DEPARTMENT OF REGIONAL ECONOMIC EXPANSION

PORT OF QUEBEC STUDY

SYNTHESIS, CONCLUSIONS AND RECOMMENDATIONS

APRIL 1973

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CONSULTING ENGINEERS

IN COLLABORATION WITH
METRA CONSULTANTS LTD.

AND THE PARTICIPATION OF
BELANGER, CHABOT, NOBERT, ANGERS AND ASSOCIATES INC.
DUPUIS & COTE, CONSULTING ENGINEERS

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June 4th, 1973.

The Honorable Donald Jamieson
Department of Regional
Economic Expansion
Ottawa, Ont.

Study of Quebec Port

Dear Mr. Jamieson:

On January 24 1972, the Honorable Jean Marchand, then Minister of Regional Economic Expansion, signed at Québec City Hall a contract for the Study of the Port of Quebec between your Ministry and a group of consultants which we had the pleasure to direct.

This group comprised:

Asselin, Benoit, Boucher, Ducharme, Lapointe Inc. - Consultants
Metra Consultants Ltd - Economists
Bélanger, Chabot, Nobert and Angers - Economists
Biro - System Analysts
Dupuis and Côté - Consulting Engineers

We respectfully submit to you the results of our studies, as well as the conclusions and recommendations which evolved from them. The study is presented in ten volumes as follows:

- Four volumes constituting the principal text of the report which are:

  Part A Movement of traffic via Quebec Port - Comparative advantages and future potential

. . . / 2

Part B Industrial Development of Quebec Port

Part C Physical Planning of Quebec Port

Part D Development Policies for Quebec Port

- Four volumes of Annexes:

  1 Monographs by Commodities

  2 Analysis of Maritime Traffic - Tables

  2 A Analysis of Maritime Traffic - Flow

  3 Existing Installations

- One volume of "Synthèse, Conclusions et Recommandations", in French

- One volume of "Synthesis, Conclusions and Recommendations", in English.

We endeavoured to follow to the letter the terms of reference entrusted to us, which are reproduced in the two volumes of Synthesis (French and English).

We would like to take this opportunity of thanking the members of the Study Steering Committee which was responsible for supervising the progress of the work, namely:

MM	M. Latouche	N.H.B.	President
	R. Drouin	D.R.E.E.	Secretary
	Y. Gagnon	N.H.B.	Member
	F. Jolicoeur	D.R.E.E.	"
	R.H. Smith (represented by Mr.C.Pellegrin)	M.O.T.	"
		M.O.T.	"
	B. Riendeau	O.P.D.Q.	"
	W. Kauk	D.R.E.E.	"
	R. Dufour	C.U.Q.	"
	J. Rousseau	C.U.Q.	"

Not only has this Steering Committee fulfilled admirably its duty in orienting the studies but it has also courteously assisted the Consultant in having access to documents and data, often difficult to obtain. It was instrumental in arranging numerous interviews with government officials and private organizations. We benefited immensely from its wide experience in various fields.

It is not possible to name all those who assisted us in our work and we wish to equally thank those who replied to our inquiries and gave us one or more interviews during the study.

It is the results of this team-work that we are presenting today. The study does not pretend to offer a definitive solution to all the problems which confront the port of Quebec and its hinterland. Nevertheless, we endeavour to give realistic advice to serve as a base for more detailed studies required.

Quebec is able to and must become an important port and we are confident of its future, provided the different levels of Government make a choice on the options open to them and then take the necessary action. Its excellent geographical location together with the natural water depth allow us to envisage a promising future for Quebec Port.

We hope that this report completely fulfills the terms of reference which you entrusted to us and that the report will be to your complete satisfaction.

Please accept, Mr. Jamieson, our highest regards.

ASSELIN, BENOIT, BOUCHER, DUCHARME, LAPOINTE INC.

Marc Benoît, Eng.
President

:gl

This report has been prepared for the

DEPARTMENT OF REGIONAL ECONOMIC EXPANSION

by

ASSELIN, BENOIT, BOUCHER, DUCHARME, LAPOINTE INC.

In collaboration with

METRA CONSULTANTS LIMITED (MCL)

and the participation of

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SYNTHESIS, CONCLUSIONS AND RECOMMENDATIONS

STUDY OF QUEBEC PORT

SYNTHESIS, CONCLUSIONS AND RECOMMENDATIONS

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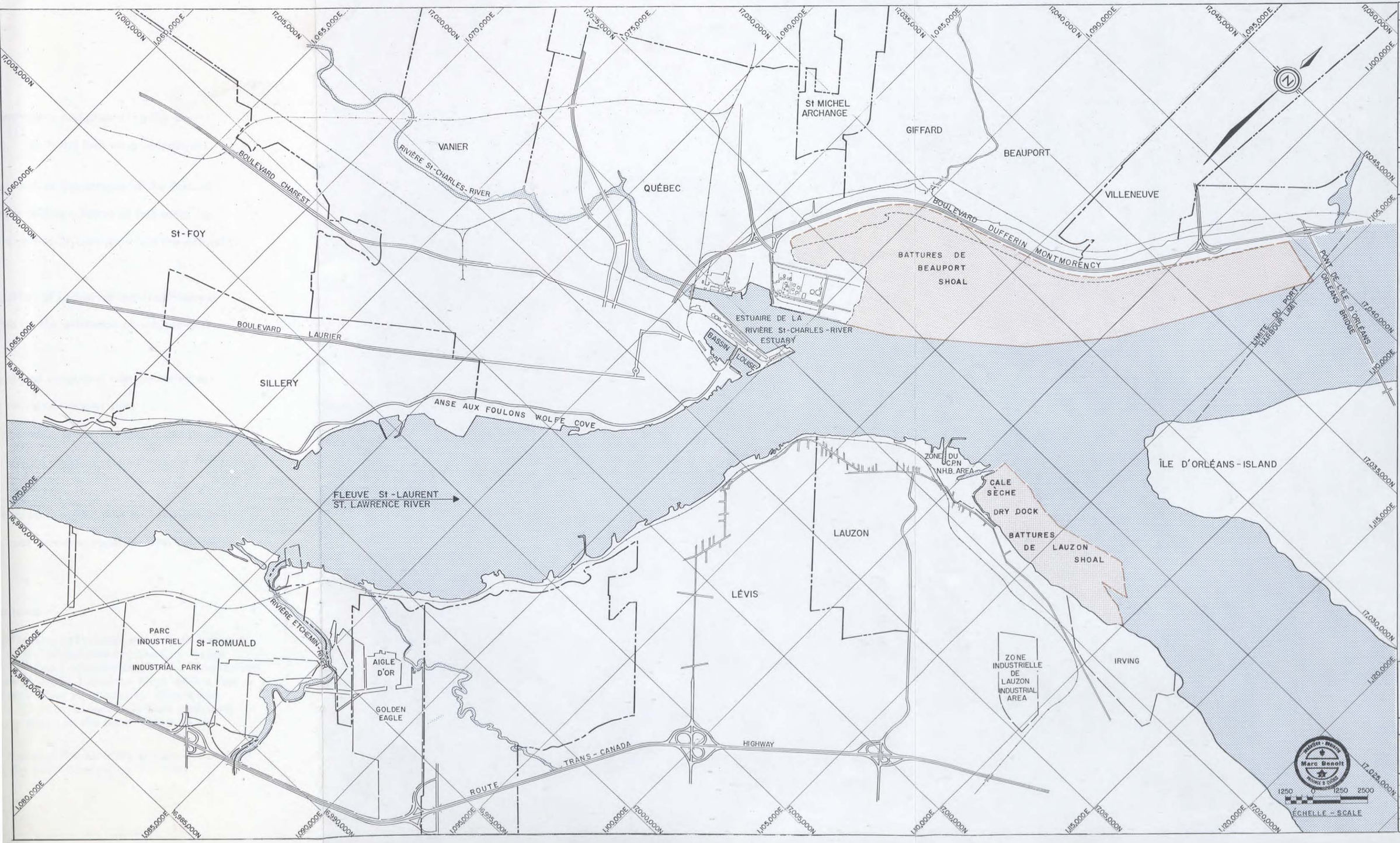

GOUVERNEMENT DU CANADA
GOVERNMENT OF CANADA

MINISTÈRE DE L'EXPANSION ÉCONOMIQUE RÉGIONALE
DEPARTMENT OF REGIONAL ECONOMIC EXPANSION

CONSEIL DES PORTS NATIONAUX
NATIONAL HARBOURS BOARD
SERVICES DE LA MARINE
MINISTÈRE DES TRANSPORTS
MARINE SERVICES
MINISTRY OF TRANSPORT

GOUVERNEMENT DU QUÉBEC
CONSEIL EXÉCUTIF
OFFICE DE PLANIFICATION ET DE DÉVELOPPEMENT DU QUÉBEC

révisions	date

ASSELIN, BENOÎT, BOUCHER DUCHARME, LAPOINTE
Ingénieurs - Conseils Consulting Engineers
ET / AND
METRA CONSULTANTS LTÉE.
B.C.N.A. ET ASSOCIÉS INC.
DUPUIS À CÔTE

PORT DE QUEBEC
ÉTUDE 1971 STUDY

PLAN GÉNÉRAL DE SITUATION
GENERAL LAYOUT

Dessiné / Drawn	Calculé / Checked	Projeté / Designed
G. P.		
Tracé / Traced	Vérifié / Verified	Approuvé / Approved
Échelle / Scale 1" = 1250'	Dessin No. Drawing No.	Date MAR. 1973
No contrat / Contract No. 625	No dessin d'ouvrage / Work Drawing No. 400 - 17	

FOREWORD

The present document aims at synthesing and presenting the conclusions of a Study prepared on the Quebec Port[1] with the following objectives:

1. Investigate and analyse the comparative advantages of the Port of Quebec as a point of transhipment and as a factor of industrial location, in comparison with ports on the St.Lawrence and the Atlantic Coast;
2. Identify the types and specialization of industries and transhipment traffic which could be stimulated by the existence of a super-port in the Quebec Special Area;
3. Define a strategy of development and congruent administrative system to realize the captureable value of the port site;
4. Prepare a comprehensive development plan for the Port in conjunction with and in complement to the spatial development scheme for the Quebec region;
5. Program a schedule of investments for required port installations and estcblish capital and operating cost streams, together with the calculus of attendant benefit streams.

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(1) The area of Quebec Port is defined as follows:

a) The St.Lawrence River cnd shores extending to the high water mark between a line drawn from the Western abutment of the bridge crossing the Cap Rouge River at its mouth - in a direction South 15° East (astronomical) to the intersection of the high water mark on the South Shore of the St.Lawrence River with a line drawn from the East side of the Montmorency River at its mouth, directed in straight line with the R.C. Ste-Pétronille Church, Island of Orléans and produced to the intersection with the high water marks on the South Shore of St. Lawrence River.

b) These parts between the high water marks of the tributary streams discharging into the St.Lawrence River, as far up as the point reached by the tide.

This Study was commissioned by the Department of Regional Economic Expansion and prepared by Asselin, Benoît, Boucher, Ducharme, Lapointe Inc. Consultants (1). ABBDL Inc. obtained the collaboration of Metra Consultants Limited for the economic studies, and the participation of Bélanger, Chabot, Nobert, Angers and Associates (Administration Consultants), Biro Inc. (Systems Analysts) and Dupuis and Côté, consulting engineers for the other parts of the study. Furthermore, the Ministry of Transport retained the La Salle Hydraulic Laboratory Limited to build and operate an hydraulic scale model of the St. Lawrence River in the Port of Quebec area. The model enabled alternative configurations to be evaluated.

The Study was supervised by a Steering Committee composed of representatives of the following organizations:

- The Department of Regional Economic Expansion
- The National Harbours Board
- The Ministry of Transport
- The Quebec Planning and Development Board (O.P.D.Q.)
- The Quebec Urban Community (C.U.Q.)

In addition to the present summary, the original Report of this Study (in French) was presented in four main volumes with several volumes of appendices. The main volumes of the Report are:

- PART A - Flow of goods through Quebec Port
- PART B - Industrial development of Quebec Port

---

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- PART C - Physical planning of Quebec Port
- PART D - Development policies for Quebec Port.

The Study proceeded successfully due to the complete cooperation not only of public organizations directly involved but also of other public agencies. One must mention the Research Division of the Quebec Bureau of Statistics (B.S.Q.) which completed a study of the "impact-matrix" of the Economic Accounts of Quebec.

It should also be mentioned that the financial aspect was studied using the computer program BUDGET of the Société d'Infomatique Appliquée (SIA), Paris, France with the CDC 6600 computer of the Société de Mathématiques Appliquées (SMA) Montréal.

CHAPTER 1

ECONOMIC AND PHYSICAL FRAMEWORK

1. ECONOMIC AND PHYSICAL FRAMEWORK

1.1 Elements of the problem

The expansion of the Canadian and Quebec economies, the growth of certain US exports arising in the Great Lakes region, and the exploration of new natural resources in Quebec will create an increased demand for maritime transportation in the coming years. New port investments will therefore become necessary and Quebec Port, due to its situation and its facilities, is well placed to attract an important share of this new traffic.

On the other hand, the province of Quebec is finding itself more and more confronted with problems of regional development due to the predominance of the Montreal metropolis and the relative evolution of industrial areas in the Province. In fact, a lack of balance in regional development is already seen. This justifies the search for solutions to reduce regional economic disparities. This is the case for the manufacturing sector in the Quebec region which is insufficiently developed. Thus one solution worth studying is to develop the port and increase the traffic so as to attract new industries.

1.2 Quebec as a port

The port is part of a complex system linking:

- Producers and consumers of goods conveyed on the St. Lawrence River and Seaway,
- Surface transportation systems collecting and distributing goods,
- Other St. Lawrence River and Atlantic ports.

Next to economic considerations, other factors like commercial practises and quality of service are taken into consideration by port users. Thus, taking account of all these factors, the port of Quebec has undergone a rapid expansion with twice as much traffic in 1972 as in 1968, due mainly to the entry into service of the Golden Eagle refinery. In 1969-1970, Quebec Port was handling around 6.5% of the whole port traffic of Quebec and the Maritime provinces (excluding Newfoundland) with 7,300,000 tons for 1969 and 8,500,000 tons for 1970 (1). In 1971, the traffic reached 11,000,000 tons and exceeded 15,000,000 tons in 1972.

If one attempts to view Quebec Port within the whole system, one observes that there are both advantages and disadvantages, as follows:

Advantages
- Access channel, (North Traverse) in the process of being dredged to a depth of 41 feet, will render the port accessible to ships 100,000/125,000 dwt by taking advantage of the tide,
- Ice problems for ships are less than those encountered in upper River ports,
- Site offering great potential for future harbour development,
- Good connections to surface transportation facilities,
- Excellent transhipment point for upstream bound traffic;
- Good access to important North American production and consumption centres.

Disadvantages
- Limited local market potential (a 1,000,000 population market in 15 years time),
- Proximity of competitive port facilities for certain types of cargos.

These characteristics oriented the port of Quebec towards the bulk handling of goods and the transhipment of goods produced and consumed upstream.

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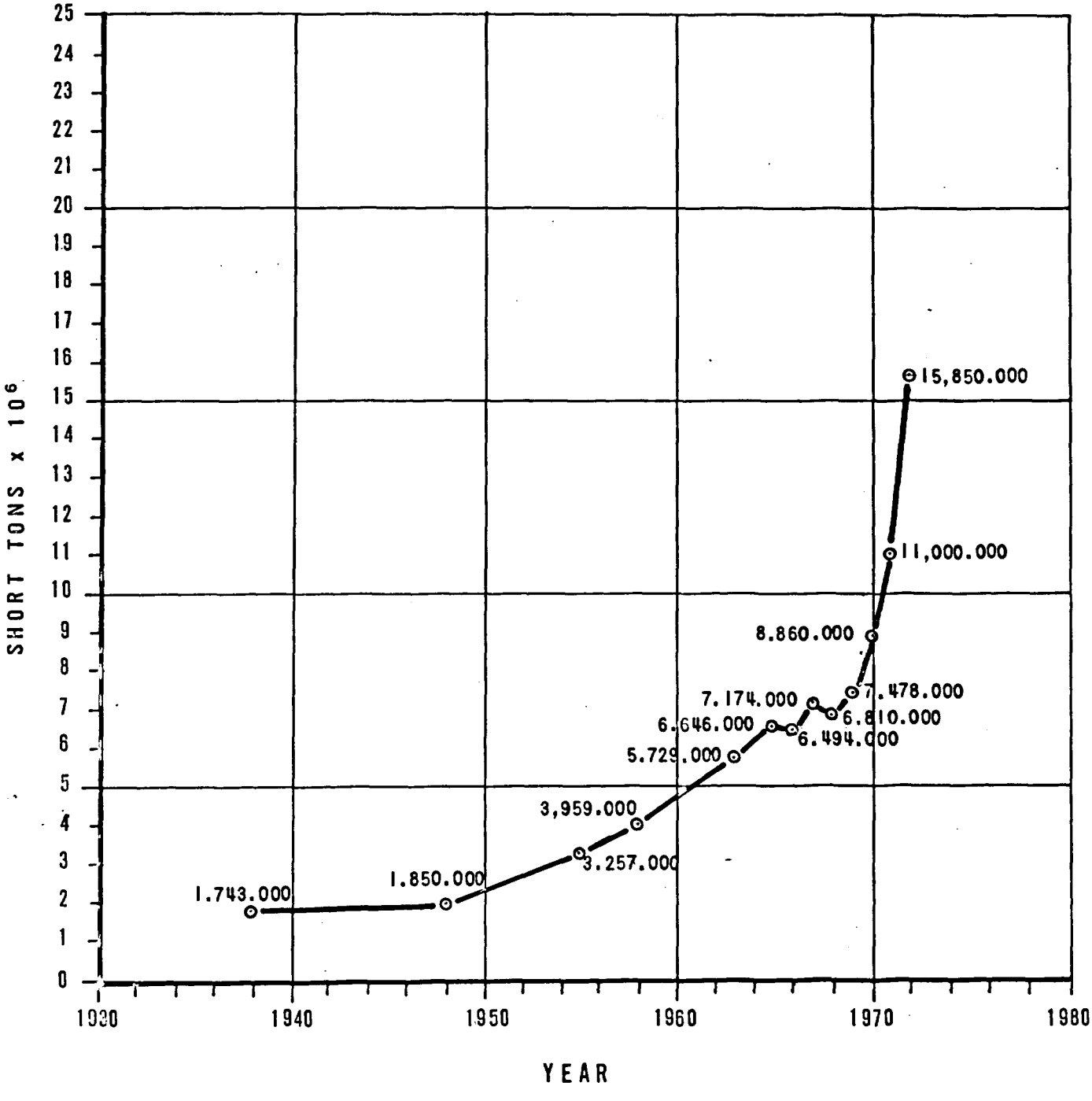
(1) Throughout this Study, reference is made to short tons of 2,000 lbs.

PORT OF QUEBEC
ANNUAL TOTAL TONNAGE
1938 - 1972



The present Study indicates that this main trend will continue in the future.

The most important present traffic is as follows:

- Cereals and oil-yielding seeds (3,200,000 tons in 1970),
- Hydrocarbons (2,900,000 tons in 1970),
- Pulpwood (900,000 tons in 1970),
- Metals and ore (700,000 tons in 1970),
- Papers and cardboard (300,000 tons in 1970).

It should be noted that container traffic has increased very rapidly since 1969 (685,000 tons in 1972).

1.3 Quebec as an industrial port complex

The manufacturing economy of the "Communauté Urbaine de Québec" and more generally of the Administrative Region is weak, loosely integrated and has very limited exports. This was illustrated in studies made on the subject and is indicated in published statistics.

It is relatively easy to explain the above if one considers the weakness of the influence zone (i.e., roughly the Administrative Region) which has already been pointed out and also if one considers the absence of specific natural resources which would have attracted some processing industries.

It is therefore normal to depend on the existence of a port and the transhipment of a large variety of goods as supplementary factors attracting industry. These factors affect only certain industries and require that appropriate installations be built to utilize their full value (Port Industrial Zone).

The most frequent industrial sectors found in port zones are:

- Oil refineries - petrochemicals,
- Steel plants - metallurgy and metal works,
- To a lesser extent: food processing industries, wood processing industries,
- Industrial and commercial activities directly related to the above industries.

Existing industries with their own handling facilities are the following:

- Naval construction and repair ,
- Oil refineries,
- Pulp and paper.

The nature and the size of most industries of the "Communauté Urbaine de Québec" are such that it is unlikely that important inter-industrial links could be created locally by locating heavy industry in the Port Zone between now and 1985. The latter will have to create by themselves, in as much as it is possible, one or more types of complementary activities. It is in fact a generating process of attraction leading to the development of local manufacturing facilities. It is a problem of industrial development policy which should be handled at the provincial level.

If one considers the possibility of establishing a new Industrial Port Zone by an extension adjacent to the present port on the Beauport Flats, it is found that there is a shortage of land to establish zones of the size found in large European ports. In addition to the adverse ecological impact, it is also physically impossible to erect a sizable refinery/petrochemical complex on the Beauport Flats.

Therefore, the future potential development areas for port-industries will necessarily be dispersed: Beauport Flats, Lauzon, Beaumont etc., according to the demand. This is a constraint that does not favour either economies of scale or ease of administration of such areas. This reinforces the need for new links in the integrated physical planning of the region.

CHAPTER 2

METHODOLOGY

2. METHODOLOGY

2.1 Principles

This Study is not a design study; it is a feasibility study. What can be done? What should be done?

Efforts were made to examine all development possibilities, even the unlikely ones, for the port of Quebec in its port functions and in its industrial functions. Some of the forecasts made or possibilities examined might therefore appear either excessively pessimistic or excessively optimistic. It should be understood that they are not proposed as such, but were examined to consider the full range of the potential developments.

The proposed port developments and port industrial zone developments on Beauport Flats are the ones which have the most flexibility to adapt to demand and to technological changes.

Finally, as much for the sake of clarity in the presentation as for the purpose of making a distinction between two different operations, with different requirements of management, the Port itself and the Port Industrial Zone are separated.

2.2 Traffic forecasts

Rather than correlating the inflows and the outflows of goods with their socio-economic characteristics, we have studied the effects of possible routings of 30 specified products. They are listed in the summarized table of traffic forecasts.

Taking into account forecasts on the future evolution of world markets and production, North-American and Canadian for each product, we endeavoured to determine the share a Quebec Port could retain based on the most economic routing of corresponding traffic. With that aim, in the case where many routes are available, a cost model was used to define the least expensive transportation route. This also implied taking into consideration improvements to Quebec Port services and equipment in comparison to other ports in the light of technical evolution in the transport sector.

2.3 Industrial development

The method actually adopted is a result of the peculiar conditions prevailing in the region:

- Absence of a real industrial fabric that could complement the port-oriented industries (with some few exceptions),
- Weak port location advantages for Quebec over any other site on the River or on the Atlantic Coast.

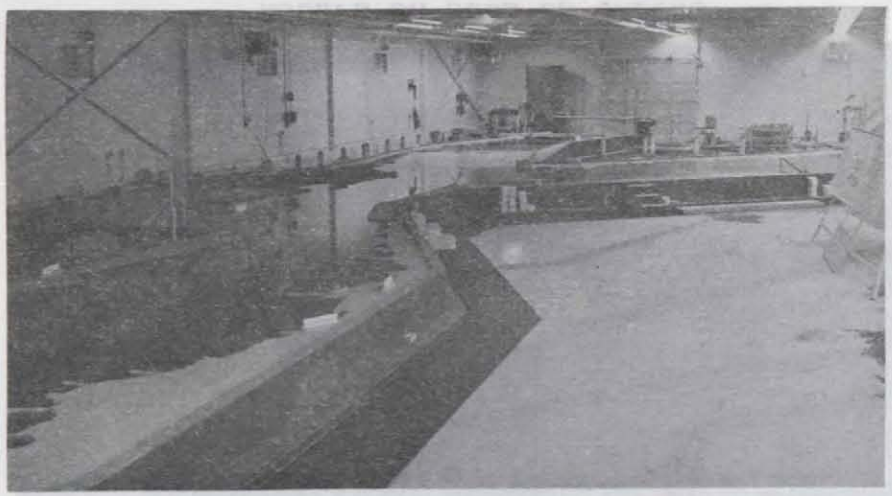
Consequently, the cpproach used was to conceive various industrial development schemes, in consideration of the actual development which had occurred in some of the most important industrial port zones in the world, as well as the particular characteristics of the Port of Quebec such as the kind of goods transhipped and the industrial interconnections.

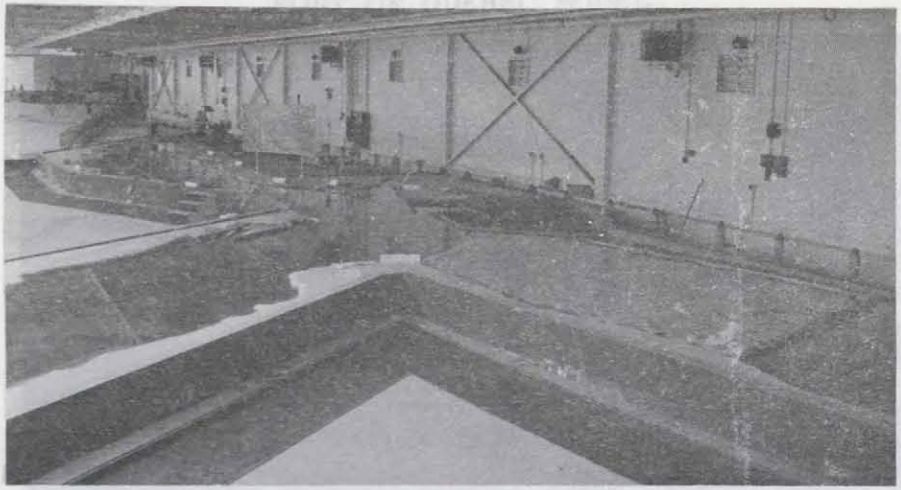
2.4 Physical planning of the Port

It soon became clear there was no practial alternative other than extending the installations towards the east on the Beauport Flats (with some small installations on the Lauzon Flats). This solution presents numerous advantages:

MINISTERE DES TRANSPORTS - SERVICES DE LA MARINE
LABORATOIRE D'HYDRAULIQUE - VILLE LASALLE, QUEBEC
MODELE DU PORT DE QUEBEC

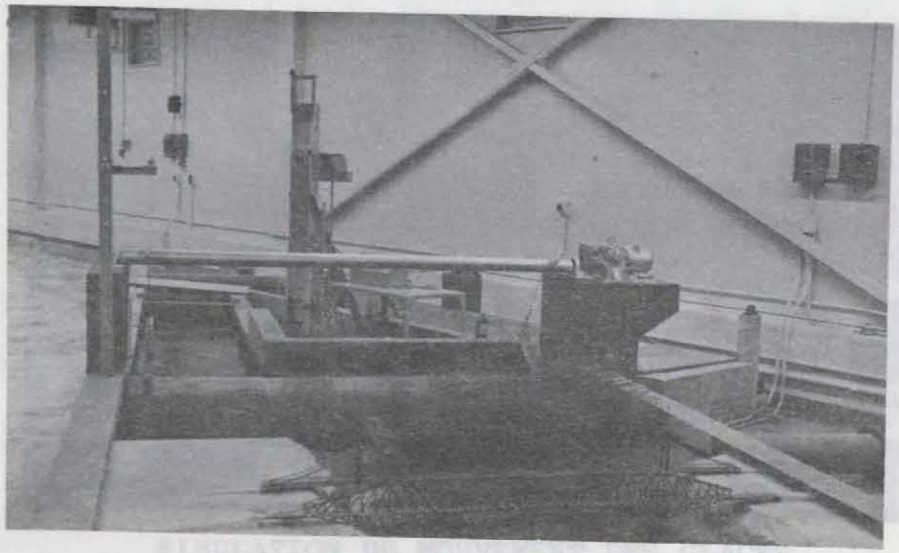
MINISTRY OF TRANSPORT - MARINE SERVICES
HYDRAULIC LABORATORY - VILLE LASALLE, QUEBEC
PORT OF QUEBEC MODEL

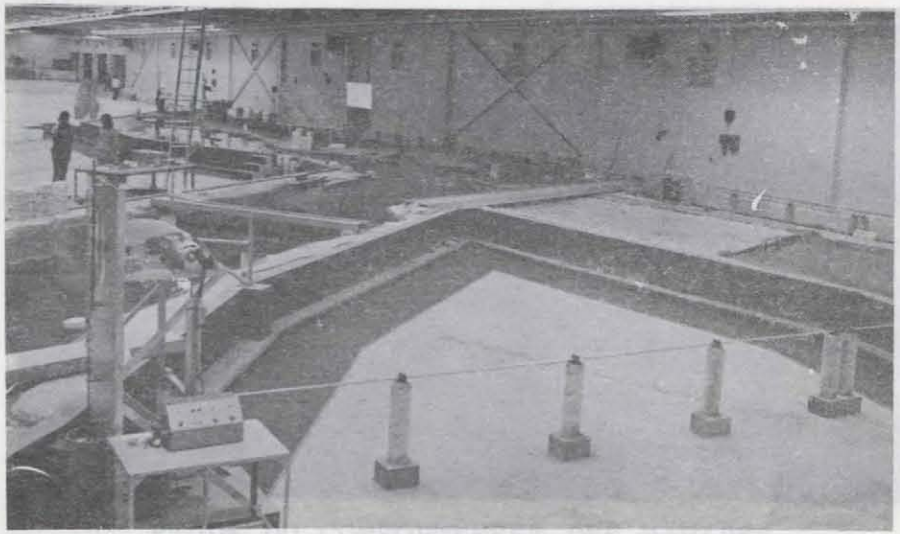




VUES D'ENSEMBLE DU MODELE - GENERAL VIEWS OF MODEL

Echelles Scales	- En plan Horizontal	1/600	- Distorsion Distortion	4	- Vitesses Velocity	1/12.25
	- Des hauteurs Vertical	1/150	- Temps Time	1/49	- Débits Discharge	$1/1.1 \times 10^6$





MECANISME DE REPRODUCTION DES MAREES - TIDAL MECHANISM

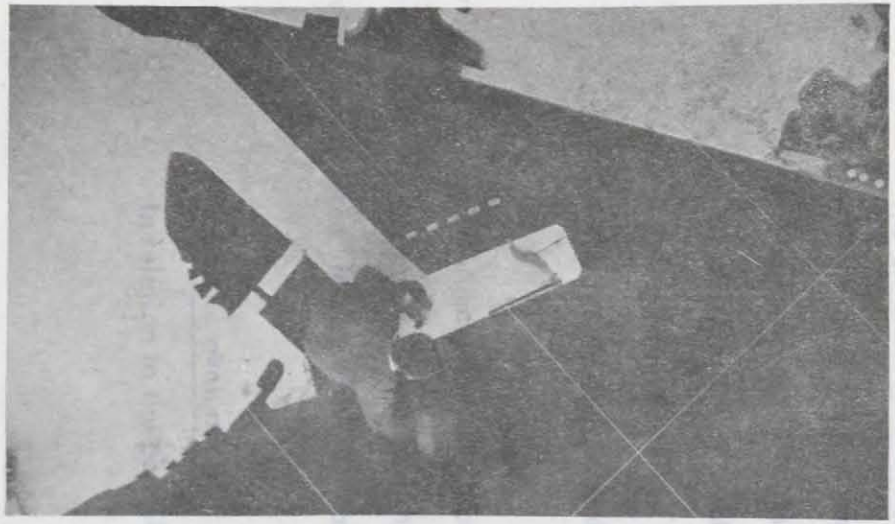
Développement des Voies Navigables

Waterways Development

MINISTERE DES TRANSPORTS - SERVICES DE LA MARINE

LABORATOIRE D'HYDRAULIQUE - VILLE LASALLE, QUEBEC

MODELE DU PORT DE QUEBEC

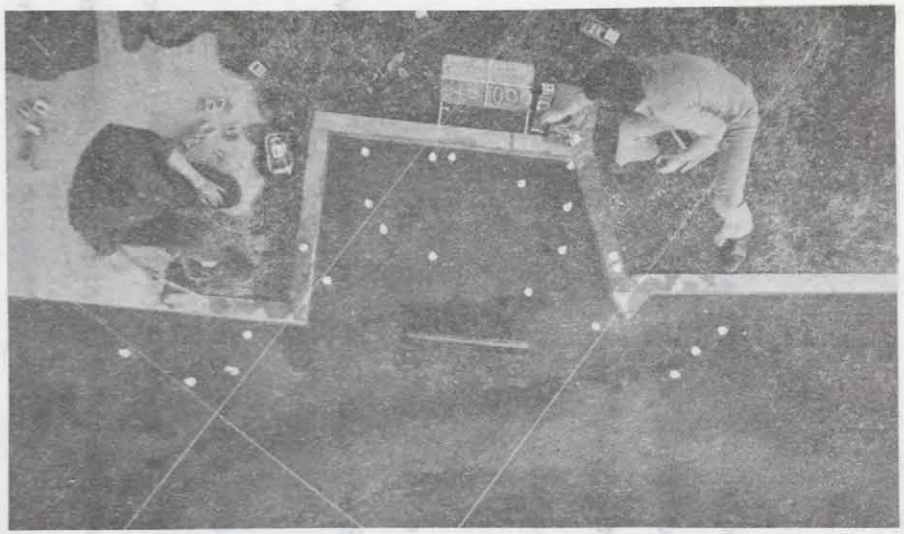


A l'aide de permanganate - Using permanganate

MINISTRY OF TRANSPORT - MARINE SERVICES

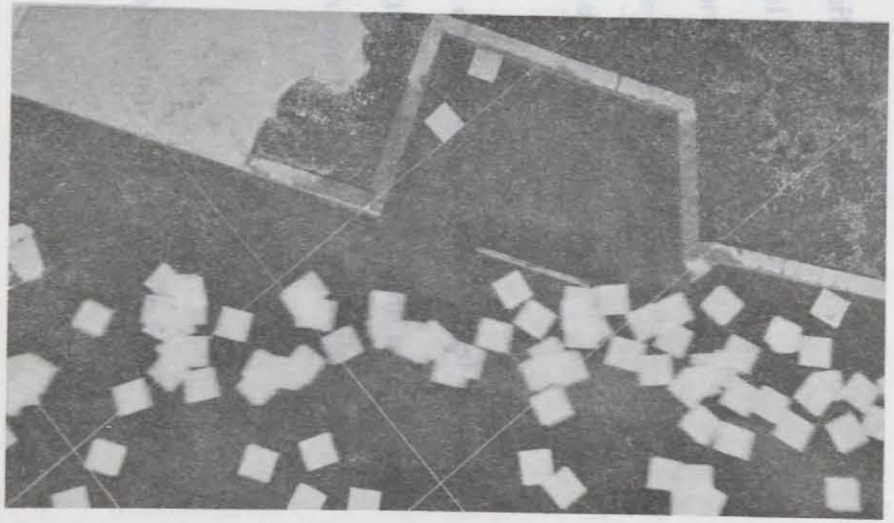
HYDRAULIC LABORATORY - VILLE LASALLE, QUEBEC

PORT OF QUEBEC MODEL

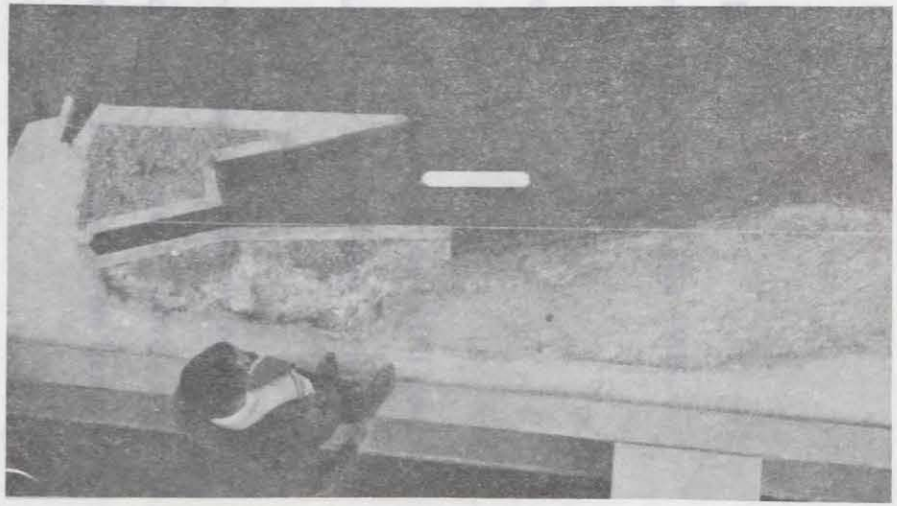


A l'aide de flotteurs - Using floats

ETUDE DES COURANTS - CURRENTS STUDY



SIMULATION DU MOUVEMENT DES GLACES
ICE MOVEMENT STUDY



ETUDE DU COMPORTEMENT DES NAVIRES
VESSEL MANOEUVERING STUDY

- Large area available for land fill,
- Length of wharves adaptable to requirements even past 1985,
- Space to provide industrial area behind wharves,
- Continuity with existing facilities.

The only drawback is the quantity of fill required. Such fill could however be obtained from the bed of the St.Lawrence River in proximity to the sites.

The effects of such works on general hydraulic conditions and on ice movement have been duly analysed on the hydraulic model. The studies have demonstrated the necessity of a caisson type break water (mole) to protect the basin from heavy current and ice movements.

The different schemes related to:

- The role of the port and the traffic forecasts
- The depth of the access channel, (North Traverse)
- The feasibility of creating a Port Industrial Zone,
- The existing facilities and those under construction,
- The feasibility of constructing a dry dock.

For all schemes developed, the attempt was for the highest degree of flexibility in physical planning and in the length of the wharves. The schemes are divided into three classes: without a basin, with one basin, with two basins.

2.5 Economic evaluation

In relation to the port physical planning, the economic feasibility

was evaluated. The internal rate of return attached to the contemplated investment was calculated. The "investment coefficient" of the project i.e., the necessary investment to create a dollar of value added, was also calculated.

The benefits to the users, in terms of the national economy were not included, since the Study is oriented to the regional impact of the project. Because the National Harbours Board is not the sole administrator of construction and management of port infrastructure and equipment, it is essential to consider the participation of private industry in harbour operations. This was done only approximately since data used was from US sources. The whole analysis has also taken into account the financial aspect, i.e., in giving consideration to various modes of financing.

To calculate revenues from the project, a comparison was made between total revenues expected from the new project against expected traffic revenues in 1985 if no investment was made (reference traffic forecast).

As far as the Port Industrial Zone is concerned, estimates of results of the operations were made with the understanding that full commercial benefits would be obtained only two or three years after construction.

The regional impact has been determined by applying a multiplying factor to income and employment created by the new activities. This calculation was based on the data of the "Comptabilité Économique de la Province de Québec" (impact matrix). The regionalisation of multiplying factors at the level of the Quebec Administrative region was made later on by weighting the various economic regional sectors in the Province.

CHAPTER 3

CONCLUSIONS OF THE STUDY ON PORT DEVELOPMENT

3. CONCLUSIONS OF THE STUDY ON PORT DEVELOPMENT

3.1 Traffic

In studying the future traffic at Quebec Port four (4) forecasts were made for 1985. The two extreme forecasts for each class of goods are based on the market development and the attraction factors of the port to be in the one case the most favourable and in the other case the most unfavourable for all the goods considered. Following these assumptions, the widest limits are set within which the future trade will vary. It is unlikely that one or the other extreme will ever be encountered.

Another band was established between two mean limits called the higher and the lower within which the actual trattic will likely fall. The forecasts are shown in the following table.

1985 TRAFFIC FORECASTS

In ,000 tons 2,000 lb	Present Situation 1970	Low Forecast 1985	Lower mean Forecast 1985	Higher mean Forecast 1985	High Forecast 1985
Dry commodities	5,628	7,100	9,100	13,400	21,600
Petroleum products crude oil	2,924	14,500	15,000	15,000	15,000
TOTAL	8,552	21,600	24,100	28,400	36,600

The above forecasts do not take into account the installation of a petroleum terminal within the port area. If a terminal were constructed, the

tonnage of petroleum products would increase to 25,000,000 - 30,000,000 tons in 1985. However, it is rather unlikely that such an installation will be made in the port area (1) Similarly, the port traffic would increase by 7,000,000 to 9,000,000 tons if a new steel complex was erected in Quebec. This last forecast is not worthy of consideration until 1985 unless it is related to a small mill utilizing scrap iron. The table below gives the traffic forecasts for each selected product (2).

Statistical data was obtained from documents 54-203 and 54-204 of Statistics Canada. For some products, traffic tonnages might be a little different from those given in National Harbours Board reports.

It is noted that the average traffic of petroleum products varies little in the mean forecast which defines the most probable range; on the other hand the volume of dry commodity traffic is more indefinite because some 9,000,000 to 13,000,000 tons originate from the James Bay resources (ore, wood). This traffic will depend upon the date when exploitation commences and on the proportion routed through Quebec. The possible variation in the Quebec Port traffic will also be influenced by the attraction of the port to possible users (especially as regards grains).

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(1) This however does not exclude the possibility of a new terminal for liquified gas carrier ships to satisfy an appreciable local demand. Due to recent technical advances this kind of transportation seems to have a promising future.

(2) The total volumes of commodities forecast for 1985 are average values. This implies that for the aggregate mean forecast the traffic for a certain product might vary between the lower and the higher forecasts for that product.

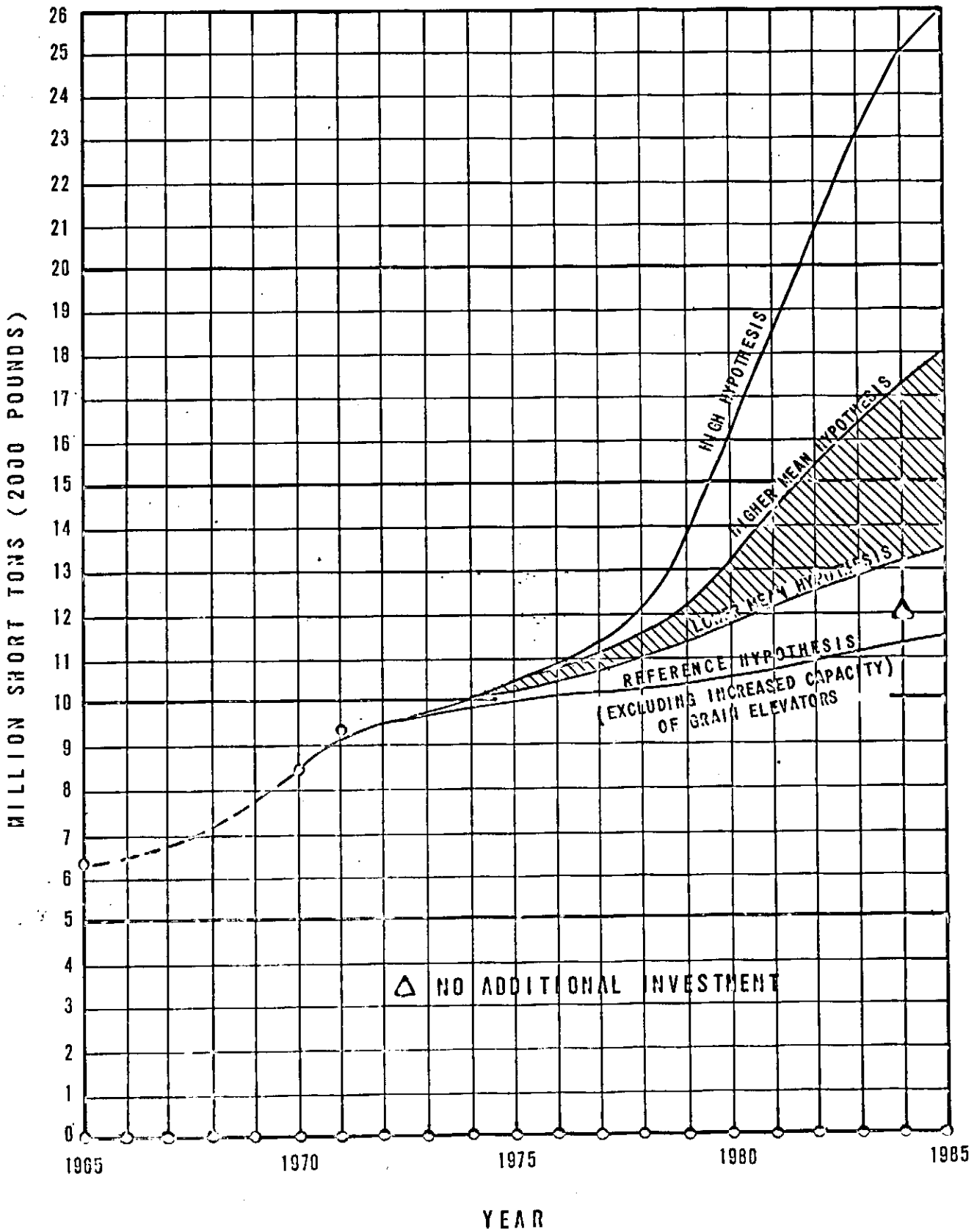
QUEBEC PORT TRAFFIC FORECASTS BY COMMODITY

In thousand tons (2000 lb)	Present Situation	Low Forecast	Lower Mean Forecast	Higher Mean Forecast	High Forecast
	1970	1985	1985	1985	1985
Wheat	947	1,300	1,800	2,500	4,500
Other cereals	1,127	1,300	1,400	1,500	2,500
Oleaginous seeds	1,197	1,300	1,500	1,800	2,000
Sugar	-	-	-	-	400
Pulpwood	795	900	900	1,000	1,100
Bauxite, aluminium	13	-	20	110	170
Iron ore	-	-	-	2,000	3,000
Copper and copper ore	106	150	180	300	340
Lead and lead ore	10	10	15	20	25
Nickel and nickel ore	8	-	-	-	-
Zinc and zinc ore	499	800	900	1,000	1,100
Iron and steel scrap	82	70	70	70	70
Coal	-	-	-	-	-
Crude petroleum	-	8,000	8,000	8,000	8,000
Asbestos	128	400	800	800	1,400
Gypsum	-	-	-	-	-
Phosphates	-	-	-	20	50
Salt	54	80	90	100	110
Sulphur	-	-	200	300	1,000
Lumber	24	10	20	100	200
Pulp and paper	77	-	70	100	400
Paper, cardboard	300	300	600	600	1,700
Chemicals	6	10	10	10	10
Potash	-	-	-	400	700
Gasoline	895	1,500	2,000	2,000	2,000
Bunker oil	2,029	5,000	5,000	5,000	5,000
Steel	22	40	40	150	200
Cement	2	-	-	40	50
Automobiles	1	5	15	40	40
General cargo (N.E.S.)	230	400	450	450	500
TOTAL	8,552	21,575	24,080	28,410	36,570
TOTAL (Not including hydro carbons)	5,623	7,075	9,080	13,410	21,570

NOTE: N.E.S. = Not Elsewhere Specified

TRAFFIC HYPOTHESIS AT THE PORT OF QUEBEC

EXCLUDING THE GOLDEN EAGLE OIL REFINERY TRAFFIC



These average traffic forecasts do not take into account a possible fundamental change in the shipment of grains and general cargo in containers from U.S. sources (1). Such traffic is too subject to exogenous influences to be taken into consideration in project studies. However, in the high or most optimistic forecast account has been taken of a notable increase in grain cargo routed through the St.Lawrence Seaway and Quebec Port. Regarding container traffic from the United States good potential exists. But due to the uncertain situation regarding this traffic, namely the possibility of a change in U.S. transport policy, it is not reasonable to assume a large container traffic from that source. A similar case exists for Canadian containers presently routed through some U.S. ports.

On the basis of the present situation and to serve as a guide an estimate of future traffic was made related to terminal requirements by type. It is given in the following table. This synthesis table shows clearly that the range within the mean forecasts concerns mainly grains and heavy bulk cargo. However the consequences of this range in forecasts on the physical requirements are not considerable because of the high capacity of this type of installation and the flexibility in adjusting loading and unloading schedules.

With respect to the forecast growth of container traffic, asbestos produced in the Thetford Mines region is assumed to be shipped entirely through Quebec Port.

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(1) The higher mean forecast allows for an increase of 1,000,000 tons in the U.S. grain traffic from 1970 to 1985 which would be the normal increase anticipated in U.S. grain exports through Canada.

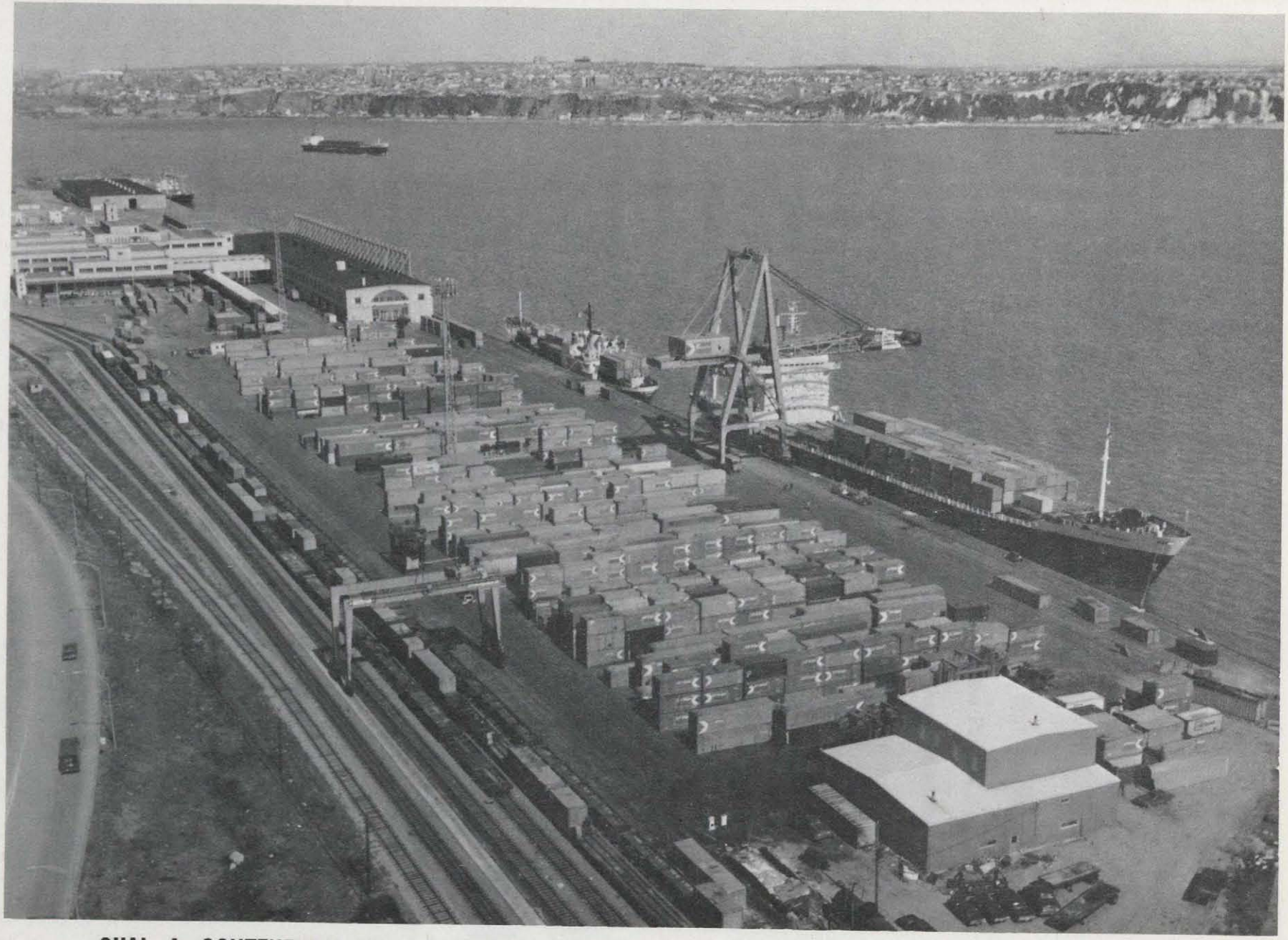
TRAFFIC FORECASTS BY TYPE OF TERMINAL

In thousands 2000 lb tons	Present Situation 1970	Low Forecast 1985	Lower Mean Forecast 1985	Higher Mean Forecast 1985	High Forecast 1985
Cereals, grains	3,271	3,900	4,700	5,800	9,000
Bulk, cars & commodities using open storage	1,592	1,950	2,300	5,000	7,200
Hydrocarbons	2,924	14,500	15,000	15,000	15,000
General cargo in sheds	464	500	600	600	900
Containers	301	750	1,500	2,000	4,500

3.2 Alternative Physical Plans

Planning studies were based on traffic forecasts and anticipated technological changes related to marine transportation. Assuming that the North Traverse will not be dredged to more than 41 feet before 1985, theoretical studies were made on tides and passage of ships to take advantage of tides to negotiate the North Traverse. Conclusions, confirming previous studies, indicate a utilisable depth of 54 feet, sufficient for 100,000 to 125,000 dwt ships (or even more for certain reduced draft ships) to use Quebec Port. Water depth at the wharves was therefore set at 55 feet.

That part of Quebec Port called "the old port" cannot be further developed due to the lack of land at or near the existing wharves. However, it should be



QUAI A CONTENEURS DU CANADIEN PACIFIC – CANADIAN PACIFIC CONTAINERS WHARF

noted that an expansion has been started at the western limits of Beauport Flats (Piers Nos 50 to 54). It is thus logical to add additional wharves by continuing in the same direction and reclaiming land from the river. The most economical way of creating new land is to use material dredged from the river bed.

The harbour itself, under the administration of the Port of Quebec, will consist of a strip 500 feet wide perpendicular to the edge of the wharves. Behind this strip the fill area will be perfectly suitable for physical planning of an industrial port zone. The fill is retained either by piers or by dikes made with selected materials. The total area of Beauport Flats which would be filled would vary from 1,100 to 1,200 acres depending on the selected layout. In addition a fill area of 325 acres could be obtained at Lauzon Flats if a new dry dock is constructed. This solution would be more economical than revamping the Champlain dry dock in view of 100,000 dwt ships making use of Quebec Port and the event of the establishment of an oil terminal down river.

Based on the traffic forecasts the need for additional wharves from now until 1985 will amount to 5,000/6,000 feet for the lower mean forecast and up to 8,000 feet for the higher mean forecast.

To indicate the order of magnitude, 15,000 feet of piers would be required for the high forecast. For the low forecast depending mainly on the increase of petroleum products traffic the requirements will be mostly taken care of by industry owned installations and will require no new investment from the National Harbours Board. Conversely, the absence of new investment would limit the traffic of the port to a value near the low forecast (7,000,000 to 7,500,000 tons of dry cargo).

THIS ESTIMATE IS NOT ONLY DUE TO THE THEORETICAL CAPACITY OF WHARVES AND EQUIPMENT BUT ALSO TO THE REDUCED ATTRACTION IF NO INVESTMENT IS UNDERTAKEN.

The physical planning of the above mentioned works (width and length of wharves and water depths) was based on the characteristics of future ships and new cargo handling techniques. The obsolescence of some of the present installations, caused either by age or by their inadaptability to changing technology, was also taken into account.

Three basic alternative schemes were studied for the development:

- Alternative I

It consists of two basins of approximately 120 acres each, one for Lash and/or Seabee operations and the other one for general cargo. This alternative was not retained because it greatly exceeded requirements for wharf space.

- Alternative II

This alternative with a 120 acre basin would supply a sheltered water area for the barge transfer operation. A mole studied on the hydraulic model would reduce the currents inside the basin and would protect it against ice. This mole could eventually be used for the docking of liquefied gas carrying ships.

This alternative could cover all the future needs of the port in the foreseeable future. It ensures Quebec's future by offering it the possibility of becoming the terminal for barge carrying ships in the St.Lawrence River. In fact, the nature of its future traffic, its position as the furthest up river port capable of receiving barge carrying ships places Quebec in a very favourable situation.

E. 1080,000
E. 1085,000
E. 1090,000
E. 1095,000
E. 1100,000
E. 1105,000
N. 17,025,000
N. 17,040,000
N. 17,035,000
N. 17,030,000
N. 17,020,000
E. 1085,000
E. 1095,000
E. 1100,000
E. 1105,000

CHARLESBOURG

GIFFARD

ST. - MICHEL ARCHANGE

GIFFARD

QUÉBEC

QUÉBEC

BEAUPORT

VILLENEUVE

AVENUE ROYALE

BOULEVARD ST. ANNE

C.N.
C.N.R.

PONT DE L'ILE D'ORLEANS BRIDGE

BOULEVARD DUFFERIN MONTMORENCY

COUR DE TRIAGE DU C.N.

B.A.E.Q.M.

PHASE II (443 ACRES)

PHASE I (265 ACRES)

PHASE III (570 ACRES)

SEMINAIRE DE QUÉBEC

PROJET DE LOCATION AL'ANGLO CANADIAN PULP & PAPER MILLS LTD

ESTUAIRE DE LA RIVIERE ST.-CHARLES RIVER ESTUARY

QUÉBEC

BASSIN LOUISE

FLEUVE ST. - LAURENT
ST. LAWRENCE RIVER

LIMITE DU PORT
HARBOUR LIMIT

ILE D'ORLÉANS ISLAND

500 0 500 1000
ÉCHELLE - SCALE

GOUVERNEMENT DU CANADA
GOVERNMENT OF CANADA

MINISTÈRE DE L'EXPANSION ÉCONOMIQUE RÉGIONALE
DEPARTMENT OF REGIONAL ECONOMIC EXPANSION

CONSEIL DES PORTS NATIONAUX
NATIONAL HARBOURS BOARD
SERVICES DE LA MARINE
MINISTÈRE DES TRANSPORTS
MARINE SERVICES
MINISTRY OF TRANSPORT

GOUVERNEMENT DU QUÉBEC
CONSEIL EXÉCUTIF
OFFICE DE PLANIFICATION ET DE DÉVELOPPEMENT DU QUÉBEC

Révisions | Mark

ASSELIN, BENOIT, BOUCHER, DUCHARME, LAPOINTE
Ingénieurs-Conseils — Consulting Engineers
ET / AND
METRA CONSULTANTS LTÉE.
R.C.N.A. ET ASSOCIÉS INC.
DUPUIS & CÔTÉ

PORT DE QUEBEC
STUDY 1971

VARIANTE II - SCHEME II

AMÉNAGEMENTS
MOYENNE BASSE 6,000'

ARRANGEMENTS
AVERAGE LOW 6,000'

Dessiné / Drawn	Vérifié / Checked	Projet / Designed
G.P.		
Approuvé / Approved		
Approuvé / Approved		
Échelle / Scale	Date	
1" = 500'	MAR. 1973	
No. Numéro du dessin / Drawing No.		No. Numéro du projet / Job No.
625		400 - 12

INGÉNIEUR - ENGINEER
Marc Benoit
PROVINCE DE QUÉBEC

- Alternative III

There is no basin in this alternative, which can adapt itself to future traffic conditions but cannot accommodate the barge carrying ships. No hydraulic model studies were made since from preliminary examination, docking appeared to be difficult if not impossible particularly during the winter months. For this reason the alternative was rejected.

For all alternative schemes the construction of a new dry dock at Lauzon for large ship repairs was studied; (1) The dry dock would be further justified in the event of the construction of a deep water oil terminal downstream from Quebec.

Although the dry dock was not taken into account in the economic feasibility studies of Quebec Port and the industrial properties on Beauport Flats, nevertheless it will generate employment and favour the installation of mechanical and metallurgical industries in the zone of influence of Quebec Port, especially at Lauzon Flats.

The works were divided into three four-year periods (1974-1977, 1978-1981, 1982-1985). The first one covers the construction of 5,000 to 6,000 feet of wharves to handle the mean traffic forecasts. This first phase will meet the requirements of the high forecast should the traffic increase to this extent.

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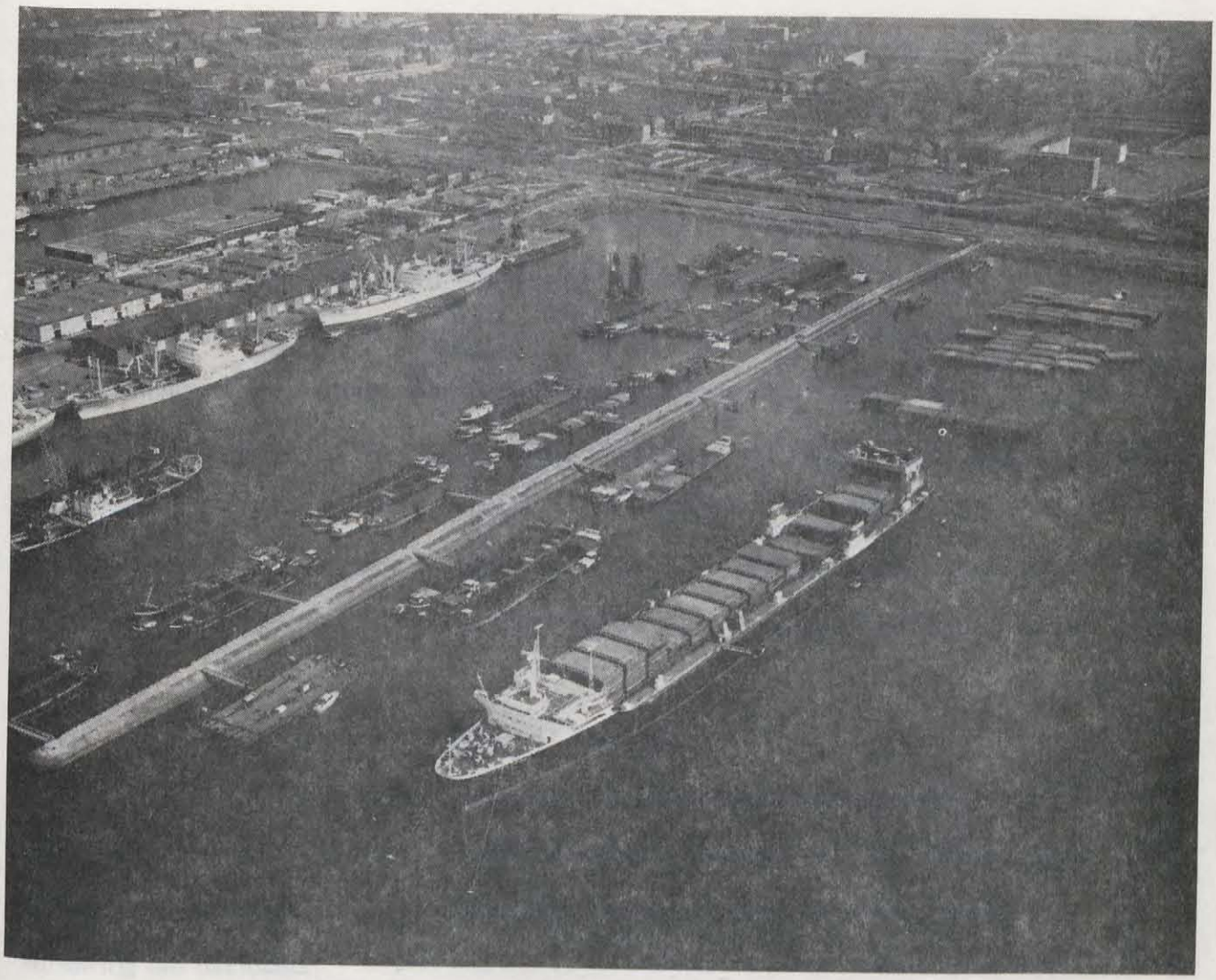
(1) Some 100,000 dwt ships, partially lightened until completion of the North Traverse dredging, are already arriving at the Golden Eagle terminal.

NAVIRE LASH — LASH CARGO

NAVIRE RO RO (ROLL ON / ROLL OFF) RO RO SHIP



PORT DE OF ROTTERDAM

BASSIN POUR NAVIRES LASH ET SEABEE

BASSIN FOR LASH AND SEABEE SHIPS

Around 1976-1977, further studies would determine the requirements of the second phase in relation to the evolution of markets and traffic.

The selection of three periods of equal length was done arbitrarily so as to evaluate the technical feasibility of the works and the logical sequence of construction. In reality the detailed program for the first period as well as its exact duration will have to be studied at the time of design. The works required for the mean traffic forecasts would be entirely completed in a period not exceeding 6 years as far as port installations are concerned. However it is possible, to some extent, to spread the works over a longer period which would reduce the annual financial charges. Notably a petroleum products terminal and a general purpose wharf could be constructed later even with the lower mean forecast. A first phase with 4,000 feet of wharves to be constructed in four years would be sufficient. It is believed that it would not be advisable to go below that figure even for the first phase using the lower mean traffic forecasts.

3.3 Investment and Economic Feasibility

Project investment expenditures and economic feasibility for the various traffic forecasts considered are tabulated below on page.... It should be remembered that "The Project" means the port extension on the Beauport Flats and that the following are excluded:

- Improvements to the Louise Basin elevators;
- Dredging works already in progress;
- Future Lauzon dry dock;

The Port Industrial Zone is another aspect of the project given consideration further on.

As regards the Port, the Project covers the following:

- Dredging of the basin and of the river bed adjacent to the wharves;
- Construction of protective dikes as required;
- Construction of a basin protection mole;
- Construction of wharves and paved open areas 500 feet wide;
- Construction of roads, railways, for access to wharves and sheds;
- Construction of sheds for dry commodities excluding bulk or containerized goods;
- Construction of part of a Commerce or Port House for general services and Port administration, (the other part (1) to be placed at the disposal of private enterprise for example at a self-financing rental);
- Construction of ancillary facilities;

In reference to the Port Industrial Zone, the "Project" covers the following:

- Filling of the flats;
- Construction of protective dikes;
- Construction of main access roads, railways, water mains, and sewers;
- Provision of ancillary facilities.

Construction costs include 20% for engineering and contingencies.

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(1) Estimated at $1,000,000

ELEMENTS OF ECONOMIC FEASIBILITY

FOR THE EXTENSION PROJECT OF THE PORT INSTALLATIONS

(in thousand dollars 1972)

Traffic Forecast	Lower Mean Forecast		Higher Mean Forecast	High Forecast
	Forecasts retained			
Alternative Physical plans	No basin 5,000' of wharf	One basin. 6,000' of wharf	One basin 8,000' of wharf	One basin 15,000' of wharf
		Alternatives retained		
Construction Period	1974-1977	1974-1978	1974-1979	1974-1984
Amount of investment	32,000	44,850	53,750	89,250
Operating results before financing and amortization charges (1)	1,545	1,500	2,800	6,420
Added value created by the Project(2)	2,340	2,375	4,115	8,875
Internal rate of return	3.3%	1.6%	3.6%	6.0%
Present value of the project (/50 years)				
- at 0%	37,700	22,600	72,200	201,500
- at 4%	(4,300)	(16,800)	(3,900)	27,600
- at 6%	(11,400)	(23,100)	(16,600)	(1,000)
- at 7.5%	(14,500)	(25,700)	(21,900)	(13,200)
- at 8.5%	(15,900)	(26,800)	(24,300)	(18,600)

Nota: The figures in brackets are negative

(1) Annual operating revenues minus annual operating costs excluding amortization.

(2) Consists of additional wages and local taxes paid by, and operating surplus of the NHB at Quebec Port.

The new port facilities are based on the construction of a single basin with specialized berths. The goal is to take advantage of the possibility that in the near future the port will receive large tonnage ships for special commodities or ships requiring specific equipment: grain ships, mineral ships, barge-carriers, container ships, Roll-On/Roll-Off ships. It follows that substantial investments must be made quickly. Moreover certain works, for example, the basin dredging, must be done without interruption. The cost of the basin alone could be estimated at around $9 million. Benefits grow with traffic since fixed charges are then amortized on higher returns. This means that marginal benefits, once the basin and other basic works are completed, are substantially higher than shown in the table. When the volume of the mean forecasts approaches the high forecast volume, let us say in the year 2000, a new project would be required to yield benefits of about 10%. That is based on the maintenance of the price structure, traffic, etc...

It is true that the benefits might appear low if they are compared, for instance, to industrial activities (1). The port has, however, been considered only as part of the infrastructure of the National Harbours Board. IT IS WELL KNOWN

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(1) If the viable part of the Industrial Zone, that is to say the commercialization of 125 acres filled from the excavation of the dock was entirely consolidated with the physical planning of the port, the port would benefit by the receipt of $2.6 million in the most favourable case: sale of land at $1.50 per sq.ft. (where the annual rental is 0.15 cents per sq. ft.). The investment allocated would only represent 5%. To the degree of approximation of evaluation of costs, it is relatively negligible. If the sale price of industrial land was $1.00 a sq.ft. the benefit taken by the latter would represent only about 0.6% of the investment for the mean forecast.

THAT NO COUNTRY HAS A TOLL AND CHARGES STRUCTURE FOR LARGE EQUIPMENT INFRASTRUCTURE USERS THAT WILL GIVE A RETURN COMPARABLE TO THAT OF PRIVATE ENTERPRISE. GOVERNMENT ASSISTANCE IS GENERALLY REQUIRED EITHER IN THE FORM OF DIRECT SUBSIDY OR AS A LONG TERM LOAN AT A LOW INTEREST RATE. (1)

Credit should be given for the benefits which accrue to the community either from the savings realized by the users, or by the regional impact created by

---

(1) It would be preferable to substitute the words "Government participation" to the word "Subsidy". No port in the world can alone support considerable infrastructure installation expenditures and also succeed in having a balanced budget.

The following is found in the French administration of autonomous ports: "The Government is participating to the extent of 80% of the expenditures for the following modernization programs: - dredging of basins; - creation and expansion of access channels and water depth of outer harbours; - construction, expansion and repair of access locks and protection works.

The Government also reimburses 60% of the amount paid in servicing loans granted to meet the expense of similar operations undertaken before the port became autonomous and which the latter has contracted or taken over.

60% of the cost of setting up, extending or renovating the infrastructure installations and drydocking equipment, other than that previously mentioned, is assumed by the government. The latter also reimburses 20% of the amount paid in servicing loans granted to meet the expenses of similar operations undertaken before the port became autonomous.

See report "Etudes des Zones industrielles portuaires, Ministère des Richesses Naturelles, Direction Générale de l'Energie, En.D-2 (Pages 99 and 100) ". If the same rules were applied to Quebec Port, the feasibility of the project would be guaranteed.

the construction of port facilities. Moreover if the port is considered as an functioning entity a large number of undertakings giving navigation services, handling operations, warehousing, brokerage, etc... will benefit from revenues over and above the port infrastructure revenues. If all the activities were consolidated as if Quebec were an autonomous port a better financial result would have been obtained.

The benefits for the users at the national level have not been analysed here. A short investigation has shown that transportation of zinc and copper ore, Canadian cereals, asbestos, potash, etc... would create savings of a few million dollars compared to a routing to Maritime or Lower St. Lawrence ports or Vancouver. However, ports in the vicinity of Quebec would have the same advantages.

To assess the regional impact, we have made use of standards based on similar American studies. Such studies are based on sample surveys. Applying these to Quebec indicates that in the case of the lower and the higher mean forecasts, the increase of revenues due to commercial and industrial activities alone excluding industrial and land transportation activities, would be from $20 to $25 million and $35 to $40 million respectively. Similarly employment would increase by around 1,300/1,400 and 2,100/2,200. A multiplying factor of 1.5 to 1.7 should be applied to these figures to obtain the total regional impact (indirect effects caused by purchases made by the above activities and household purchases).

THE ECONOMIC FEASIBILITY ANALYSIS WAS BASED ON A CONSTANT VALUE DOLLAR (1972 VALUE) WITH THE TOLL STRUCTURE UNCHANGED. It is clear that increased toll charges would increase benefits for a given traffic.

But independent of statutory regulations if raising the toll would increase the revenues from certain selected commodities, certain other commodities would be penalized. Quebec Port is in a location to be in competition not only with Canadian ports but also with a few U.S. ports. Careful examination of the consequences should be made before deciding to proceed with any modification of the present equilibrium. On the other hand barge-carrying ships provide lower revenues with the present port tariff structures since cargo is not unloaded over the wharf. One solution would be for the port to be normally remunerated for its services in receiving such ships and supplying basins for the manoeuvring of the barges. A solution already applied elsewhere is worth mentioning, in that part of the barge charges paid to the final unloading ports is returned to the port where the carrier ship arrived.

Further to the economic analysis, some examples of increasing the financing were studied. The aim is to determine the minimum amount of subsidy required to enable the port to operate the project in a normal financial context. It was assumed that the available funds of the whole port would be assigned to the project. (1). Under these conditions if the interest rate for additional loans is 6% and the amortization period is 20 years, a minimum subsidy of around $6 M will be required for one basin with 6,000 feet of wharves for the lower mean forecast and $3.5 M with 8,000 feet of wharves for the higher mean forecast. The latter corresponds to a more beneficial operation requiring a relatively smaller subsidy. It is found that if some savings can be made in the first case the minimal subsidies are in all cases less than $1 M per year as an average during the construction period. This assumes that the available funds are used completely and consequently existing debt charges are not paid which constitutes a kind of indirect subsidy.

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(1) Operating revenues after renewal but before payment of amortization and interest charges.

Under the same conditions, if long term public money interest rates were higher, additional subsidies, around $10 M would be necessary for the two mean forecasts with a 7.5% to 8.5% rate. On the other hand, with a rate of only 4% in theory no subsidy would be required. It would be sensible to talk about a 4% to 6% rate. In fact, to achieve economic feasibility the regular rate must apply. To make a financial analysis on a realistic basis, with no inflation and the dollar keeping its present value, which are the two conditions assumed for calculating expenditures and revenues, it is probable that the rate of interest for public money would not exceed 6%.

For a 50 year amortization period with a required rate of return of 7.5% and an interest rate equally at 7.5%, practically no subsidy would be required if around $3 M in savings could be made under the lower mean traffic forecasts with 6,000 feet of wharves. This is based on the present value of the port net revenue on existing facilities (before amortization) which would amount to $22.8 M at a discount rate of 7.5%. This can be compared with the present worth of the project as shown in the table on page...

3.4 Conclusions and Recommendations

THE QUEBEC PORT IS SITUATED IN A COMPLEX OF PORTS SUFFICIENTLY CLOSE THAT THEY HAVE THE SAME HINTERLAND FOR MANY KINDS OF COMMODITIES: MONTREAL-CONTRECOEUR, SOREL, TROIS-RIVIERES. For the transportation of these commodities access facilities, especially for certain specialized ships, quality of equipment and services are more important than the direct transport charges. IT IS IMPORTANT TO AVOID COSTLY COMPETITION BETWEEN THESE PORTS WHICH COULD BE CAUSED BY OVER INVESTING AND DIVIDING THE TRAFFIC AMONGST OTHER PORT COMPLEXES: Lower St.Lawrence ports, Maritime ports, North Eastern United States ports. THE REGIONAL DEVELOPMENT POLICY

MUST MORE OR LESS DETERMINE THE SPECIFIC ROLE OF EACH PORT AND ORIENT INVESTMENTS ACCORDINGLY.

- THE ROLE OF QUEBEC PORT, TAKING INTO ACCOUNT THE WEAK MANUFACTURING BASE OF ITS IMMEDIATE HINTERLAND AND ITS ACCESS FOR LARGE DRAFT SHIPS, IS ORIENTED TOWARDS TRANSHIPMENT AND BULK TRAFFIC (Cereals, grains, ore), CONTAINER TRAFFIC (sharing with Montreal) AND EVENTUALLY BARGE CARRYING SHIP TRAFFIC. In the long term, liquefied gas traffic should also be taken into consideration.

- THE MOST PROBABLE RANGE OF QUEBEC PORT TRAFFIC IN 1985 WILL BE 24,000,000/28,500,000 TONS WITH THE VARIATION OCCURING IN THE TRAFFIC OF DRY COMMODITIES PARTICULARLY GRAINS AND BULK MATERIAL. These traffic estimates do not take into account the creation of an oil terminal down-stream which could come under the authority of Quebec Port. This would lead to a doubling of traffic.

- DEEP WATER WHARF REQUIREMENTS TO HANDLE THAT TRAFFIC WOULD BE 5,000/6,000 FEET OR 8,000 FEET RESPECTIVELY FOR THE MEAN LOW AND MEAN HIGH FORECASTS. A first phase of 5,000/6,000 feet to be constructed in the first four year period would serve the traffic projected for all forecasts. The next phase of work to be performed in the second period will be determined later on within the range already mentioned. This proposed first phase meets the objective of creating a strong enough port impact to foster the port development through the quality of its facilities. By reducing some of the facilities such as petroleum product wharves, barge landing wharves, provisions for other wharves, it would be possible to erect only 4,000 to 4,500 feet of wharves as a first step between 1974 and 1977 and thus spread the investment out somewhat.

THE LOCATION AND CHARACTERISTICS OF QUEBEC PORT PLACE IT IN A PARTICULARLY FAVOURABLE SITUATION TO BECOME THE TERMINAL IN THE ST.LAWRENCE RIVER FOR BARGE CARRYING SHIPS. Therefore it is important to foresee the development required to serve this kind of shipping (calm water area). A specific study is required to evaluate the importance of the barge traffic in the St.Lawrence River and in the Seaway and to determine the characteristics of such traffic and its rate structure.

THE NATURE OF THE MAJOR TRAFFIC PROJECTED REQUIRES A HIGH PERCENTAGE OF SPECIALIZED WHARVES TO SUIT CERTAIN KINDS OF CARGOS OR SHIPS. A large part of the attraction of Quebec Port will reside in its facilities to accommodate large ships. The proposed development scheme must therefore include deep water berths matching the depth of the access channel at high tides. The possibility of berthing 100,000 dwt ships corresponds to the technical evolution of marine transport for most types of traffic with the exception of mammoth tankers and very large ore carriers.

OF ALL THE SCHEMES INVESTIGATED THE ONE FINALLY RETAINED RECOMMENDS THE CONSTRUCTION OF A BASIN PROTECTED BY A MOLE. It not only enables barge carrying ships to be manoeuvred but it is the only one technically acceptable for ease of berthing and ice movement. The investment at 1972 dollars was estimated at $45 M or $54 M according to whether 6,000 feet of wharves are built for the lower mean forecast or 8,000 feet for the higher mean forecast. These amounts include the excavation of the basin, dredging for wharves, wharves, open areas, sheds and utilities. The proposed first phase of the work would correspond approximately to the first case.

It would consist of approximately of 5,500 feet of wharves in the first four years, subsequent works being dependent on the development of traffic. This part of the work is common for all forecasts. The building of 4,000 feet of quay only would limit the cost to $36 M spent from 1974 to 1977 or 1978.

THE INTERNAL RATE OF RETURN IS 1.6% FOR THE LOWER MEAN FORECAST WITH 6,000 FEET OF WHARVES AND 3.6% FOR THE HIGHER MEAN FORECAST, 8,000 FEET OF WHARVES WITH A FIRST PHASE OF 5,500 FEET COMMON TO BOTH FORECASTS. The cost of excavating the basin (around $9 M) is in fact amortized on lower returns for the lower forecast. A 50-year life is assumed. If all the funds available to the port are utilized to self finance the port extension and if the interest on the borrowed money is 4% no subsidy is necessary. Since the future traffic is likely to be the lower or higher mean forecast, with an interest rate of 6%, the subsidies necessary are respectively $6 M and $3.5 M. If the interest rate is 8.5% the subsidy required would be approximately $10 M. Though this last rate appears excessive, the receipts are based on a constant value dollar, that is as if the economy was stable with no inflation. It must be noted that the assumption of financing by operating revenues from the existing installations assumes that none of these revenues are used to pay charges on the existing debt.

THE ECONOMIC FEASIBILITY OF THE PORT EXTENSION PROJECT INDICATES ONLY ONE ASPECT OF ITS VALUE. THE FOLLOWING MUST ALSO BE CONSIDERED:

- BENEFITS FOR CERTAIN USERS (Asbestos traffic, cereals etc.)

If barge-carrier shipping develops there will be important benefits for the users. The problem is the establishment of a tariff which enables the port to collect part of these benefits.

REGIONAL IMPACT. This could be measured by estimating the additional revenues and jobs developed by the increase of the traffic: $20 to $40 M and around 1,300 to 2,000 new jobs depending on the traffic forecast. To this should be added the indirect and induced effects created by these revenues, the multiplying factor being 1.5 to 1.7. The temporary employment of a few hundred people during construction is another item to be taken into account.

Other regional impacts cannot be measured but they are not negligible; increased incentives for certain industries either because they are associated with port or marine activities or because they make use of transit goods focused on the port. Equally notable is the growth of the economy of the city as a result of a larger volume of commercial transactions and because of movement of capital.

On the other hand, the excellent marine equipment and land transport facilities for this part of the Province of Quebec are such that the port itself cannot be considered indispensable to the development of new natural resources.

THE PLANNING OPERATION TO REACH THE HIGH MEAN TRAFFIC FORECAST (AROUND 28.5 MILLION TONS IN 1985 WITH 15 MILLION OF PETROLEUM PRODUCTS) IS THE POLICY ULTIMATELY PROPOSED. This requires the construction of one basin with 8,000 feet of new wharves. It enables the reception of barge carriers, while at the same time guaranteeing a reasonable return on the total investment. This calls for the following actions:

- Active promotion, not only to persuade the maritime shipping agents over which the Port Authority has often only an indirect

influence, but also to persuade the intermediaries;

- a larger scope for the port to effect promotion: creation of a commercial and promotion service; decentralization of the management powers of the National Harbours Board, more control, or at least, information, and a stronger coordinating role by the port over private activities forming part of the port operations. It should be noted that the port is a national infrastructure, and as such should remain dependent on the Federal Government. However, the port also has a local impact which is important to the Province and to the metropolitan area. The local port authority which is consultative, could acquire a greater role in management decisions even if the major policy decisions remain with the National Harbours Board.

- Representations to the concerned Government authorities to obtain at least neutral railway rates for Metropolitan Quebec and make its port the most favourable outlet for James Bay raw materials or semi-finished products.

- In order to promote the new barge carrier shipping, it is recommended, if the development outlook continues favourable to create a joint venture with provincial and local participation to help local entrepreneurs take part in this operation.

CHAPTER 4

CONCLUSIONS OF THE STUDY ON THE PORT ORIENTED INDUSTRIAL ZONE

DIAGRAM OF HYPOTHESES STUDIED AND TERMINOLOGY UTILIZED

TRAFFIC HYPOTHESIS IN 1985

- LOW HYPOTHESIS → NO ADDITIONAL PORT IMPROVEMENT REQUIRED
- LOWER MEAN HYPOTHESIS
- HIGHER MEAN HYPOTHESIS
- HIGH HYPOTHESIS

ALTERNATIVES OF PORT IMPROVEMENT

	I 2 WET-DOCKS	II 1 WET-DOCK	III NO WET-DOCK
A	15.000'	15.000'	15.000'
B	8.000'	8.000'	8.000'
C	6,000'	6.000'	6.000'
D			5.000'

LENGTH OF NEW WHARF TO BE BUILT

INDUSTRIALIZATION SCENARIOS

A	WITHOUT POLICY FOR INDUSTRIAL DEVELOPMENT
B	INDUSTRIALIZATION ORIENTED TOWARDS STEEL COMPLEX AND METAL WORKS
C	INDUSTRIALIZATION ORIENTED TOWARDS STEEL COMPLEX AND OIL REFINERIES
D	INDUSTRIALIZATION ORIENTED TOWARDS OIL REFINERIES AND PETROCHEMICALS
E	MAXIMUM INDUSTRIALIZATION STEEL COMPLEX REFINERIES, PETROCHEMICALS

HIGHER MEAN HYPO. OF DEVELOPT.	HYPOTHETICAL ARRANGEMENT FOR A PORT ORIENTED INDUSTRIAL ZONE AT BEAUPORT FLATS	* F
LOWER MEAN HYPO. OF DEVELOPT.		E
MEAN HYPOTHESIS OF DEVELOPT.		D
HIGHER MEAN HYPO. OF DEVELOPT.		C
LOWER MEAN HYPO. OF DEVELOPT.		B
LOW HYPOTHESIS OF DEVELOPT.		C

* VERSION G OF THIS HYPOTHESIS REFERS IN PART D TO A SPECIAL TYPE OF DESIGN QUITE SIMILAR TO F.

4. CONCLUSIONS OF THE STUDY ON THE PORT ORIENTED INDUSTRIAL ZONE

4.1 Industrial Development

Traffic forecasts covering a very large number of products are derived from market analysis and existing production areas and commercial systems. They also depend upon national economic policy. On the contrary, no industrial area exists around Quebec Port to stress particular activities in preference to others. Location decisions are often not in the hands of government even if at times it could influence them; the decisions are in the hands of industry whose motives are short term, functioning only according to their direct interests. In these conditions, we have less of a basis for establishing industrialization forecasts than for establishing traffic forecasts. It is the reason why, as mentioned before, possible industrialization forecasts for a Port Industrial Zone have been simulated, based on industries usually interested in a port location and on industries drawing benefits from transit shipments. Five ofthese industrial development hypotheses called "Scenarios" are outlined below:

Scenario "A"

No particular effort is made. Nevertheless, a few warehousing and service activities will be established behind the wharves on Beauport Flats.

Scenario "B"

Certain promotion and incentive efforts are exerted to attract large metallurgy or mechanical industries. Such activities would be linked to naval construction or to equipment for James Bay(1). Related to the above industries, other industries appear such as "agro-alimentary",asbestos cement, asbestos and potash fertilizers. From 500/600 acres at Beauport and 1,300/1,400 acres at Lauzon will have to be occupied to give employment to 1500 to 5000 persons, depending on the success of the operation.

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(1) Or more precisely linked to the forest and mining hinterland of the port.

Scenario "C"

As in the preceeding case, the creation of a petroleum terminal could lead to the installation of one or more oil refineries. The Beauport Flats site is not large enough and some 2000 to 2500 acres will have to be obtained most likely from East of Lauzon. Total employment possibilities with the most favourable case could be close to 6000 persons.

Scenario "D"

Instead of looking for new industrial facilities linked to metal products which can be located on Beauport Flats, creation of a petrochemical refinery complex is contemplated. Beauport and Lauzon Flats are left with only few service activities connected to the port with probably agro-alimentary and asbestos industries making use of only a part of the site. On the other hand an important petro-chemical industry complex will be set up on the South Shore close to oil refineries. From 2000 to 6000 persons will find employment in that case.

Scenario "E"

It is the most optimistic where all the former scenarios materialize. At the best 5000 acres of Port Industrial Zone are created with employment for more than 8000 persons.

The two extreme scenarios described appear unlikely. That is due to the expressed desire of Local and Provincial authorities to create an Industrial Port Zone. On the other hand, it is unlikely that Provincial and Federal Governments will help Quebec to develop at the same time a metallurgical and a petro-chemical complex.

Similarly, the possibility of creating an important steel complex using ore has been excluded for the year 1985, the end of the period under consideration. However, a small steel mill using scrap remains a possibility.

4.2 Investment and Economic Feasibility

Only Scenarios B,C and D, described above are retained as realistic in terms of the industrialization objectives of the Port Zone.

It has been assumed that the present day average sale, price of land or the present value of land rental is $1 or $1.25 per sq.ft. The latter price would be the result of a favourable market or of a sufficiently strong demand to result in a capital gain on land. For average values, selling prices were established as a function of the situation in relation to the wharves and of the utilization made by the tenant, the small users being penalized. The table below gives an indication of the financial results with a sale price of $1.50 per sq.ft. which is equivalent to an annual rental price of $0.15 a square foot. It was assumed that two years would elapse from the beginning of the works to the sale of lots; one year for the filling and earthwork and one year to complete ancillary works. The interest rate, taking into account financing fees, is 8.5% (1). The results with an interest rate of 6% were investigated in cases following remarks of the earlier Paragraph 3.2. Marketing and promotion costs are estimated as being 10% of the total price.

The feasibility of the development of industrial land for refineries or petrochemicals was not studied at length since it will probably be arranged by the industries themselves. Functionally, they will belong to the Port Industrial Zone but, without doubt, administratively, they will not. Similarly, the possible recovery of 325 acres (290 commercially useable) on LauzonFlats were not taken into account: this is linked to the eventual construction of a large dry dock and since it is not yet known what part will be utilized for naval facilities, the costs will, therefore, be consolidated with the dry dock operations. If the latter bears the cost of the fill the commercial operation of the lands utilized by the naval facilities would be nearly balanced. It is noted that close to the Port there is no other suitable site adjacent to the river.

(1) The interest rate has only a small influence since it is a short term operation: 6% instead of 8.5% would create a saving of around $1 million if 488 acres, were developed.

RESULTS OF PHYSICAL PLANNING

OF AN INDUSTRIAL PORT ZONE ON BEAUPORT FLATS

(In 1972 thousand dollars)

		SCENARIO "B"		SCENARIO "C"		SCENARIO "D"	
		Net project cost*	Financial & commercial costs **	Net project cost *	Financial & commercial costs **	Net project cost *	Financial & commercial costs **
LOW DEVELOPMENT HYPOTHESIS	Usable area	490 acres		490 acres		105 acres	
	Sale price						
	$1.00/ft^2	(16,800)	(7,900)	(16,800)	(7,900)	300	(800)
	$1.25/ft^2	(11,400)	(7,900)	(11,400)	(7,900)	1,500	(800)
	$1.50/ft^2	(6,100)	(7,900)	(6,100)	(7,900)	2,600	(800)
LOWER MEAN DEVELOPMENT HYPOTHESIS	Usable area	730 acres		730 acres		730 acres	
	Sale price						
	$1.00/ft^2	(23,000)	(11,300)	(23,000)	(11,300)	(18,400)	(8,300)
	$1.25/ft^2	(15,100)	(11,300)	(15,100)	(11,300)	(13,000)	(8,300)
	$1.50/ft^2	(7,100)	(11,300)	(7,100)	(11,300)	(7,800)	(8,300)
HIGHER MEAN DEVELOPMENT HYPOTHESIS	Usable area	970 acres		970 acres		730 acres	
	Sale price						
	$1.00/ft^2	(30,700)	(15,100)	(30,700)	(15,100)	(24,800)	(11,700)
	$1.25/ft^2	(20,100)	(15,100)	(20,100)	(15,100)	(16,700)	(11,700)
	$1.50/ft^2	(9,400)	(15,100)	(9,400)	(15,100)	(8,900)	(11,700)

* Inclusive of financial and commercial costs

** Included in net project cost.

With the exception of a relatively small area, (about 125 acres including common areas, of which about 105 acres are for commercial use), which can be filled at no cost with excavation material from the basin dredging, the development costs are high, around $1.70 per useful sq. ft. or $1.50 per sq.ft. for the whole area. The consequence is that if the above area is not developed, the operation will show a deficit. This leads to the conclusion that the benefits resulting from this section should be consolidated with the returns from the Port Industrial Zone. The possibility for the port to retain the benefits could also be considered. This would improve the port viability at the expense of the Port Industrial Zone.

The cost of creation of the Port Industrial Zone on Beauport Flats favours Scenario D in which a few diversified industries are sited, while promotion efforts are concentrated on oil refineries and linked and complementary industries such as petrochemicals and plastics. The regional multiplier for these industries is higher than that for other industrial activities, being of the order of 1.6 to 1.7.

4.3 Conclusions and Recommendations

THREE GROUPS OF POSSIBLE BASIC INDUSTRIES CAN BE CONSIDERED FOR THE DEVELOPMENT OF AN INDUSTRIAL PORT ZONE IN CONNECTION WITH QUEBEC PORT:

- METALLURGY AND METAL WORKING INDUSTRIES;
- REFINING OF PETROLEUM PRODUCTS:
- PETROCHEMICALS.

It is conceded that it is unlikely that federal and provincial governments will agree to develop at the same time metallurgical and petrochemical complexes, or in

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(1) Including financial and commercial costs of around 20% of total costs.

other words, will not agree to concentrate the heavy industry of the province in Metropolitan Quebec in the future. It was therefore, accepted that the two roles were mutually exclusive. Furthermore, the establishment of a petrochemical complex is dependent upon the earlier installation of a complex of refineries from which chemical industries are supplied.

THE CREATION OF AN INDUSTRIAL ZONE ON LAND RECOVERED FROM BEAUPORT AND LAUZON FLATS (APPROXIMATELY 1200 ACRES AND 300 ACRES RESPECTIVELY OF WHICH 80% IS USABLE AREA) REQUIRES A CONSIDERABLE INVESTMENT WITH A SUBSIDY OF AROUND $30 MILLION IF THE SALE PRICE OF THE LAND IS $1 PER SQUARE FOOT. It is therefore important to adjust to demand (including however a marginal anticipation of future demands) the recovered lands with ancillary facilities for the Port Industrial Zone on Beauport and Lauzon Flats. The refineries and other petrochemical industries which can be located on the neighbouring plateaux using pipelines would benefit from using lower cost land.

THE INCOME MULTIPLIER FOR ALL INDUSTRIAL ACTIVITIES IS ABOUT 1.3. THE EMPLOYMENT MULTIPLIER IS HIGHER FOR REFINERY AND PETROCHEMICAL INDUSTRIES (1.5 to 1.7) THAN FOR METAL WORKING (1.4 to 1.5).

THEREFORE, IT SEEMS PREFERABLE TO RECOMMEND TO PROVINCIAL AND REGIONAL AUTHORITIES TO ENCOURAGE THE ESTABLISHMENT OF REFINERIES WITH A PETROCHEMICAL COMPLEX, IN PREFERENCE TO OTHER INDUSTRIAL SECTORS AS KEY INDUSTRIES FOR THE DEVELOPMENT OF A PORT INDUSTRIAL ZONE. It is evident that the creation in Metropolitan Quebec of sufficient refinery capacity to attract basic petrochemical industries would be rendered easier with a down river petroleum terminal supplying the Quebec Area through pipelines. Although no decision has

yet been reached, the fact that the Portland-Montreal pipeline is operating at near capacity following the tremendous growth of demand, will give an impetus to the above solution. In addition to these key industries, other manufacturing sectors should be interested in developing in close proximity to the port. Reference is made to port oriented industries, naval construction and repair, equipment manufacturing and other activities drawing benefits from the port traffic: agro-alimentary, cereal products, asbestos and wood industries . Furthermore, commercial activities, warehousing and service facilities will always require installations close to the port.

THE PORT INDUSTRIAL ZONE ADMINISTRATION MUST BE SEPARATED FROM THE PORT ADMINISTRATION PER SE AND IT SHOULD BE ENTRUSTED TO A SPECIALIZED ORGANIZATION SIMILAR TO THE MANAGEMENT CORPORATION OF THE BECANCOUR INDUSTRIAL PARK. In fact, such a corporation would be in a position to receive federal or provincial assistance for regional economic expansion purposes. The activities of the one are of a very different nature from those of the other. However, this would not prevent the Port from recovering part of the benefits accruing from the first commercialised phase of 105 acres. The Zone corporation should have the responsibility for:

- The acquisition and development of lands;
- The promotion and commercialization of the Zone;
- The management of the common services of the Zone.

WHATEVER THE PACE OF DEVELOPMENT OF AN INDUSTRIAL PORT ZONE IT WILL NOT COMPETE WITH EXISTING INDUSTRIAL PARKS, SINCE

THE NATURE OF THE INDUSTRIES POTENTIALLY INTERESTED IN ONE IS FUNDAMENTALLY DIFFERENT FROM THAT OF THE OTHER. On the contrary, in the case of the development of a refinery/petrochemical complex, complementary petrochemical industries (such as plastics processing and manufacturing for example) should create a market for existing urban industrial parks.

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- Part A — Movements of traffic via Quebec Port
  Comparative advantages and future potential
- Part B — Industrial development of Quebec Port
- Part C — Study of Development
- Part D — Development policy of Quebec Port

and also of four volumes of Appendixes:

- Appendix 1 — Monographs
- Appendix 2 — Analysis of Maritime Traffics - Tables
- Appendix 2A — Analysis of Maritime Traffics - Maps and Port Monographs
- Appendix 3 — Existing installations

To facilitate reference, Tables of Contents of parts A, B, C, and D, are presented in this report.

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PART A

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AND
TERMS OF REFERENCE

QUEBEC PORT STUDY (1971)

MAJOR OBJECTIVES AND TERMS OF REFERENCE

DEPARTMENT OF REGIONAL ECONOMIC EXPANSION

QUEBEC PORT STUDY (1971)

MAJOR OBJECTIVES

1. Investigate and analyse the comparative advantages of the Port of Quebec as a point of trans-shipment and as a factor of industrial location in comparison with ports of the St. Lawrence and the Atlantic Coast;

2. Identify the types and specialization of industries and trans-shipment traffic which could be stimulated by the existence of a super-port in the Quebec Special Area.

3. Define a strategy of development and congruent administrative system to realize the captureable value of the port site;

4. Prepare a comprehensive development plan for the Port in conjunction with and in complement to the spatial development scheme for the Quebec region;

5. Program a schedule of investments for required port installations and establish capital and operating cost streams, together with the calculus of attendant benefit streams.

QUEBEC PORT STUDY (1971)

PROPOSED TERMS OF REFERENCE

PHASE I ECONOMIC STUDY COMPONENTS

1.1 Compile for the past five-year period and present in flow-chart form annual tonnage of out-bound and inbound traffic from each principal port to include Quebec, Maritime, Great Lakes (American and Canadian), and North East American Ports and other ports if necessary according to nature, tonnage, origin and destination of cargo. (See Appendices 1.1a, 1.1b, and 1.1c)

1.2 Indicate the importance of the role of transit cargo ports in the Maritimes and Quebec and identify the ultimate export destination and origin via these ports and the mode of intermediary transport.

1.3 Make an economic analysis of movements of commodities potentially routable via a super-port in the Quebec Special Area taking into account the type and characteristic of vessel utilized, the technology employed, the back-haul traffic, other modes of transport, costs of movement and other attendant services (tariffs, wharfage and other charges). This will also include policies of public and semi-public agencies and private companies (Canadian Transport Commission, Wheat Board, Railways, etc.), and other external variables affecting the viability of new traffic. This analysis will then form a base for generating realistic hypotheses on development of the port's trans-shipment role.

1.4 Analyse the potential of the Port of Quebec as a trans-shipment point in terms of past trends and the existing state of traffic, and in the framework of the evolution of future traffic and technology in marine and land transport, i.e., containers, RO-RO vessels, super bulk carriers, unit trains, the "land-bridge" concept, and determine the Port of Quebec's competitive position vis-à-vis other St. Lawrence and Atlantic coast ports as a function of the principal users, actual and potential.

1.5 Identify the types of industry with which the port is critical as a factor of location (port-oriented industries) and distinguish those whose proximity to the berths is essential for their implantation, and which can benefit in particular from characteristics of the Port of Quebec; analyse the potential for the development of these and for other allied industries for location in the Quebec special area in terms of land and service needs, production and transfer costs, accessibility and entry into market channels, labour needs, and the required economies of scale, etc.

1.6 In synthesizing the information obtained and the analyses completed above, define a strategy of development for the Port of Quebec and its allied activities and indicate public agency action necessary to render the port more attractive as factor of industrial location and more competitive as a mode of trans-shipment given the following constraints and variables.

a) Water depth

b) Cost of land (available and recoverable)

c) Port infrastructure and support equipment, existing and new, including storage and warehousing facilities

d) Transport rates and tariffs

e) Promotion and publicity

f) Factors affecting optimal utilization and return on port equipment and facilities

g) Productivity and availability of work force and the conditions of work

h) Other modes of transport

i) Complementary infrastructure external to the port area

j) Subventions and subsidies (direct and indirect), etc.

PHASE 2 PHYSICAL AND DEVELOPMENT PLAN COMPONENTS

2.1 Analyze the physical characteristics and spatial organization of relevant principal world ports and their back-up facilities including those in the process of development; (See Appendix 2.1)

2.2 Examine existing Quebec Port facilities and infrastructure in light of the foreseen requirements and identify other works required for the development of the Port of Quebec as a function of the following:

a) the findings from the economic study (phase I)

b) the spatial development scheme for the Quebec special area

c) the relevant and applicable findings in paragraph 2.1 .

2.3 Study the best range of options relative to the physical placement of berths both with and without the Bassin, taking into account:

a) soil condition

b) equilibrium of "dredge and fill" operations

c) water flows and river currents

d) movement of ice

e) sedimentation and siltation

f) displacement of water channels and channel beds

g) flow of surface water and waste disposal

h) impact on surrounding environment and

i) all other pertinent effects upon the port supported by hydraulic model tests (See Appendix 2.3)

2.4 Draw up a plan and justify the most favourable option for the location of berths.

2.5 Prepare an overall development plan defining the expansion limits of the Port of Quebec and indicate the proper land use by zone, the characteristic requirements and placement by use, and required services and linkages with the hinterland. This development plan must take into account quality and cost effects upon the environment, and indicate the chronological timing, cost of investment, and foreseen operating costs.

PHASE 3 STUDY SYNTHESIS

3.1 Taking into consideration the total results obtained in phases (1) and (2), detail in order of priority new required investments which will yield the nearest optimum net benefit for the port system. Group these investments by principal stage of development to the design year (Study Horizon yr. 1985) and explicitly detail those required in the first planning stage of 5 years; (See Appendix 3.1)

3.2 Propose an administrative system to yield an optimum utilization of Port facilities and complementary industrial zones.

APPENDIXES

QUEBEC PORT STUDY (1971)

APPENDIX 1.1

A LIST OF PRINCIPAL PORTS TO BE CONSIDERED

a) Principal Quebec Ports

Baie Comeau, Montreal, Port Cartier, Quebec, Sept-Iles, Sorel, Trois-Rivières;

b) Principal Maritime Ports

Nova Scotia - Halifax, Canso, New Brunswick - Saint John;

c) Canadian Great Lakes Ports

Hamilton, Port Arthur, Toronto, Windsor;

d) American Great Lakes Ports

Chicago, Cleveland, Detroit, Duluth, Milwaukee, Toledo;

e) American North East

Baltimore, New York, Norfolk, Portland

QUEBEC PORT STUDY (1971)

APPENDIX 1.1

B

CATEGORIES OF CARGOES TO BE CONSIDERED

Food Stuffs

Asbestos

Automobiles

Wood and Wood Products

Beverages

Cement

Coal

Metal Products

Canadian Grains

American Grains

Petroleum Products

Minerals and Concentrates

Newsprint

Pulp

Chemical Products

Scrap Iron and Steel

General Cargo

Miscellaneous

QUEBEC PORT STUDY (1971)

APPENDIX 1.2

INTERPRETATION OF THE EXPRESSION "ORIGIN AND DESTINATION OF CARGOES"

For the principal categories of cargoes destined for, or originating in North America, ultimate origin and destination will be specified as those of the principal ports utilized on this continent. In other cases, identification of country of origin or destination will suffice.

QUEBEC PORT STUDY (1971)

APPENDIX 2.1

MAJOR INTERNATIONAL PORTS FOR CONSIDERATION

Anvers (Zebruges)

Fos (Marseille)

Genoa

Hamburg

Le Hâvre

London

New York

Rotterdam

QUEBEC HARBOUR STUDY (1971)

APPENDIX 2.3

To reproduce the existing conditions and to study the effects of new works and their implications, a hydraulic model of the Quebec Harbour will be made available to the consultant. Two other already existing models with somewhat different characteristics will complement studies performed on this new model.

The following are the characteristics of these models:

A National Research Council

The hydraulic model at the NRC in Ottawa simulated approximately a 325 mile section of the St. Lawrence River from Montreal to Father Point. The model is built to a horizontal scale of 1: 2000 and a vertical scale of 1: 120, and has a physical length of some 750 feet. The purpose of the model is to study the effects of proposed channel improvements on the overall tidal motions in the river, and additionally to permit some expertise to be developed in Canada on tides and studies relating thereto on a hydraulic model. Simultaneous with the hydraulic model studies, complementary investigations are carried out on a mathematical model of the same stretch of the river.

B Ministry of Transport - LaSalle Mini-Model

This unusually small model reproduces the St. Lawrence River from Lake St. Peter to Ile aux Coudres at a scale of 1: 10,000 horizontally and 1: 500 vertically, so that some 180 miles of river in the prototype is covered by the 100 foot long model.

APPENDIX 2,3 (cont'd)

C Quebec Harbour Model (see attached plan)

This model with an approximate length of 120 feet will simulate the section of the river in the Quebec region. It will be constructed to a scale 1: 600 horizontal and 1: 500 vertical. This model will be located at the Hydraulic Laboratory, Ministry of Transport, Ville LaSalle.

QUEBEC PORT STUDY (1971)

APPENDIX 3.1

SELECTION OF THE OPTIMUM STRATEGY IN TERMS OF COST AND BENEFIT STREAMS

The objective function for the Master Plan of the Port of Quebec will be to maximize the monetary flows accruing to the Quebec region attributable to activity generated through the Port of Quebec over the planning period.

1 Direct quantifiable costs and benefits

It is necessary that sensitivity tests using present value analysis over the economic life of each feasible investment alternative (Port system and sub-systems) be made under the following conditions:

a) Optimistic, pessimistic, and neutral path trends of commodity flows;

b) High, low and long-term average costs of capital;

c) Various investment phasing within the planning horizon given technological constraints with direct benefits and direct cost flows over the investment period. The direct costs and benefits are considered to be those accruing to the port itself including net increases in customs receipts.

2. Indirect quantifiable costs and benefits

These will include as a minimum the following:

a) Labor and income multipliers leading to added secondary and tertiary activity in the Quebec Region;

b) Increase of decrease in the economic efficiency of employed or under-employed resources due to the increase of port scale.

(This will be treated in the same framework as Part (1)).

APPENDIX 3.1 (cont'd)

3 Direct and indirect non-quantifiable benefits and costs

These streams of positive and negative effects will be treated for example in terms of the increase or decrease of the social and environmental qualities and resources of the region attributable to these developments.

(All calculations and results will be included as an appendix to the reports.)

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