the use of appropriate mitigative measures, construction activities are not likely to cause significant adverse environmental effects on the pond.

With respect to loss of vegetation cover, any potential effects would be felt in the short to medium term. Overall, with the application of appropriate mitigative measures, construction is not likely to cause significant adverse environmental effects on the vegetation cover.

The majority of the feeding habitat of the Sharp-tailed Sparrow is located in the southern part of île aux Fermiers. Although the total exact area of feeding habitat that may be affected is unknown, it is estimated that it would be somewhat less than 1.5 ha. TQM proposed to mitigate the adverse environmental effects of construction on the Sharp-tailed Sparrow feeding habitat by replanting its preferred vegetation in affected areas. Due to the readily available habitat for this bird on the southern part of the île aux Fermiers, the effect on the Sharp-tailed Sparrow should be minor in the short term and insignificant in the medium term. Consequently, the project is not likely to cause significant adverse environmental effects with respect to this population.

TQM's construction schedule would avoid disturbing the majority of nesting waterfowl in May and June. Late nesters could be disturbed if TQM was to begin construction on 1 July. The best habitat for waterfowl nesting is located in the southern part of the island, therefore the majority of nesting would occur away from the construction site. Any adverse environmental effect on waterfowl nesting would be temporary, minor and of short duration. The project is therefore not likely to cause significant adverse environmental effects on nesting waterfowl. The same conclusion can be drawn with respect to the waterfowl management program. The proposed construction schedule would also avoid the hunting season.

The primary renewable resources potentially affected by pipeline construction on île aux Fermiers would be agriculture, birds, and vegetation. The residual effects on each of these resources are not likely to be significant in the short or medium term. Pipeline construction is not likely to cause significant adverse environmental effects with respect to the continued and sustained use of these renewable resources on Île aux Fermiers.

4.9.2 Bunker Hill

Potential Adverse Environmental Effects

Bunker Hill is a ridge of hills rising to a height of approximately 50 m from the base to its peak, stretching a length of 9 km between Fitch Bay, Lake Memphrémagog, and the southern tip of Lake Massawippi. Bunker Hill is considered of special interest to the local residents due to the limited disturbance of the area and due to a concern that the exceptional forest ecosystem and old maple forests located in the Bunker Hill area were not well defined by the Company. The Québec government has indicated that the proposed pipeline route does not cross or encroach upon the exceptional forest ecosystem located at the east side of Bunker Hill. TQM identified the locations of four old maple forests in the vicinity of Bunker Hill.

TQM proposed to install the pipeline across Bunker Hill within a decommissioned Hydro-Québec right-of-way that had been originally cleared in 1957. This right-of-way contains a population of red maples averaging ten years of age. The age of maple trees in the vicinity of Bunker Hill and alongside the decommissioned right-of-way is estimated to be between 50 and 90 years.

The potential effects of clearing wooded areas on Bunker Hill include:

- loss of high quality trees;
- rutting, compaction, and loss of topsoil;
- erosion on steep slopes;
- the accumulation of woody debris; and

- cumulative effect due to the clearing of the decommissioned Hydro-Québec right-of-way.

A debate took place between an intervenor and TQM concerning the slope of Bunker Hill. Upon re-evaluation of the initial measurements, TQM determined the slope to be 150 m long with incremental slopes of between 12° and 28°. This slope contains many rock outcrops. Where the bedrock is not exposed, there is a very thin layer of soil.

The projected route would cross Bunker Hill, span the valley between Bunker Hill and Brown's Hill, and cross an aquifer and wet area at the base of Bunker Hill, and streams flowing into Lake Massawippi. The wet area originates from the groundwater. The movement of water at the surface is impeded by rock, thus forming a wet area approximately 15 m x 30 m. The drainage from this wet area coalesces into a stream. The blasting and excavation of the trench could promote the movement of water along the trench line, increasing the potential for erosion of this slope and the transport of sediments into the wet area at the base of Bunker Hill. It is considered that the wet area would require specific mitigative measures to protect the natural drainage of the area. The effects on this wet area could be similar to those on other wetlands impacted by the project.

An intervenor stated that the proposed mitigative measures would require extensive transport of earth to create the berms required to divert drainage water away from the trench. He doubted the thoroughness of the Company's technical surveys of Bunker Hill.

TQM conducted surveys of rare plants and birds. These surveys were conducted to determine the presence of rare species in areas they would most likely occur. The width of each segment examined was 30 m on either side of the right-of-way. During these surveys no rare or vulnerable species were identified. Surveys for mammals, amphibians and reptiles native to Bunker Hill were not conducted because, based on currently available data, no species of particular concern are recorded in this area.

An intervenor indicated the presence of a number of animal species of interest in the Bunker Hill area, including *Desmognathus fuscus fuscus*, the Northern dusky salamander, which is a candidate species to be designated as threatened or vulnerable in Québec. The intervenor also identified concerns related to the potential environmental effects of the project on deer, peregrine falcon, heron, muskrat, fish, and rare plants. He questioned the thoroughness of TQM's surveys.

Mitigative Measures

TQM proposed to limit the clear-cutting of trees to the decommissioned Hydro-Québec right-of-way and did not plan to enlarge the width of the right-of-way to carry out this work. The old maples would not be encroached upon by pipeline construction activities. Special individual trees adjacent to the right-of-way would be marked or encircled by fences to ensure their protection against pipeline construction activities, where necessary.

TQM undertook to restore the right-of-way after the installation of the pipeline and reconstruct critical sections in wooded areas. TQM agreed to advise all parties as to the type of restoration program to be undertaken and the use of indigenous vegetation.

The steepest portion of the Bunker Hill escarpment would require a continuous series of berms and lateral drainage ditches to protect against erosion. To ensure the stability of the slopes and to prevent erosion, the Company would install trench plugs and diversion berms along the right-of-way. Due to

the small quantity of soil available on the Bunker Hill escarpment it would be necessary to transport material to this site to construct the diversion berms.

Standard mitigative measures to enhance slope stability and prevent erosion would be:

- minimize levelling the terrain on slopes;
- excavate diversion channels;
- restore natural topography;
- use chipped woody debris to prevent erosion on slopes; and
- seed and fertilize to stabilize slopes using specific mixtures determined in cooperation with the landowners.

TQM would employ controlled blasting when excavating the trench in the bedrock slope of Bunker Hill. The blasting technique used to construct pipelines would fissure the rock so that the fractured rock can subsequently be excavated from the trench. Blasting mats would be used when necessary to avoid flying rocks and debris.

The Company would incorporate drainage provisions into the project design, such as the placement of spoil piles and the placement of access roads and ramps, to minimize the interference with the natural drainage of the wet area. As well, the Company would re-establish the natural drainage patterns once construction is completed by contouring the topography to preconstruction conditions.

To mitigate the adverse effects upon wildlife habitat, the Company would limit the width of the right-of-way clear-cut to 18 m. Clear-cutting operations would take place outside of sensitive periods for deer and nesting birds. No particular mitigative measures are proposed to avoid the initial displacement of wildlife from the area as construction activities would only have a temporary disruptive effect, and wildlife is expected to return after the restoration measures are completed. In regard to the Northern dusky salamander, the Company stated that cautions would be exercised at watercourse crossings in case a rare species of reptile or amphibian is present.

An intervenor requested that TQM undertake to restore the right-of-way as much as possible to its natural condition. In particular, he called for the Company to consider restoring microtopography and to allow for the growth of trees on the right-of-way except for the narrow band over the pipe TQM requires for its visual inspection. TQM indicated that it is prepared to use different types of restoration programs to improve the visual aspects of its right-of-way in critical forested areas.

Conclusions

The proposed clearing would have a permanent impact on the ten-year old red maples found on the right-of-way and would have a moderate effect on the forested area of Bunker Hill. By restricting the clearing to the decommissioned right-of-way, there would be no impact on the mature maples on either side of the proposed right-of-way. Overall, clear-cutting of right-of-way on Bunker Hill is not likely to cause significant adverse environmental effects.

The 12° to 28° slope on Bunker Hill is not a technically difficult slope on which to carry out pipeline construction. The effect on the stability of this slope would be mitigated with the installation of trench plugs. The effect on stability should be minor and the potential for instability and erosion along the

trench line should be minimal. Consequently, excavation activities are not likely to cause significant adverse environmental effects on the stability of the slope.

With TQM's proposed standard mitigation to protect the wet area and aquifer at the base of Bunker Hill, the project is not likely to cause significant adverse environmental effects.

There would be a potential for disturbing the Northern dusky salamander's habitat since it congregates near ponds and wetlands during the winter. Its preferred summer habitat is older mature forests, so the project is not likely to cause significant adverse effects on this amphibian.

The proposed mitigative measure to avoid sensitive periods for wildlife reduces the possibility of adverse environmental effects. Although wildlife are expected to be disturbed by construction activities, they are equally expected to return to the area in the short to medium term. Effects on wildlife are inevitable but minor to moderate in the short term. Overall, the project is not likely to cause significant adverse environmental effects on wildlife.

A number of environmental components and issues were identified with respect to Bunker Hill. The close proximity of all these components, and the issues raised, suggest the various environmental effects upon each of the components (forests, wildlife, slope, wet area, and aquifer) could be expected to have a cumulative effect upon the Bunker Hill area. The use of a decommissioned right-of-way would reduce the cumulative impact compared to clearing and establishing new right-of-way. The environmental effects of the project on each component would be expected to decrease over time and become minor in the medium to long term. The visual impacts of the clear-cut on Bunker Hill would be minimized by using management techniques to improve the visual aspect of the right-of-way and restore it to a condition as close as possible to its natural state. Therefore, the project is not likely to cause significant cumulative adverse environmental effects.

There may be a short term effect on the primary renewable resources of this area; that is the forest, aquifer, wet area, and wildlife. However, this effect is considered minor. The continued use of these resources over the medium term to long term should not be in jeopardy. Consequently, the project is not likely to cause significant adverse effects on the sustainable use of renewable resources.

In the event of a malfunction or accident causing an explosion, the potential effects on Bunker Hill may be significant. The size and location of a leak or an explosion would determine the significance of the impact upon the environmental components in the immediate vicinity. The risk of a malfunction or accident should be low, based on the established engineering standards for pipeline construction. A significant adverse environmental effect is therefore not likely to occur as a result of a malfunction or accident.

4.10 Air Quality

Potential Adverse Environmental Effects

There were concerns expressed by intervenors that gas escaping from the pipeline facilities including compressor stations would create adverse environmental effects for humans, animals and vegetation. During planned maintenance or emergency blowdowns of the compressors, natural gas, which is a greenhouse gas, may be vented to the atmosphere. Where gas odorizer facilities are used, strong

odours may arise during normal operation of the odorizing system, during the refilling of the odorizer tank, or during an accidental odorizer agent spill.

Mitigative Measures

The air contaminant of primary concern from a health perspective is NO_x, which is emitted when gas fuel is burned to drive a compressor unit. The proposed compressors to be installed at Lachenaie and East Hereford would be electric-driven units, which do not burn gas fuel.

With respect to natural gas vented to the atmosphere, TQM indicated that discharge incidents would occur primarily during upset conditions which are likely to be infrequent, and that the volume of gas discharged to the atmosphere would be relatively small. The gas would dissipate quickly because it is lighter than air.

TQM would not install gas odorizing facilities on its proposed facilities. Such facilities would be built and operated by Gaz Métropolitain and would be located within Gaz Métropolitain's delivery station at Waterloo. In order to avoid odours due to leaks and spills that may arise during normal operation, the Gaz Métropolitain system would be designed in such way that the length of the odorizer piping would be reduced to the extent possible. All refills of the odorizer tanks would be done in a closed circuit fashion, thereby eliminating the releasing of strong odours to the atmosphere. Odorizer tanks would be further protected by a spill retention system, which would contain any spill and facilitate clean-up.

Conclusions

Since the electric compressor units discharge no gaseous emissions to the atmosphere, there would be no incremental adverse air quality effects resulting from their operation. Any gas volumes vented to the atmosphere from the proposed facilities would be relatively small, localized, dissipate quickly, and occur infrequently. Thus, the proposed facilities are not likely to cause significant adverse environmental effects on human, animal or vegetation health.

Given the design parameters for the pipeline facilities and TQM's commitment to safe operation and maintenance, emissions of greenhouse gases would likely be of an extremely low magnitude. Thus these emissions are not likely to cause significant adverse environmental effects.

The mitigative measures proposed for the odorizing facilities would reduce the likelihood of a spill to a minimal level and therefore, significant adverse environmental effects are not likely to occur.

4.11 Acoustic Environment

Potential Adverse Environmental Effects

The public and TQM recognized heightened noise resulting from pipeline construction, operations and ongoing safety inspections as a potential source of adverse environmental effects. Noise impacts could be particularly relevant as the proposed pipeline would pass through quiet, rural areas where agriculture, tourism, and leisure pursuits are the predominant activities.

At the construction stage, noise from project traffic, blasting, and the operation of heavy equipment could disturb nearby residents, livestock and wildlife, and interfere with certain recreational activities.

At the operations phase, noise from compressor stations may cause potential adverse health effects for livestock and wildlife and could disturb nearby residents. The main source of noise arises from the routine operation of the compressor system. Noise from blowdowns (rapid release of gas) is infrequent but can also be loud. There would be planned blowdowns when the compressors are being put in service and to allow for maintenance and repairs. Unplanned blowdowns may also occur in order to purge the pipeline of gas under emergency situations.

The removal of forested buffer zones adjacent to highways could result in increased, ongoing background noise levels at nearby residences.

Ongoing pipeline safety inspection activities are proposed to be performed primarily through weekly or biweekly helicopter surveillance, during the summer and winter seasons respectively. Helicopter noise impacts may upset farm animals, curtail recreation activities, and annoy residents. Examples of possible effects on farm animals include a lower quality of milk production, should dairy cattle be disturbed, and higher abortion rates among livestock. Recreation activities that may be affected by noise include golfing and deer hunting and horseback riding, due to the animals being startled.

Intervenors raised the question of the effects of ultra-sound waves emitting from metering stations. The concern was that these waves could affect human health.

Mitigative Measures

A number of mitigative measures are available to avoid or reduce the above kinds of noise impacts. At the construction stage, TQM stated that construction in any one area would be of short duration, a few days at most, and the Company committed to:

- abide by the hours of work time permitted by municipal bylaws, which normally means work can only take place during daylight hours;
- advise nearby residents in advance of planned construction activity;
- consult with relevant parties to deal with any anticipated issues;
- make available Company liaison officers to deal with complaints;
- maintain pipeline construction equipment in proper working order and equipped with silencers, thus avoiding excessive noise; and
- complete construction prior to the deer hunting season, if possible.

In response to the issue of noise levels arising due to forest and vegetation clearance, TQM stated that a buffer strip of vegetation would generally be left along highways. The Company provided a study showing that the cutting of an 18 m strip of forest should not result in a perceptible increase in noise for nearby residences. TQM is willing to transplant trees removed from the right-of-way to the landowner's adjacent property, where feasible, to maintain noise screening protection.

Without any mitigation, the routine operating noise from TQM's East Hereford Compressor Station would exceed proposed provincial standards. However, TQM proposed to construct a berm around the East Hereford Compressor Station, and install mufflers and sound-insulated buildings at both compressor station locations. Mitigative measures for compressor stations would be included in the design stage to ensure that proposed new provincial standards are met. TQM also undertook to take into account the potential cumulative impacts of the East Hereford Compressor Station operating concurrently with a nearby saw mill, when designing its routine operating noise controls. In respect of

blowdowns, TQM said that while these would be loud, they would be infrequent and of short duration. Noise from a blowdown is in the form of a loud bang followed by a diminishing hiss of gas over a 15 to 20 second period. Planned blowdowns at a compressor station would occur during the initial testing of the compressor station, then infrequently, perhaps once every several years, for maintenance purposes. Unplanned blowdowns on a pipeline occur very infrequently, typically less than once in ten years, as the purging of a line is usually done through section valves. Where the blowdowns are for maintenance purposes or during the startup period for the East Hereford Compressor Station, nearby residents would be notified in advance.

TQM proposed helicopter surveillance because it is an effective method for carrying out routine safety inspections. TQM indicated that helicopter noise could be problematic in certain situations. The Company committed to avoid overflights of sensitive farm operations such as poultry-houses, mink farms, and herds of animals. The Company undertook to discuss individual concerns with potentially affected parties and to vary the height and path of overflights to deal with problem cases. Beyond these measures, TQM expressed a willingness to forego overflights in exceptional circumstances, in order to avoid problems. In such cases, overflights would be replaced by ground surveillance.

Conclusions

The above noise issues could result in significant adverse effects if not adequately addressed by the Company's studies and commitments. Noise-related issues experienced from the construction of a pipeline project are similar to those experienced from other linear construction activity, such as road building, and are manageable with proper precautions. At the construction stage any adverse noise impacts would be localized. The period of time that construction activity is in any one location would normally be a matter of a day or two. If the construction activity is properly supervised, the effects should be brief and infrequent. TQM liaison agents would be available to address complaints.

TQM undertook to: design its compressor stations to meet provincial noise standards; to monitor operations to ensure that the established noise limits are respected; and to address and report any complaints as and when they arise, including reporting on the measures taken to resolve the problem.

Blowdowns are done for reasons of safety, happen infrequently and for only a brief period of time. The effects would be felt in localized areas.

The use of ultra-sound measurement at metering stations does not impose any risk to the surrounding residents as low energy ultra-sound waves are used, and would dissipate within the metering station.

With respect to helicopter noise, TQM's proposed mitigative measures would allow it to anticipate and provide resolution to potential problems, particularly if there were effective communications between the Company and those residing, working, or carrying out recreation activities near the right-of-way. By changing the height and pattern of the flight path, in consultation with affected parties, the magnitude of the noise at any given location is not likely to be significant. Moreover, the frequency of the overflights can be adapted to specific situations, such as sensitive periods for livestock. As well, other surveillance measures such as ground patrols are possible.

For these reasons, the construction, maintenance or operation of the pipeline, blowdowns or the use of helicopters are not likely to cause significant adverse effects on the acoustic environment.

4.12 Heritage and Archaeological Resources

Potential Adverse Environmental Effects

It was suggested that pipeline construction may have the potential to disturb or destroy archaeological and heritage artifacts, structures and sites. As well, certain intervenors were concerned with the potential adverse effect of locating a pipeline in proximity to an historic residential enclave along Chemin de la Diligence in Stukely-Sud. In their view, the presence of a right-of-way would detract from the heritage nature of the area. Since there are already three rights-of-way in the area, an additional one could compound the adverse visual effect. Moreover, some intervenors stated that, in their understanding, Hydro-Québec is planning another transmission line through the area. If this line and the TQM pipeline were constructed, some properties would have five rights-of-way. The pipeline could damage heritage homes due to construction practices such as utilizing explosives. There was also a concern that the project right-of-way might compromise the physical and cultural heritage of the East Hereford area, which includes a horticultural tradition and an historic cemetery.

Mitigative Measures

TQM examined provincial records in order to carry out a baseline archaeological and heritage study covering known archaeological/heritage sites, designated places and monuments; and general heritage enclaves along the proposed route. Three sites were identified from the baseline study and examined in the field. The proposed route was altered to avoid two of the identified sites. TQM undertook to do further fieldwork prior to construction in order to identify, according to provincial archaeological/heritage criteria, any previously undiscovered sites along the right-of-way. All areas identified as having a potential for archaeological sites would be sampled for the presence of artifacts prior to construction. During construction, the discovery of any artifacts would result in: a halt in construction; an examination of the site by a trained archaeologist; and reporting of the results to the appropriate provincial authorities. An archaeologist would also be present during construction wherever a high potential site has been designated as requiring professional archaeological assessment or where an environmental inspector so requests. TQM stated that directional drilling could be employed to avoid an archaeological or heritage site.

TQM, as part of the archaeological and heritage study, identified one designated historic structure and 18 structures of heritage interest that were within 50 to 300 m of the centre line of the right-of-way. Among the structures of heritage interest were four houses and two churches along the Chemin de la Diligence in Stukely-Sud. All six buildings were approximately 150 m from the centre line of the right-of-way. In situations where explosives would be used in the vicinity of heritage structures, TQM committed to examining the potential effects of vibrations, and to taking measures to control the vibrations such as altering the charge and pattern of explosives. From the perspective of the visual presence of the pipeline, TQM undertook to screen above-ground facilities with vegetation. Some intervenors stated that the proposed right-of-way, placed on the hill behind Chemin de la Diligence, would be visible from their house and from the Chemin de la Diligence.

With respect to East Hereford's horticultural tradition, TQM committed to consult with appropriate parties on a landscape plan for the compressor station site, which would incorporate floral elements.

Conclusions

The evidence shows that archaeological features would not be affected since route modifications have been adopted and should a site or artifacts be discovered during construction appropriate mitigative measures would be taken to secure and protect archaeological resources. Under these circumstances, the project is not likely to cause a significant adverse effect on archaeological resources.

With respect to heritage matters, some adverse effects are possible in the Chemin de la Diligence area. Blasting could cause damage, although the 150 m distance from right-of-way to the structures and the commitment to vary the charge and pattern in sensitive area would suggest only minimal damage, if any. Moreover, restoration could be carried out to repair any damage. There also may be a cumulative effect of the widening of the existing rights-of-way, but it is unlikely to be significant given that the widening would be on the side of the rights-of-way furthest from the structures. It should be noted that in the existing situation the dominant visual feature on the rights-of-way is an electrical transmission line and this would not change significantly. Hence, the project is not likely to cause significant adverse environmental effects in the Chemin de la Diligence area.

The floral tradition of East Hereford should not be compromised by the pipeline facilities, given that they are five km away from the town of East Hereford, which is the focal point for the horticultural tradition. The compressor station would be landscaped in consultation with local interests. The proposed facilities should not have a significant adverse visual effect. As for the cemetery, it fronts on a highway and is adjacent to a saw mill, and neither the right-of-way nor the compressor station would infringe on it. Given TQM's commitments to noise control and landscaping, and the existing land uses, the project is not likely to cause significant adverse environmental effects.

4.13 Socio-Economic Matters

This section covers potential adverse socio-economic effects arising from environmental changes induced by the project. Many intervenors expressed concern with the potential adverse visual effects of the project on the Eastern Townships' recreation and tourism vocation. There also were concerns that hunting and fishing opportunities would be diminished by pipeline construction and operational activities. Construction activities in general were viewed as having the potential to damage farming and leisure activities. Finally, a number of intervenors expressed concern that the project right-of-way would open new areas to trespass or exacerbate current trespass problems.

4.13.1 Visual or Aesthetic Environment

Potential Adverse Environmental Effects

There was general concern that a new pipeline would detract from the visual or aesthetic environment of Eastern Townships by diminishing the natural appeal of the area along the right-of-way, particularly east of Granby. The MRC of Memphrémagog and several intervenors were concerned about the potential for damaging the region's image and vocation as a recreation and tourism area. There was concern that the visual appeal would be diminished, and that the continued use and development of the natural aspects of the region would be compromised.

There was also concern with the social or psychological implications of altering the visual environment. Some believed that the pipeline would ruin the exceptional beauty of the area. Some

also expressed concern with the impact of the pipeline on the integrity of the landscape in their immediate surroundings. These concerns also applied to individual facilities, such as the East Hereford Compressor Station, and to potential cumulative effects, such as adding an additional right-of-way in the Chemin de la Diligence area.

Mitigative Measures

TQM proposed to minimize the visual effects by paralleling existing rights-of-way, since the visual effect of a new pipeline adjacent to an existing corridor is less noticeable than if a non-adjacent right-of-way was cleared. TQM noted that in much of the proposed route, the right-of-way abuts multiple roadway, electrical line and gas line easements. Thus, according to TQM, the adverse visual effect would be minimal. As well, by paralleling existing rights-of-way, the need for clearing trees for access roads and temporary work space would be held to a minimum. Where the route must go through forested areas, TQM proposed to restrict deforestation to a minimum. TQM would adopt the approach of routing through flatter, open areas, to the extent possible, in order to minimize adverse visual effects.

To reduce adverse visual impacts at the local level, TQM in addition to its overall routing principles, proposed to:

- leave a buffer zone of trees when possible;
- plant tree screens;
- relocate existing trees;
- allow fruit and Christmas tree plantings three metres from the pipeline centre;
- change the direction of the easement to restrict the sightline; and
- directional drill to reduce vegetation clearing in sensitive areas.

During the hearing, there was uncertainty as to what concrete steps TQM intended to take to reduce the visual impact. In order to address concerns regarding the region's image and vocation as a recreation and tourism area, the MRC of Memphrémagog demanded that the project routing take into consideration measures to restrict sightlines down the right-of-way from highways, including leaving forested buffers between the pipeline and a highway. At a macro level, TQM's committed to two alternate route modifications from the original proposed route, in order to address the concerns of the MRC of Memphrémagog. More specifically, TQM agreed to:

- restrict sightlines down the right-of-way by putting bends/angles in the right-of-way;
- restrict the size of openings at critical sightlines;
- conceal above ground structures with vegetation; and
- leave forested buffers between the pipeline and the highway.

TQM stated that, at the level of the individual landowner, landscaping would be done systematically on a case-by-case basis. TQM, through its liaison officers, would interview landowners as to their landscaping preferences, obtain landowner agreements for each plan, and ensure that the contractor implements the agreed plans. TQM also addressed the concern that indigenous plants be used in replanting. TQM agreed that, after consultation with individual landowners, the plantings could be modified from its general practice of applying a standard prairies or forest mix.

TQM committed to landscape the East Hereford Compressor Station, including floral plantings. This would be done in consultation with local interests. In addition, TQM would integrate a cycle trail into its landscape plans as requested by the local municipality, if the affected landowners consent.

Conclusions

The main visual and aesthetic concerns are the potential effects of the project on Estrie's recreational and tourism vocation from a social and economic point of view.

The project's presence from Lachenaie to Granby would be compatible with the mixed vocation of the land, which consists of industrial, commercial, institutional, and recreational and tourism activities. For that part of the project, TQM's routing principles, its willingness to make routing changes based on aesthetic and visual considerations, as well as its plans with respect of mitigating visual impacts at the macro and local levels during construction, lead to the conclusion that the project is not likely to cause significant adverse environmental effects.

With respect to the project's Granby to East Hereford component, the mix of human activities also is varied and the vocation is multi-purpose, but with a greater emphasis on recreational and tourism activities and the more dominant natural state of the landscape. From the perspective of socio-economic effects stemming from the potential environmental changes induced by this project, there is no evidence to suggest that this particular project would detract significantly from the current recreational and tourism experience. This, combined with TQM's proposed mitigative measures at the macro and local levels identified above, would indicate that the project is not likely to cause significant adverse effects on the visual and aesthetic environment.

There are also important issues related to visual and aesthetic effects of the project upon individual landowners whose property is crossed by the project. In addition to the mitigative measures to be applied at the macro and local levels as indicated above, the Company has undertaken to deal with the concerns of landowners on a one-on-one basis in order to avoid or otherwise mitigate the effects. To that end, the Company has agreed to minimize tree removal to the extent possible and to examine options for revegetation as part of the landscape plans it would negotiate with each landowner. Therefore, in most cases, significant adverse environmental effects are not likely to occur.

4.13.2 Hunting and Fishing Opportunities

Potential Adverse Environmental Effects

Issues were raised about the economic and social effects of the project on deer hunting and trout fishing. One concern was that a new or an expanded existing corridor could destroy forest habitat that deer need for protection and sustenance. A reduction in the deer population could result in fewer deer hunters, and thus reduced revenues generated in the region because of a reduced demand for accommodation services, supplies, and leases to hunt on private lands. A second issue was that any reduction in the deer or fish populations could result in a curtailment of an important recreational activity for landowners who hunt or fish. Finally, there was a concern that helicopter overflights or other activities during the hunting season could scare the deer away from areas along the pipeline and reduce hunting prospects.

Mitigative Measures

TQM consulted with provincial wildlife officials and avoided identified areas where deer concentrate in the winter. In addition, TQM referenced studies that conclude that rights-of-way do not necessarily have a negative effect on deer numbers, and that the critical factor with respect to the population effect is not the width of the right-of-way, unless it exceeds 100 m which is not the case here. However, the actual effects cannot be assessed because the new right-of-way may go through unidentified deer yards and there was no real assessment of fragmentation. Specifically for the Mount Shefford area, where there is a deer wintering yard, the proposed right-of-way would skirt the forest area. In addition to avoiding critical deer habitat, TQM proposed to:

- limit the width of the right-of-way, where possible;
- give preference to clear-cutting during the May to December period;
- restrict any winter clear-cutting between February and the end of March;
- leave cut branches on the ground; and
- avoid work in the hunting season, if possible.

TQM acknowledged that overflights could disturb animals and agreed, as explained in Section 4.11 - Acoustic Environment, to avoid sensitive time periods and areas.

TQM proposed several mitigative measures to avoid significant adverse effects on fish and fish habitat. One measure was to restrict construction during spawning and early life stages for fish, as determined by government regulatory authorities. A second was to directionally drill beneath sensitive watercourses. A third was to prepare a construction plan for each watercourse crossing and obtain provincial approval for them. The plans would include methods to control run off on approach slopes and trench or drill each watercourse in a manner that minimizes sediment release. TQM also committed to re-profile and re-establish approach slopes to their original gradient. A more detailed treatment of these measures is provided in Section 4.6 - Fisheries and Fish Habitat.

Conclusions

As discussed in Section 4.8 - Wildlife and Wildlife Habitat, the clearing of additional right-of-way is not likely to cause a significant adverse environmental effect on the deer population. The actual status of the deer population in the general project area is such that the Province issued additional deer hunting permits in 1997, an indication of an abundance of deer in these areas. The number of hunters is a function of the number of permits issued. Should the deer population decline in the future, it would be the possible for, and likely that, the Province would determine the reason for the decline and make necessary adjustments to the issuance of deer hunting permits.

The effects of helicopter overflights on wildlife have been considered by TQM. The Company is willing to take this into account and adjust the route, timing and flying level of inspection overflights during sensitive periods, following consultation with affected parties. This consultative process should reduce situations where deer are startled during hunting season from helicopter inspections to the point where significant adverse effects are not likely to occur.

As discussed in Section 4.6 - Fisheries and Fish Habitat, the project is not likely to have a significant adverse environmental effect on fishing activities.

4.13.3 Construction Practices

Potential Adverse Environmental Effects

Pipeline construction may result in nuisances and damage. Examples of nuisances include noise and traffic congestion. Examples of potential damages include cutting of fences, breaking drainage tiles, crop loss, and wear and tear on secondary roads by construction equipment.

Mitigative Measures

TQM committed to following all regulatory requirements and accepted industry practices to avoid, minimize and mitigate construction-related nuisances and damages. The Company adopted as policy and practice the construction standards set out in the TransCanada Manuals on Pipeline Construction (April 1993), Construction Safety (January 1995), Waste Management (February 1995), Environmental Management (March 1995) and Hydrostatic Testing (December 1995) (the "Manuals").

With respect to general mitigative measures TQM committed to:

- consult with municipalities on construction plans, prior to construction;
- minimize noise and dust;
- consult with affected residents on their concerns, prior to construction;
- notify landowners 48 hours in advance of construction;
- verify traffic situations with municipalities and the Province to avoid conflicts;
- undertake directional drilling;
- control the charge size and pattern of blasting to reduce vibrations near buildings; and
- ensure replacement water for any disrupted water supply.

In addition, TQM undertook to minimize interference with agricultural and forestry activity during construction. The Company committed to:

- avoid sensitive periods;
- minimize the length of open trench;
- leave a passage open across a trenched area as long as possible;
- transfer livestock to alternate pastures; and
- install temporary fences.

Where damages arise, TQM undertook to repair the damage or pay reasonable compensation costs.

Conclusions

The Manuals establish acceptable practices and procedures for building the pipeline. TQM adopted these Manuals and accepted responsibility to ensure the standards are met. The NEB would have inspectors on site to monitor adherence to these standards during construction. The construction techniques for pipelines are well developed and significant adverse environmental effects are unlikely. The duration of the construction period is a day or two for most areas, and accordingly any nuisances or inconvenience would be short lived. Problems that do arise would be localized and dealt with when identified according to standard procedures. Where an immediate resolution is not possible, the situation would be brought under control or contained, and become subject to a remediation plan. Overall, significant adverse environmental effects are not likely to occur.

4.13.4 Effects of Trespass

Potential Adverse Environmental Effects

The opening up of new right-of-way could increase the potential for people and recreational vehicles to more readily trespass on private lands. Such intrusions could result in: nuisances such as noise from recreational vehicles and littering; danger such as stray bullets from hunters; and damage such as poaching wildlife, breaking fences, soil compaction and disturbing livestock. The enlargement of the width of a right-of-way could extend the area over which intrusions occur, and could intensify existing intrusions.

The evidence was that trespass via existing rights-of-way has been a problem for a number of landowners. Since the project route would parallel existing rights-of-way, these adverse effects could be exacerbated if not properly mitigated.

Mitigative Measures

TQM proposed several concepts for controlling intrusions through the use of gates, vegetation, and various forms of barrier. The application of any of these concepts would be determined following consultation with individual landowners. Also, warning signs would be installed at places where the right-of-way crosses roads or other points of possible access. In addition, TQM initiated discussions with Hydro-Québec and Gaz Métropolitain on the joint application of deterrents where there are parallel rights-of-way. TQM would also develop an intruder monitoring program in cooperation with Hydro-Québec and Gaz Métropolitain.

Conclusions

If the mitigative measures are applied in a way that resolves existing intrusions, as well as preventing potential intrusions from this project, there could be a specific positive environmental effect. The magnitude of the existing problem was not evident from the information provided, although those speaking on the concern saw the issue as an important one. Not all landowners considered recreational vehicles crossing their land as an intrusion, and some permit access to their land by sportsmen. Where there is an adverse environmental effect, it is likely to be of short duration, infrequent and local. Moreover, if a problem arises, additional physical control measures could be introduced following consultation with TQM. A landowner could also address complaints to the NEB who could ensure that TQM commitments regarding intruder control are honoured.

Based on the above, significant adverse environmental effects are not likely to occur.

4.14 Cumulative Environmental Effects

TQM indicated that it has carried out an assessment of the cumulative effects which construction and operation of the proposed pipeline facilities could have on the receiving environment. It stated that its approach was based on the principle whereby the environmental effects of various human activities can combine and give rise to a set of interactions in time and space, producing effects of which the nature and scale may be different from the effects of each of the activities taken separately.

TQM stated that, with the above principle in mind, it took into consideration not only the sum of the individual effects in time and space, but also synergy, interaction, threshold and feedback effects. As well, TQM stated that the study was subject to spatial and temporal constraints. Thus, it indicated that it took the past 20 years into account with respect to existing projects and activities, and the past five years with respect to projects and activities planned for the future. TQM also indicated that it had studied only those projects and activities close enough to the project to make it possible, in TQM's opinion, to observe an interaction among the effects.

TQM described its selected approach as identifying:

- the effects of the project itself;
- the effects of existing projects and activities that may create a set of interactions with those of the project; and
- the potential effects of future projects and activities in the vicinity of the project.

Regarding the effects of the project, TQM stated that it has reported on the various anticipated effects as well as the significance of these effects once mitigative measures to limit, if not eliminate, the adverse effects on cultivated land, forests and urban areas, water bodies, soil, vegetation, wildlife, archaeology and heritage resources have been implemented.

As for the effects of existing projects and activities, TQM stated that it has identified only a very limited number of current projects and activities wherein it saw a potential for interaction in the vicinity of the project. TQM submitted that in order to limit additional effects on the environment it has opted for using existing energy corridors as much as possible, thus respecting the philosophy underlying the location criteria established by interested parties in the early 1980s.

As for the potential effects of future projects and activities, TQM indicated that it has identified certain projects and activities now in the planning, approval or implementation stages.

The following provides a summary of the conclusions related to cumulative environmental effects that have been included in each of the topical sections in Chapter 4 of this report.

Cumulative adverse environmental effects on soil or agriculture should be minor, localized, and mitigable in the medium to long term, and hence not likely to be significant. If the proposed mitigative measures, plans, and inspection are strictly adhered to, the project is not likely to cause significant cumulative adverse effects on soil and agriculture. The main cumulative adverse environmental effect on rare plants would be the additional access to natural areas harbouring these plants and the harvesting of these plants, such as wild leek. However, the distribution of existing forestry roads is such that people now have access to most areas of potential concern. There is, in addition, no evidence that these plants are being collected. The project is not likely, therefore, to have a significant cumulative adverse environmental effect in that regard.

The project would remove approximately 152 ha of forested land, primarily in Eastern Townships. Since this is a region with an active forest industry, there could be a cumulative effect. However, the area of proposed clear-cut would be small compared to the hundreds of square kilometres over which wood harvesting is carried out. Moreover, it would be possible to replant Christmas trees on two-thirds of the right-of-way, which would provide for continuous cropping. Overall, a significant cumulative adverse environmental effect is not likely to occur.

Any cumulative adverse environmental effects on wetlands or river crossings would be most likely to arise from sedimentation, due to erosion and altered drainage. If the proposed mitigative measures were strictly adhered to, these effects should be minor, localized and mitigable in the short to medium term. With appropriate plans and inspection, it is unlikely that there would be significant cumulative adverse effects.

The project is not likely to cause significant cumulative adverse environmental effects on wildlife. The one potential cumulative effect identified was in respect of fragmentation of wildlife habitat, and specifically to a deer yard that intervenors stated existed in Stukely-Sud. The Company undertook to consider that deer yard similarly to two officially designated deer yards along the route. The route would thus parallel an existing pipeline right-of-way and encroach on the Stukely-Sud deer yard only to the extent allowed under provincial law.

Air emissions from pipelines are possible sources of cumulative adverse environmental effects because they include greenhouse gases. However, the risk of a release of natural gas is very low because of the application of state-of-the-art design, construction, and operations safety standards to the pipeline. Any incident would involve a small amount of gas and would be an exceptional case. Therefore, the project is not likely to cause a significant cumulative adverse environmental effect.

The compressor stations are not likely to cause a significant cumulative adverse environmental effect from noise, because TQM committed to design and operate its stations so as not to exceed provincial standards. The Company also agreed to a monitoring process and to report complaints.

The paralleling of existing rights-of-way raises the question of a cumulative adverse visual effect. There would be an added impact to the extent that the current rights-of-way would be visible and the additional area of the TQM right-of-way could not be fully screened. TQM has undertaken to work out landscape plans with individual landowners that would address the local visual aspect in most cases. The alternative of building a non-adjacent right-of-way would have an even greater potential for an adverse visual effect as it would extend the geographic scale over which rights-of-way spread. The effect would be less localized. It is therefore not likely that a significant cumulative adverse visual effect is occur.

The construction of a right-of-way may increase trespass on and damage to private lands and property. The design and implementation of barriers would reduce such trespass. TQM undertook to implement various barriers along its right-of-way in consultation with individual landowners, and to install warning signs. Given these provisions, it is unlikely that there would be a significant increase in trespass. Any trespass problems would likely be infrequent and be susceptible to enhanced methods of controlling trespass. TQM would be responsible to install additional preventive measures as required. The necessary action could be taken quickly and a continued significant cumulative adverse environmental effect is unlikely. There was also concern that the paralleling of rights-of-way would increase trespass in areas where there are already problems on the existing rights-of-way. This is possible, but unlikely, because TQM committed to work together with the companies holding the other rights-of-way to come up with a common and concerted strategy to deter and prevent trespass everywhere on adjoining rights-of-way.

A concern was raised that the current project would lead to further pipeline projects and the requirement for additional right-of-way. The evidence was that the proposed pipeline has been sized to carry additional gas volumes if required in the future. This reduces the likelihood of a need for

another pipeline in the foreseeable future. The only evidence that any additional projects would be built or that other activities would be carried out in the foreseeable future that would require additional rights-of-way was speculative. A significant cumulative adverse effect is therefore not likely.

In conclusion, based on the information obtained during the hearing, its own analysis—which is reported under each of the factors in the study—and taking into account the application of the mitigative measures identified in this report, the Board believes that the project is not likely to cause significant cumulative adverse environmental effects.

4.15 Effects of Accidents or Malfunctions

Potential Adverse Environmental Effects

A break in a gas pipeline would cause a release of gas which may create a crater and may ignite or explode. Such failures of the pipeline may be due to defects in the pipe, faulty construction methods, improper maintenance, or third-party damage. A release of gas may adversely affect the health of people, animals and vegetation. A subsequent fire or explosion could cause injuries, death, or environmental damage. There is also the risk of secondary fires being ignited causing environmental damage and endangering humans. During the construction of the project, there may be accidents causing injuries to workers.

Several intervenors expressed concerns with the availability and state of local emergency services that would be needed to respond to an incident related to a pipeline. They noted that smaller municipalities did not have emergency plans in place to deal with such incidents. They stated that, in many areas, emergency service providers are local volunteers; are not trained or equipped to deal with a gas pipeline incident; and may not want the added responsibility. They also pointed out that parts of the project area are relatively isolated, and that emergency communications systems and emergency service response times are inadequate. Finally they wondered what the cost of the required new emergency services would be, and if the municipalities would have to bear the burden of added costs.

Mitigative Measures

Mitigative measures begin with the design and construction of the pipeline to meet required safety standards. For the design of the pipeline, TQM has committed to meet, and in some cases exceed, the requirements of the *Canadian Standards Association* CSA Z662 standard and the NEB's *Onshore Pipeline Regulations* (which incorporate the requirements of CSA Z662). Furthermore, TQM commissioned a risk analysis study, which determined that the project would have a risk profile that would be at an acceptable level if the proposed pipeline were constructed according to the design. All this would help to ensure that the pipeline would operate safely for the approved gas volumes and pressures. The required pipe wall thickness at a specified location would be determined according to CSA Z662, which sets the maximum allowable stress levels of the pipeline. These levels are based on the class location of the pipeline, which is determined by the population density in the immediate vicinity of the pipeline. As the population density increases, the maximum allowable stress level of the pipeline is reduced. One of the most common methods of applying this requirement is through the use of thicker wall pipe in areas where there are higher population densities. This is an approach used in standards in Canada, the U.S., Europe and elsewhere around the world.

The Company further indicated that, in designing the pipeline, it would take into account the conclusions and recommendations of the NEB *Report of the Inquiry Concerning Stress Corrosion Cracking on Canadian Oil and Gas Pipelines*. For example, in order to protect the pipeline from corrosion, TQM would use a high-performance coating system such as fusion bonded epoxy, combined with the application of cathodic protection.

The Company undertook to follow appropriate construction techniques and inspection practices to ensure safe operation. Prior to putting the pipeline into service, all welds would be thoroughly inspected with non-destructive inspection techniques. The pipeline would undergo a hydrostatic test above its Maximum Operating Pressure in order to ensure that it could safely operate at its approved operating pressure. The pipeline network would be monitored 24 hours a day using a Supervisory Control and Data Acquisition system at TQM's existing control centre located at its head office in Montréal, with a backup at its maintenance centre in Repentigny. If a leak or rupture were detected, the Company's safety system would have the capability to isolate the damaged section of the pipeline by automatically closing the appropriate mainline valves, which would be located between eight and 23 km apart along the pipeline. TQM indicated that, in a worst case scenario, it should take approximately 20 minutes to completely eliminate the pressure from the damaged pipeline section that has been isolated. Routine surveillance of the right-of-way (aerial or on foot) would be performed to identify potentially dangerous conditions. The pipeline would also be inspected from the inside through the use of electronic in-line inspection tools. This would permit the early detection of conditions of the pipe wall that could potentially affect the integrity of the pipeline.

Accidents on pipelines could result from third-party activity, for example an unauthorized dig in the vicinity of the pipeline. To minimize the possibility of this occurring, signalling strips would be put in place on either side of the pipeline trench prior to backfilling, which would warn a person conducting unauthorized excavating of the proximity of the pipeline. TQM indicated that, in sensitive areas such as water, road, or railway crossings, it would take additional measures to further protect the pipe, such as installing concrete slabs, protective casings, or having greater burying depth. Furthermore, an awareness program would be conducted by TQM to remind municipalities and landowners of the exact location of the pipeline, as well as safety requirements. Signs adhering to CSA requirements would be placed along the right-of-way, at all road, railway, ditch crossings and navigable water areas. It is also important to note that section 112 of the NEB Act introduces a 30 m controlled area on either side of pipeline. This controlled area is meant to safeguard the pipeline from third-parties, but does not preclude development of the land. Within the controlled area, all excavations using power-operated equipment or explosives in the controlled area must receive prior Company permission. TQM is also a member of "info-excavation", a one-call centre, which informs the Company of a request for excavation in proximity to its pipeline. As noted above, routine surveillance of the right-of-way would be conducted, which would identify potential encroachments.

An emergency response plan would be in place to guide emergency personnel in handling incidents. TQM committed to contribute to the development of emergency response planning for all municipalities that would be crossed by the proposed pipeline. The Company stated that, prior to putting the proposed pipeline into service, the emergency response plan for its existing pipeline network would be updated to include the proposed facilities. TQM would also put in place an ongoing training program for local emergency response personnel working in areas affected by the proposed pipeline project. There has also been discussion with municipalities on ways and means for the Company to assist in upgrading general emergency communications systems, given that the

pipeline brings a new demand on existing emergency systems. In the event of an emergency situation, trained Company personnel would provide necessary assistance to local emergency responders. The Company carries insurance to compensate for any damages than may arise.

During construction, the responsibility for dealing with incidents rests first and foremost with the construction contractors. The contractors are responsible to ensure that workers have proper training and that medical and evacuation services are available. Each contractor must develop an accident prevention program, and submit it to the *Commission de la Santé et Sécurité au Travail (CSST) du Québec* for approval. In order to be allowed to work on the construction site, each construction worker must successfully complete a safety course.

Conclusions

Should an accident occur, the immediate adverse environmental effects are likely to be confined to a relatively small area, and the environment should be readily restored. Eighty-two per cent of the pipeline is in the agricultural zone and the adverse environmental effects should be minimal in this situation. Environmental damage could be significant in forested areas, if a secondary fire occurred. In urbanized areas, damage to vegetation and lands would be relatively minor and could be easily mitigated. Depending on its magnitude, a pipeline incident may also have adverse effects on people and structures. A pipeline incident occurring in a watercourse crossing could disturb wildlife and plant life, as well as potentially disturb downstream water collection points. Should an incident occur in close proximity to roads, railways or other utilities, there would be minimal environmental damage, which would be easily restored. In any incident resulting in a release, natural gas would dissipate quickly into the atmosphere since it is lighter than air.

On the basis of TQM's pipeline design, construction, inspection and public consultation commitments, there is a low probability for an incident to occur. If an incident were to occur, the duration of the effects would likely be brief. TQM would work closely with municipalities to produce local emergency response plans and ensure that they are in place. The company would provide local emergency response personnel with any necessary training to deal with pipeline incidents. TQM's emergency response plan would help cope with the immediate effects. Given these factors and the fact that the overall risk of having an accident or malfunction is low, such events are not likely to cause significant adverse environmental effects.

4.16 Sustainable Development

Potential Adverse Environmental Effects

The CEAA defines sustainable development as "development that meets the needs of the present, without compromising the ability of future generations to meet their own needs." Three potential adverse project effects that could prevent the meeting of the sustainable development objective are: the undermining of the viability of the ecosystem, waste of and damage to natural resources, and risks or threats to a healthy environment and a healthy economy. The purpose in this section is to consider the effects in an overall sense. Thus, for greater detail on specific natural resource elements, and renewable resource capacity to meet present and future needs, the reader should refer to the sections dealing with topical environmental issues such as fish and fish habitats, wetlands, forests, and vegetation.

There was some concern expressed as to whether the project could affect the sustainability of the fish farming operation at East Hereford. The sustainability would be affected solely as a result of a negative impact on the quantity and quality of water available from the present source. The potential adverse environmental effects, mitigative measures and the Board's conclusions related to this matter are contained in Section 4.5 - Hydrology.

Mitigative Measures

TQM stated that the primary methods of ensuring sustainable development are to select the corridor of "least impact", and then avoid any remaining sensitive areas when planning the detailed route. Criteria used to ensure "least impact" were: to plan the route through agricultural land to the extent possible; to follow existing right-of-way; and to avoid forested area. The agricultural and forestry categories are the critical natural renewable resources for this project.

Some 82% of the project would be in the agricultural zone, where construction techniques would be used that pay close attention to soil protection and drainage considerations in order to sustain the long term productivity of the land. There would be a short-term loss of agricultural production during the construction period, and a long-term loss of a small amount of agricultural land used for permanent above-ground structures, such as valves and compressor and metering stations. In TQM's opinion, these losses would not likely be significant.

In forested areas, emphasis would be on routing through disturbed and marginal areas to the extent possible, and paralleling existing rights-of-way, in keeping with TQM's stated goal of minimizing tree removal. There is also a 12 km section of the proposed route that would be within an abandoned Hydro-Québec right-of-way. However, 152 ha of wooded area that would be deforested would not be available for reforestation. While small, shallow-rooted trees such as dwarf apple or Christmas trees could be planted on the right-of-way, there would be a long-term loss of merchantable timber. Landowners would receive monetary compensation for loss of existing wood and future potential harvests.

The Company argued that natural gas largely replaces oil which, in its view, would reduce environmental costs. On the economic side, the Company pointed to a need for enhanced gas supply as the current facilities could not supply the existing market and that there have been significant interruptions in winter service. Moreover, access to natural gas is seen as supportive of continued industrial and agricultural development in Québec. A number of agricultural producers in the Saint-Hyacinthe region have requested access to natural gas through TQM and Gaz Métropolitain, in order to make their operations more competitive over the long term. During the course of the hearing, this issue was resolved in negotiations between the agricultural producers, Gaz Métropolitain and the Province, whereby all three parties agreed to provide funding to subsidize a local gas service.

There was discussion at the hearing of differing views of sustainable development and of the factors that should be accorded greater weight when assessing whether or not the proposed project contributes to sustainable development.

Conclusions

The proposed project would have similar effects on the viability of the ecosystem to other past large-scale linear developments. The main effects would be visual impacts and fragmentation of

ecosystems. Development need not pose an unacceptable threat to the viability of the environment, when designed and carried out in a sensible and sensitive way. The TQM pipeline has been and would be subject to detailed planning and the application of approved construction and maintenance practices and procedures. To the extent that there are adverse effects, TQM has committed to resolve them. With a properly conceived and constructed project, and considering TQM's commitments, the project is not likely to cause significant adverse effects on the viability of the ecosystem.

In the project planning, agricultural considerations have been given detailed and careful consideration. The evidence is that the project is not likely to cause significant adverse environmental effects if agreed construction practices are followed. The long-term loss of agricultural product due to a small amount of agricultural land being taken out of production is not likely to be of any significant consequence. Should the pipeline be abandoned at some future date, the land used for above-ground structures could revert to agriculture.

With the loss of 152 ha of wooded land, the effect on forestry could be adverse. However, the magnitude of this amount of wooded land being removed is not likely to be significant, particularly since a majority of the land is in disturbed or marginal areas along existing rights-of-way and since there is an undertaking to permit certain kinds of trees on the easement. The affected wooded land would be distributed across a wide area, further reducing the significance and likelihood of any impact. Consequently, the project is not likely to cause significant adverse effects on forest resources.

4.17 Commitments

Potential Adverse Environmental Effects

Landowners and community representatives expressed concerns with the problem resolution and corporate-community relations processes, should the project proceed. Based on their own experiences with the Company, a number of landowners expressed scepticism about TQM's intentions and its willingness to engage in a fair and open process of problem resolution. They also questioned TQM's ability to fulfil its commitments. When landowners were asked about ways to ensure good working relations between landowners and the Company, they suggested several practices including: notification by letter to all potentially-affected parties at the outset of project planning; encouragement and support for a national landowners organization; and a code of ethics governing activities of pipeline companies and its employees, to be developed between landowners, pipeline companies and the NEB.

In response to landowners' concerns that TQM might not have the ability to fulfil its commitments, TQM pointed to its track record for its pipeline operations on the St. Lawrence North Shore. It maintained that there had been good relations with landowners and the communities. It noted the absence of complaints to the NEB as an indication of good performance.

Spokespersons representing the broader community were concerned with corporate relations. They saw the project as having potential adverse effects on the community at large. These effects would be less apparent than direct effects on landowners, and may not be susceptible to individual compensation. Examples of these effects would be traffic, noise and dust nuisances from construction, inspection and maintenance activities, and the psychological effect of the pipeline from aesthetic and safety perspectives. These intervenors sought reassurance that TQM as a good corporate citizen would

contribute to the community at large in recognition of the way its activities would affect the community.

Mitigative Measures

TQM stated that it had or would have in place approaches to deal with both individual landowner relations and community relations. Full-time liaison agents would be in place during project construction to ensure that contractors meet the requirements of agreements negotiated between TQM and landowners. These agents would handle any construction-related complaints. At the operations stage, there would be an ongoing awareness program (calendars, booklets and special aspects notification) and systematic visits to maintain contact with landowners to ensure that safety consideration are understood, to discuss any outstanding or new issues, and to follow-up on the resolution of these issues. Where there are maintenance requirements on the right-of-way with potential adverse environmental effects, affected landowners would be advised of these requirements in advance by liaison agents.

TQM stated that while it did not have an alternative system for conflict resolution in place, nor staff expertise in this regard, it was ready to introduce such a program, if necessary. It committed to exhaust all avenues of negotiation in finalizing an easement agreement. Expropriation would be considered only as a last resort.

TQM noted that it is a member of, and subscribes to, the policies of the Canadian Energy Pipeline Association, which has adopted a policy to improve relations with landowners, such as a proposed system of landowner mediation.

In respect of a corporate community role, TQM proposed several elements of a community relations plan. These include: a vigilance committee to keep the public informed of pipeline issues at the operations stage and to deal with citizens' concerns; support of social projects such as a bicycle path in East Hereford; support for local municipalities on emergency response planning and training; and an evaluation of the effectiveness of the TQM community relations program.

Conclusions

TQM addressed in a general way the matter of an enhanced process for resolving community and landowner concerns. While specific outcomes cannot be judged at this time, there are processes for monitoring how well TQM achieves its stated commitments. TQM has given an undertaking to evaluate the effectiveness of its community relations program. At the individual level, all affected parties have the right to complain to the NEB where dialogue or consultation has broken down and issues are not being resolved nor commitments upheld. Furthermore, as a matter of course, the Board monitors and enforces compliance with its regulations, certificate conditions, and commitments made by the Company at the hearing.

4.18 Waste Management

Potential Adverse Environmental Effects

Improper handling of project construction and operations waste could harm the environment, and pose risks to animal and human health. Of particular concern are any discarded construction materials,

wastes from construction crews, and the treatment of water used in hydrostatic testing. Waste from ongoing operations may also be of concern from the perspective of storage, transport, and disposal.

Mitigative Measures

TQM committed to adopt and follow the practices and procedures contained in TransCanada's Environmental Management Handbook, March 1995 ("EMS") and Waste Management Manual for Mainline Operation, February 1995 ("WMMMO"). The EMS requires that, during construction, the contractor is responsible for the daily clean-up of any debris and material on the construction site. Debris and materials must be disposed at approved disposal site. Contractors must not deposit liquids, solid waste or fuels directly on the ground or into water bodies. When servicing equipment, a ground sheet must be spread underneath the equipment and an adequate supply of absorbents, clean-up equipment and supplies must be available.

Water from hydrostatic testing would normally be disposed at a site other than the source site. The site would be agreed to by the regulatory authority and landowner. It would be discharged into well-vegetated areas using energy absorbing diffusers to prevent erosion and protect water quality. During construction, one of the environmental inspector's responsibilities would be to monitor for wastes and enforce the Company's waste management policy.

The WMMMO aims to ensure that waste materials are reduced and recycled, properly and safely classified, stored, transported, and disposed. All waste materials generated must be classified as hazardous or non-hazardous and treated accordingly. Small amounts of waste may be accumulated for later disposal, when properly labelled, segregated, and stored. Storage sites would be inspected regularly and spill kits would be available to deal with any incidents. Contractors transporting and disposing of wastes must adhere to all applicable regulatory standards.

Conclusions

With TQM's commitment to adhere to the above waste management practices and procedures, waste is not likely to cause significant adverse environmental effects. Where waste is generated, the comprehensive practices and procedures, if followed, should result in the avoidance of any adverse environmental effect. Environmental inspectors are responsible to ensure compliance or remedial action.

4.19 Emergency Response Plan

In order to guide emergency personnel in handling any incident, both TQM and municipal/regional emergency response plans would be in place prior to putting the proposed pipeline in service. The Company stated that the emergency response plan for its existing pipeline network would be updated to include the proposed facilities. The individual emergency concerns of specialized commercial operations would be considered and included in the emergency response plan. Intervenor stated that some of the remote areas are not staffed by dedicated, full-time emergency responders. Instead, they are staffed by local volunteers who normally do not possess the training or experience of full-time responders. It is important to note however, that this lack of training and experience is not limited to pipeline emergencies but also to any other type of emergency. TQM committed to contribute to the development of emergency response planning for all municipalities that will be crossed by the proposed pipeline. TQM would also put in place an ongoing training program for emergency response

personnel working in areas affected by the proposed pipeline project. There has also been discussion with municipalities on ways and means for the Company to assist in upgrading general emergency communications systems, given that the pipeline imposes new demands on emergency systems. In the event of an emergency situation, trained Company personnel would provide necessary assistance to local emergency responders.

During construction, the responsibility for dealing with incidents resides first and foremost with the construction contractors. These contractors are responsible for ensuring that workers have proper training and that medical and evacuation services are available. Each contractor must develop an accident prevention program, and submit it to the *Commission de la Santé et Sécurité au Travail du Québec* for approval. In order to be allowed to work on the construction site, each construction worker must successfully complete a safety course.

Chapter 5

Environmental Inspection, Monitoring and Follow-up Program

TQM indicated that, prior to the commencement of construction work, specific mitigative measures would be developed based on the results of the field study, especially for environmentally sensitive areas. These areas include watercourse crossings, wetlands, resource-rich zones, cultivated land, areas susceptible to wind erosion, steep slopes near watercourse crossings, and other sensitive areas such as wild leek colonies. Field work would be directed by specialized consultants, but the ultimate responsibility for accepting recommendations and the mitigative measures strategy would be TQM's. Employees and contractors would have to undergo an environmental training program prepared and submitted by TQM. The program would include an explanation of the role and responsibilities of environmental inspectors, a review of general and specific mitigative measures and an identification of environmentally sensitive elements along the pipeline route.

TQM indicated that, during the construction phase, it would implement an inspection program to ensure that the project is being built in accordance with the contract specifications. Such a program would help to address adverse environmental effects and to comply with existing legislation and regulations. According to TQM, work would be inspected by an independent contracting firm, reporting directly to TQM. The environmental monitoring team would be under the supervision of an environmental superintendent, who would report directly to the project manager. During the hearing, certain intervenors expressed doubts about the impartiality of the inspectors.

The environmental monitoring team would oversee the environmental aspects of construction on the worksites. It would be made up of agronomists, biologists, agricultural and forest engineers and archaeologists. The inspectors would work together with the analysts and worksite supervisors. They would be responsible for enforcing and following up on general and specific mitigative measures provided for in the project, and for fulfilling TQM's undertakings to the NEB and other authorities. In cases of non-compliance, where the time for following normal notification procedures would pose a risk to the environment, the environmental inspectors would be empowered to stop or modify the course of work immediately, until such time as TQM's response staff were notified. The inspectors would have to prepare daily activity reports detailing significant events and unusual incidents for inclusion in the project record.

TQM submitted that, after the construction phase, a specific environmental follow-up program would be put in place. TQM indicated that the program would be spread out over a period that would include the first five complete growing seasons. Such a program would be designed to ensure that the mitigative measures implemented during the pipeline construction phase have had the desired results. Thus, the first environmental assessment report would be completed within six months after the authorized in-service date, while the other reports would be submitted on or before 31 December following each of the first five complete growing seasons.

Should problem areas be identified, TQM would take appropriate remedial measures, and any additional mitigative measure required would be decided on by the environmental specialists and

carried out under their supervision. Furthermore, TQM would contact all affected landowners to notify them of the work to be done. Such problem areas would be re-assessed over the four following years, at the end of which, TQM has indicated, it would continue to perform routine monitoring as part of its systems-management procedures.

The Board also conducts its own environmental inspection and follow-up program. If the TQM project is approved, the Board would carry out its own inspections and audits in accordance with the relevant legislation and project approval conditions.

The environmental inspection, monitoring and follow-up program described in this section meets the requirements for a follow-up program for the proposed project.

Chapter 6

Conclusions and Recommendations

The Board concludes that the PNGTS Extension project, as proposed, is not likely to cause significant adverse environmental effects, provided that the mitigative measures identified during the course of the proceedings are applied and implemented.

In reaching this conclusion, the Board considered all the evidence and comments placed on record.

With respect to soils and agriculture, the Board is of the view that the project would not cause significant adverse environmental effects, provided that TQM strictly adheres to the mitigative measures to which it has committed. This also holds true for the effects on rare plant species, although the Board remains cautious as to the successful transplanting of some species and as to whether rare plant species have been fully inventoried. On the other hand, the Board is confident that TQM would be able to control soil erosion on agricultural land.

With respect to hydrology, the Board recognizes that construction activities could potentially have adverse effects, but that these would be confined to a specific well or water supply. The Board therefore concludes that significant adverse effects are unlikely to occur provided that the proposed mitigative measures are implemented.

Though fisheries and fish habitat are more likely to be adversely affected by the construction of the applied-for facilities, especially should a malfunction occur, the Board notes that, in its view, the risk of incidents is minor considering the engineering techniques that would be employed, to the extent that the prescribed construction windows and crossing methods are respected. The project is not likely to cause significant adverse cumulative effects on aquatic fauna.

In view of the mitigative measures, the Board expects that significant adverse effects on wildlife due to the fragmentation of the habitat which can result from the construction of the applied-for facilities is not likely to occur.

Although île aux Fermiers and some parts of Bunker Hill are recognized as environmentally significant areas and that greater care would be required when traversing these areas, TQM's approach and demonstrated understanding of these regions, coupled with the proposed mitigative measures, indicate that significant adverse effects should not occur.

The Board also considered a number of potential socio-economic factors that are likely to be affected by the project, especially in view of the recreation and tourism vocation of a large part of the region which the pipeline would traverse. In this context, visual and aesthetic impacts were examined, as well as the effect on hunting activities. TQM's proposed construction practices were also reviewed, as well as trespassing on the right-of-way. In all cases, the Board expects that, with the proposed mitigative measures, the project would not be likely to cause significant adverse environmental effects. Should the Board conclude that TQM's project is in the public convenience and necessity, the Certificate would include the following conditions regarding the environment:

1.
 - (a) TQM shall cause the approved facilities to be designed, manufactured, located, constructed and installed in accordance with those specifications, drawings and other information or data set forth in its application, or as otherwise adduced in evidence before the Board, except as varied in accordance with subsection (b) hereof; and
 - (b) TQM shall cause no variation to be made to the specifications, drawings or other information or data referred to in subsection (a) without prior approval of the Board.
2. TQM shall implement or cause to be implemented all of the policies, practices, recommendations and procedures for the protection of the environment included in or referred to in its application, the environmental reports filed as part of its application or its undertakings made to other government agencies, or as otherwise adduced in the evidence before the Board during the GH-1-97 proceedings.
3. TQM shall, prior to placing facilities into service, develop in consultation with local stakeholders and file with the Board a Community Action Program for the purposes of :
 - (a) developing emergency response plans for all municipalities that could be affected by the approved facilities;
 - (b) providing training to local emergency response personnel who would respond to any incidents relating to the approved facilities;
 - (c) setting up vigilance committees to keep the public informed and to deal with citizens' concerns;
 - (d) supporting social development projects in communities affected by the approved facilities; and
 - (e) assessing the program's results against its intended goals.
4. Prior to filing of the plan, profile and book of reference pursuant to section 33 of the NEB Act, TQM shall submit, for Board approval, any modification requiring a deviation from the route described in its application. Any such request for approval shall include:
 - (a) the results of public consultation (where appropriate), a list of affected landowners and the status of the land acquisition process (if any);
 - (b) an airphoto (where the deviation exceeds 50 metres);
 - (c) an environmental issues list identifying all relevant effects of the re-routes on, for instance, soils, vegetation, wildlife, hydrology and archeology; and
 - (d) the measures proposed to mitigate any significant adverse environmental effects.
5. TQM shall, at least ten (10) working days prior to the commencement of construction of the approved facilities, file with the Board a detailed construction schedule or schedules identifying major construction activities and shall notify the Board of any modifications to the schedule or schedules as they occur.
6. TQM shall file with the Board copies of any permits or authorizations which contain environmental conditions for the applied-for facilities issued by federal, provincial and other permitting agencies, as these authorizations or permits are received. In addition, TQM shall maintain, in the construction office(s), files containing any such information.

7. TQM shall, no later than fourteen (14) working days prior to the commencement of construction of the approved facilities, demonstrate to the Board's satisfaction that it has obtained the necessary approvals and authorizations relating to any federally regulated railway crossings which fall within the Canadian Transportation Agency's mandate.
8. Except for the construction of watercourse crossings, TQM shall, prior to the commencement of construction, file with the Board a summary detailing the results of discussions with all appropriate interest groups and relevant regulatory agencies. In addition, TQM shall maintain information files in the construction office(s) which include:
 - (a) a detailed listing of all site-specific mitigative measures to be employed as a result of undertakings to interest groups or regulatory agencies; and
 - (b) an explanation of any constraints identified that may affect the construction program.
9. TQM shall file for Board approval, no later than twenty (20) working days prior to the commencement of construction work on the watercourse crossings, additional information regarding:
 - (a) a re-assessment of fish and fish habitat sensitivity made from direct observations on-site, including the following information:
 - i) the distribution of salmonids;
 - ii) the presence of salmonids in a tributary;
 - iii) the presence of a spawning ground within 100 m of a watercourse crossing;
 - iv) the presence of a spawning ground for warm water species within 100 m of a watercourse crossing;
 - v) the presence of an endangered or threatened species;
 - vi) the presence of a spawning migration;
 - vii) a sensitive spawning and nursery habitat downstream; and
 - viii) the risk of sediment transport.
 - (b) in respect of those watercourse crossings which have been found to be sensitive, as a result of the re-assessment in (a) above:
 - i) the exact location and area of spawning grounds found within 100 m of the watercourse crossing;
 - ii) the percentage of the spawning grounds that is affected by construction;
 - iii) the species spawning at these sites;
 - iv) the exact dates of construction;
 - v) a detailed description of the construction method to be used;
 - vi) sedimentation control plans;
 - vii) estimates of expected losses of habitat and productivity;
 - viii) development of a follow-up program on the productivity of the spawning grounds after construction;
 - ix) site-specific mitigative and restorative measures to be employed as a result of undertakings to regulatory agencies;
 - x) evidence to demonstrate that all issues raised by regulatory agencies have been satisfactorily resolved, as well as updated environmental assessments for those areas where deficiencies were noted; and
 - xi) status of authorizations, including the wording of the environmental conditions.

10. TQM shall, during construction, ensure that specialized habitat for wildlife and plants with a designated status will be avoided, relocated or restored in consultation with appropriate regulatory agencies.
11. TQM shall file with the Board a post-construction environmental report within six months of the date that each approved facility is placed in service. The report shall set out the environmental issues that have arisen up to the date on which the report is filed and shall:
 - (a) indicate the issues resolved and those unresolved; and
 - (b) describe the measures TQM proposes to take in respect of the unresolved issues.
12. TQM shall file with the Board, on or before the 31 December that follows each of the first five complete growing seasons following the filing of the post-construction environmental report referred to in Condition 11:
 - (a) a list of the environmental issues indicated as unresolved in the report and any that have arisen since the report was filed; and
 - (b) a description of the measures TQM proposes to take in respect of any unresolved environmental issues.
13. TQM shall file the following with the Board:
 - (a) within three months after the commencement of operation of the compression facilities, and for each of the two following years, an environmental noise assessment indicating, for each of the two compressor stations, whether post construction noise levels resulting from compression equipment operating at full power are in compliance with provincial standards; and
 - (b) upon receipt of any complaints, and during the two-year period following the commissioning of the new compression facilities, a complete description of noise-related complaints received regarding either one of the two compression stations, including the mitigative measures TQM will undertake to address the situations giving rise to those complaints.

G. Caron
Presiding Member

J. A. Snider
Member

D. Valiela
Member

Calgary, Alberta
February 1998

Appendix I

Watercourse Crossings

SERIES A - Watercourses not subject to the *Fisheries Act*

Chainage * Alternatives	Name	Crossing Method * probable use of explosives	Construction Period
2+570	Coulée # 9714	Open Trench	May to October
17+970	Sabrevois River # 782	Open Trench	May to October
18+750	Br #2 de la rivière aux Pins #2531	Open Trench	May to October
19+700	Br #2 de la rivière aux Pins #2531	Open Trench	May to October
21+780	Br #10 de la Décharge du Trésor # 2447-4	Open Trench	May to October
22+320	Br #10 de la Décharge du Trésor # 2447-4	Open Trench	May to October
23+590	Br #7 de la Décharge du Trésor # 2447-44	Open Trench	May to October
25+770	Hébert # 10521	Open Trench	May to October
25+820	Natural Stream	Open Trench	May to October
27+100	Riendeau-Savaria # 12094	Open Trench	May to October
31+600	Bernard # 10139	Open Trench	May to October
32+160	Br. des Vingt # 10139	Open Trench	May to October
33+990	Br. des Vingt-Quatre Sud # 10139	Open Trench	May to October
39+730	Duclos-Casavant # 7704	Open Trench	May to October
40+730	La Petite Décharge des Trente # 7704	Open Trench	May to October
41+090	Natural Stream	Open Trench	May to October
44+400	Natural Stream	Open Trench	May to October
48+920	Décharge des Soixante # 5722	Open Trench	May to October
49+460	Natural Stream	Open Trench	May to October
53+110	Natural Stream	Open Trench	May to October
55+900	Décharge de la Côte Double # 6624	Open Trench	May to October
57+950	Roy # 7646	Open Trench	May to October
59+590	Br. # 9 du C.D. Soularges # 5086	Open Trench	May to October
63+250	Natural Stream	Open Trench	May to October
66+500	Charbonneau # 5187	Open Trench	May to October
69+020	Lorenzo-Voghel # 5032	Open Trench	May to October
71+280	Br. # 32A of Barbue River # 2751	Open Trench	May to October
71+380	Br. # 32A of Barbue River # 2751	Open Trench	May to October

continued

Chainage * Alternatives	Name	Crossing Method * probable use of explosives	Construction Period
71+780	Fleury # 10799	Open Trench	May to October
73+520	Nadeau # 5186	Open Trench	May to October
75+890	Barbue River # 2751	Open Trench	May to October
76+830	Br. Maurice-Couture # 11133	Open Trench	May to October
78+740	Brandy Brook # 4418	Open Trench	May to October
80+390	Br. #1 du C.D. de la Coupe # 12027	Open Trench	May to October
85+170	Natural Stream	Open Trench	May to October
85+500	Natural Stream	Open Trench	May to October
86+090	Natural Stream	Open Trench	May to October
87+790	Br. #5 of Noir Stream # 7088	Open Trench	May to October
89+020	Natural Stream	Open Trench	May to October
89+420	Gaucher # 7088	Open Trench	May to October
92+140	Guay Stream # 7088	Open Trench	May to October
92+180	Beaudry Stream # 7088	Open Trench	May to October
93+100	Natural Stream	Open Trench	May to October
93+180	Natural Stream	Open Trench*	May to October
94+200	Natural Stream	Open Trench	May to October
95+260	Natural Stream	Open Trench	May to October
96+810	Natural Stream	Open Trench	May to October
97+540	Natural Stream	Open Trench	May to October
97+890	Natural Stream	Open Trench	May to October
100+700	Natural Stream	Open Trench	May to October
101+190	Natural Stream	Open Trench	May to October
101+320	Natural Stream	Open Trench	May to October
104+710	Natural Stream	Open Trench	May to October
104+910	Natural Stream	Open Trench*	May to October
105+640	Natural Stream	Open Trench	May to October
106+760	Natural Stream	Open Trench	May to October
107+820	Natural Stream	Open Trench	May to October
108+240	Natural Stream	Open Trench*	May to October
108+310	Natural Stream	Open Trench	May to October
108+570	Natural Stream	Open Trench	May to October

continued

Chainage * Alternatives	Name	Crossing Method * probable use of explosives	Construction Period
110+800	Natural Stream	Open Trench	May to October
111+450	Natural Stream	Open Trench*	May to October
114+170	Natural Stream	Open Trench	May to October
115+780	Natural Stream	Open Trench	May to October
117+320	Natural Stream	Open Trench	May to October
119+140	Natural Stream	Open Trench	May to October
119+900	Natural Stream	Open Trench	May to October
119+980	Natural Stream	Open Trench	May to October
120+050	Natural Stream	Open Trench	May to October
125+720	Natural Stream	Open Trench	May to October
125+820	Natural Stream	Open Trench*	May to October
126+150	Natural Stream	Open Trench	May to October
126+580	Natural Stream	Open Trench	May to October
126+610	Natural Stream	Open Trench*	May to October
127+140	Natural Stream	Open Trench	May to October
128+970	O'Malley # 9979	Open Trench	May to October
128+980	Natural Stream	Open Trench	May to October
130+700	Natural Stream	Open Trench*	May to October
130+810	Natural Stream	Open Trench*	May to October
130+880	Natural Stream	Open Trench*	May to October
134+790	Natural Stream	Open Trench	May to October
136+350	Natural Stream	Open Trench	May to October
144+170	Léonard Drouin Stream	Open Trench	May to October
149+000	Gaudreau Stream	Open Trench	May to October
149+720	Côté Stream	Open Trench	May to October
154+710	Natural Stream	Open Trench*	May to October
155+090	Natural Stream	Open Trench	May to October
155+570	Natural Stream	Open Trench	May to October
155+910	Natural Stream	Open Trench	May to October
156+220	Natural Stream	Open Trench	May to October
156+250	Natural Stream	Open Trench	May to October
157+250	Natural Stream	Open Trench	May to October

continued

Chainage * Alternatives	Name	Crossing Method * probable use of explosives	Construction Period
167+240	Natural Stream	Open Trench	May to October
167+650	Natural Stream	Open Trench	May to October
180+270	Natural Stream	Open Trench	May to October
180+640	Natural Stream	Open Trench	May to October
181+270	Natural Stream	Open Trench	May to October
182+690	Natural Stream	Open Trench	May to October
183+590	Natural Stream	Open Trench	May to October
183+790	Natural Stream	Open Trench	May to October
185+040	Natural Stream	Open Trench	May to October
189+560	Natural Stream	Open Trench	May to October
191+780	Natural Stream	Open Trench	May to October
192+570	Natural Stream	Open Trench	May to October
192+740	Natural Stream	Open Trench	May to October
194+090	Natural Stream	Open Trench	May to October
194+450	Natural Stream	Open Trench	May to October
194+560	Natural Stream	Open Trench	May to October
194+790	Br. de la rivière aux Saumons # 6189	Open Trench	May to October
196+090	Natural Stream	Open Trench	May to October
196+190	Natural Stream	Open Trench	May to October
196+800	Natural Stream	Open Trench	May to October
197+150	Natural Stream	Open Trench	May to October
197+520	Natural Stream	Open Trench	May to October
197+910	Natural Stream	Open Trench	May to October
198+390	Natural Stream	Open Trench	May to October
198+670	Natural Stream	Open Trench	May to October
199+680	Natural Stream	Open Trench	May to October
199+860	Natural Stream	Open Trench	May to October
200+030	Natural Stream	Open Trench	May to October
200+700	Natural Stream	Open Trench	May to October
200+950	Natural Stream	Open Trench	May to October
201+120	Natural Stream	Open Trench	May to October
201+880	Natural Stream	Open Trench	May to October

continued

Chainage * Alternatives	Name	Crossing Method * probable use of explosives	Construction Period
0+950*	Natural Stream	Open Trench	May to October
1+365*	Natural Stream	Open Trench	May to October
1+490*	Natural Stream	Open Trench	May to October
4+655*	Natural Stream	Open Trench	May to October

continued

SERIES B - Watercourses where no significant adverse effects are anticipated provided that work schedules and mitigative measures are adhered to.

Chainage * Alternatives	Name	Crossing Method * probable use of explosives	Construction Period
0+360	Br. 1 du fossé de Feu # 612	Open Trench	May to October
3+500	Rivière des Prairies	Directional Drilling	July
7+350	St. Lawrence River north channel	Directional Drilling	June
9+800	St. Lawrence River main channel	Directional Drilling	September
11+050	St. Lawrence River south channel	Directional Drilling	July to August
14+170	Natural Stream	Open Trench	May to October
14+950	Rivières aux Pins # 2531	Open Trench	June to October
21+490	Décharge du Trésor # 2447-44	Open Trench	June to October
34+500	Branche Grande Décharge # 10139	Open Trench	June to October
35+200	Branche Petite Décharge # 10139	Open Trench	June to October
38+500	Richelieu River	Directional Drilling	June
47+210	Laurent-Noiseux # 5031	Open Trench	May to October
50+320	Décharge Pointe de chemise	Open Trench	June to October
52+380	des Dix-Terres # 5212	Open Trench	June to October
63+500	Yamaska River	Directional Drilling	July
67+160	Gobeil # 3250	Open Trench	June to October
70+900	Noiseux-Gauvin # 4019	Open Trench	May to October
82+320	North Yamaska River	Directional Drilling	August
88+770	Noir Stream # 7088	Open Trench	July to October
94+130	Natural Stream	Open Trench	May to October
94+700	Natural Stream	Open Trench*	July to 15 September
99+370	Natural Stream	Open Trench	15 June to 15 September
100+060	Natural Stream	Open Trench	May to October
112+160	Natural Stream	Open Trench	June to October
112+250	Natural Stream	Open Trench	May to October
112+520	Stukely Sud River	Open Trench	15 June to 15 September
121+580	North Missisquoi River	Open Trench	15 June to 15 September
122+190	Natural Stream	Open Trench	15 June to 15 September

continued

Chainage * Alternatives	Name	Crossing Method * probable use of explosives	Construction Period
124+500	Natural Stream	Open Trench	15 June to 15 September
124+570	Natural Stream	Open Trench	15 June to 15 September
124+630	Natural Stream	Open Trench	15 June to 15 September
132+200	Natural Stream	Open Trench	May to October
133+420	Castle Stream	Open Trench*	15 June to 15 September
133+950	Natural Stream	Open Trench	15 June to 15 September
134+630	Natural Stream	Open Trench*	May to October
134+980	Natural Stream	Open Trench	15 June to 15 October
135+600	Richard # 16659	Open Trench	May to October
136+580	Bras de la rivière aux Cerises	Open Trench	July to August
142+740	Magog River	Directional Drilling	August
146+680	Natural Stream	Open Trench	May to October
153+250	Natural Stream	Open Trench*	15 June to 15 September
153+400	Natural Stream	Open Trench*	May to October
159+450	Tomifobia River	Directional Drilling	September
160+650/700	Niger River	Directional Drilling	September
161+260	Natural Stream	Open Trench	May to October
161+370	Natural Stream	Open Trench*	May to October
164+530	Natural Stream	Open Trench	May to October
165+160	Natural Stream	Open Trench	May to October
165+920	Natural Stream	Open Trench	May to October
171+670	Natural Stream	Open Trench	May to October
173+960	Natural Stream	Open Trench	15 June to 15 September
175+310	Natural Stream	Open Trench	May to October
175+980	Natural Stream	Open Trench	May to October
176+090	Natural Stream	Open Trench	May to October
178+970	Natural Stream	Open Trench	May to October
182+520	Natural Stream	Open Trench*	May to October
185+280	Natural Stream	Open Trench*	May to October
186+800	Moes Stream	Open Trench	15 June to 15 September
188+560	Natural Stream	Open Trench	May to October
189+030	Natural Stream	Open Trench*	May to October

continued

Chainage * Alternatives	Name	Crossing Method * probable use of explosives	Construction Period
191+110	Natural Stream	Open Trench*	May to October
195+850	Br. de la Rivière aux Saumons # 6185	Open Trench	15 June to 15 September
202+740	Natural Stream	Open Trench	May to October
202+920	Natural Stream	Open Trench	May to October
203+550	Natural Stream	Open Trench	May to October
204+390	Beloin # 1710	Open Trench	15 June to 15 September
204+520	Natural Stream	Open Trench	May to October
205+550	Beloin # 1710	Open Trench	15 June to 15 September
207+750	Montminy # 1710-1	Open Trench	15 June to 15 September
210+240	Natural Stream	Open Trench	May to October
210+260	Natural Stream	Open Trench	May to October
210+550	Natural Stream	Open Trench	May to October
210+760	Natural Stream	Open Trench	May to October
211+360	Natural Stream	Open Trench	May to October
213+640	Hall River	Directional Drilling	October
5+905*	North Missisquoi River	Directional Drilling	May to October
6+865*	Natural Stream	Open Trench*	15 June to 15 September
1+110*	Magog River	Open Trench	July to 15 September
1+925*	Non-existant Stream	Open Trench	May to October
2+335*	Natural Stream	Open Trench	June to 15 September
10+360*	Natural Stream	Open Trench	May to October

continued

SERIES C - Additional information required

Chainage * Alternatives	Name	Crossing Method * probable use of explosives	Construction Period
11+690	Grand Pays Brûlé # 12624	Open Trench	June to October
12+290	Grand Pays Brûlé # 12624	Open Trench	June to October
30+760	Beloeil Stream # 1156	Open Trench	June to October
45+070	Rivière des Hurons # 1421	Open Trench	July to August
45+730	St. Louis Stream # 7542	Open Trench*	July to August
72+570	Barbue River # 2751	Open Trench	May to October
121+860	Natural Stream	Open Trench	15 June to 15 September
124+290	Natural Stream	Open Trench	15 June to 15 September
124+370	Natural Stream	Open Trench	15 June to 15 September
131+050	Isabelle # 9171	Open Trench*	15 June to 15 September
136+560	Rivière aux Cerises	Open Trench	July to August
139+880	Rouge Stream # 4479	Open Trench	15 June to 15 September
179+840	Coaticook River	Open Trench	July to August
205+810	Br. Ouest du Hall's Stream # 1710-48	Open Trench	15 June to 15 September
5+335*	Natural Stream	Open Trench	15 June to 15 September
6+360*	Black Stream	Open Trench*	15 June to 15 September
7+875*	McConnel Stream	Open Trench*	July to 15 September
11+835*	Natural Stream	not determined	15 June to 15 September

Appendix II

Scope of the Environmental Assessment

SCOPE OF THE ENVIRONMENTAL ASSESSMENT UNDER THE CANADIAN ENVIRONMENTAL ASSESSMENT ACT ("CEAA")

For the Trans Québec & Maritimes Pipeline Inc. - PNGTS Extension

Issued by the National Energy Board

10 September 1997

SCOPE OF THE PROJECT

1. Undertakings in relation to the physical work or physical activity for the PNGTS Extension triggering the CEAA.

Construction and operation of:

- 213.2 km of 610 mm OD pipe from Lachenaie to East Hereford;
- one 7.0 MW electric motor driven compressor unit at Lachenaie in the first year of operation;
- one additional 3.2 MW electric motor driven compressor unit at East Hereford and one gas aftercooler unit at Lachenaie in the second year of operation to transport additional volumes;
- two meter stations at Waterloo and East Hereford; and
- upgrading the Control and Communication System to include the proposed compression facilities and meter stations.

2. Other associated physical works or physical activities that must be undertaken to carry out the triggered project.

- construction and operation of various temporary construction work spaces and access roads;
- any modifications of existing facilities, pipelines and pipeline tie-ins that would need to be undertaken to carry out the physical works and/or physical activities identified in question 1 above; and
- any other identifiable upstream physical works or activities that are required to be built to make possible the commencement of operation of the physical works and/or physical activities identified in question 1 above, with the exception of the upstream physical works or activities to be assessed under the TransCanada PipeLines Limited 1998 Facilities Application.

3. The other undertakings in relation to the physical works identified through questions 1 and 2 above.

- the undertakings as identified for each physical work or activity in questions 1 and 2 above.

Note: Any additional modifications or decommissioning activities that would be subject to future examination under the National Energy Board Act and, consequently, under the CEAA will be included in the scope, but it is anticipated they will be examined in a broad context due to the requirement for a subsequent assessment.

FACTORS TO BE ASSESSED

The following are the mandatory factors as described in sections 16(1) and 16(2) of the CEAA, with the exception of paragraph 16 (1)(e) which describes optional factors. For the purposes of the PNGTS Extension, two optional factors, the need for the project and alternatives to the project, will be included in the factors to be assessed.

- the environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out;
- the significance of the effects referred to in paragraph (a);
- comments from the public that are received in accordance with the CEAA and its regulations;
- measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project;
- the need for the project;
- alternatives to the project;
- the purpose of the project;
- alternative means of carrying out the project that are technically and economically feasible and the environmental effects of any such alternative means;
- the need for, and the requirements of, any follow-up program in respect to the project; and
- the capacity of renewable resources that are likely to be significantly affected by the project to meet the needs of the present and those of the future.

Note: The term "environmental effects" is defined in the CEAA as, "(a) any change that the project may cause in the environment, including any effect of any such change on health and socio-economic conditions, on physical and cultural heritage, on the current use of lands and resources for traditional purposes by aboriginal persons, or on any structure, site or thing that is of historical, archaeological, paleontological or architectural significance, and (b) any change to the project that may be caused by the environment."

The environmental assessment should encompass the components identified in this definition.

SCOPE OF THE FACTORS

The following are the proposed environmental components for the PNGTS Extension associated with the factors to be assessed which were described in the previous section.

- Project Description, including the Purpose of the Project
- Alternative Means of Carrying Out the Project
- Route and Facility Site Selection
- Public Consultation, including public comments and concerns
- Environmental and Socio-Economic Description:
 - Physical Environment
 - Geology and Physiography
 - Soils and Agriculture
 - Hydrology, including Navigable Waters
 - Fisheries
 - Vegetation, including Rare/Endangered/Significant Plants
 - Forest communities
 - Wetlands
 - Wildlife and their Habitat, including Rare/Endangered/Significant Wildlife and Migratory Birds
 - Environmentally Significant Areas
 - Air Quality
 - Acoustic Environment
 - Heritage and Archaeological Resources
- Environmental and Socio-Economic Impact Assessment:
 - Issue Identification
 - Potential Adverse Environmental Effects and their Significance
 - Cumulative Effects and their Significance
 - Renewable resources capacity to meet present and future needs
- Mitigation:
 - Mitigative Measures
 - Residual Environmental Effects and their Significance
- Commitments and Policies
- Waste Management
- Contingency Plans
- Monitoring and Issue Resolution Follow-up
- Inspection
- References and Additional Studies

TQM for the PNGTS Extension has based its environmental assessment on the spatial boundaries outlined below:

- Immediate vicinity: confined to the area directly affected by physical works and activities and associated physical works and activities (i.e. permanent pipeline rights-of-way; temporary construction work space; compressor sites; access roads) or affecting a component used by or perceived by a limited number of people.

- Local: extending beyond the area directly affected by physical works and activities and associated physical works and activities or perceived by a local community or a part of it.
- Regional: extending beyond the local boundary and affecting all the region or a major proportion of Québec.

TQM For the PNGTS Extension has based its environmental assessment on the time frames (temporal boundaries) outlined below:

- Short-term: under 1 year
- Medium-term: between 1 and 5 years
- Long-term: greater than 5 years

The scope of the factors would include the environmental components, the spatial boundaries, and the temporal boundaries identified above.

Addendum I

Department of Fisheries and Oceans

Addendum II

Environment Canada
