THE EFFECTS OF THE ST. LAWRENCE SEAWAY ON TRADE PATTERNS AND CARGO VOLUMES AT THE CANADIAN GREAT LAKES PORTS

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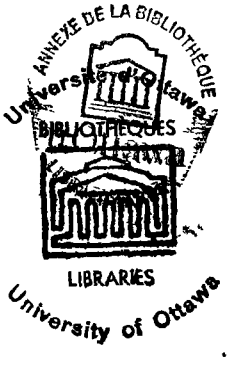

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CHAPTER I

INTRODUCTION

1. Scope and Objectives of the Study

In 1959, the St. Lawrence Seaway opened its newly expanded facilities to navigation. From that time, the waterway has had far-reaching effects on the economy of Canada as a whole as well as on particular regions and ports within the country. Although there has been much debate on the merits of the St. Lawrence Seaway, the body of literature investigating the effects of the Seaway is quite limited. The objective of this dissertation is to partially fill this void by assessing the impact the waterway has had on the Canadian ports in the Great Lakes. Specifically, it investigates the Seaway's influence on the Great Lakes ports in terms of changes in cargo volumes, changes in the nature of trade, and changes in trade patterns which have occurred in the first decade of the St. Lawrence Seaway.

2. Methodology

Basically, the research of the subject of this thesis involved the following work:

a. An examination of major publications and research studies covering the St. Lawrence Seaway and Canadian Great Lakes ports.

b. The collection, analysis and interpretation of available data on the subject. The primary data sources include:

(i) Dominion Bureau of Statistics, Shipping Report, Parts I-VI, Annual publication.

(ii) The St. Lawrence Seaway Authority, Traffic Report, Annual publication.

(iii) Dominion Bureau of Statistics, Canal Statistics, Annual publication.

c. Meetings with personnel connected with Seaway and Great Lakes port activities in order to supplement the statistical data by obtaining additional information.

The approach to the problem of the impact of the St. Lawrence Seaway on the Great Lakes ports is partially historical, but mainly statistical and analytical.

3. Organization of the Thesis

Chapter II presents a brief historical background of the early canalization on the Great Lakes - St. Lawrence waterway, an outline of events that led to the construction of the St. Lawrence Seaway, and the economic expectations of the expanded waterway.

Chapter III examines the St. Lawrence Seaway's influence on the nature, volumes, and patterns of trade at the Canadian ports in the Great Lakes with respect to main commodities.

Chapter IV attempts to assess which of the Great Lakes ports have benefited and which have been adversely affected by the St. Lawrence Seaway.

Chapter V gives a forecast of future St. Lawrence Seaway trade at the Great Lakes ports and discusses some of the problems and potentials of this waterway.

Chapter VI summarizes the findings of the study and gives the general conclusions.

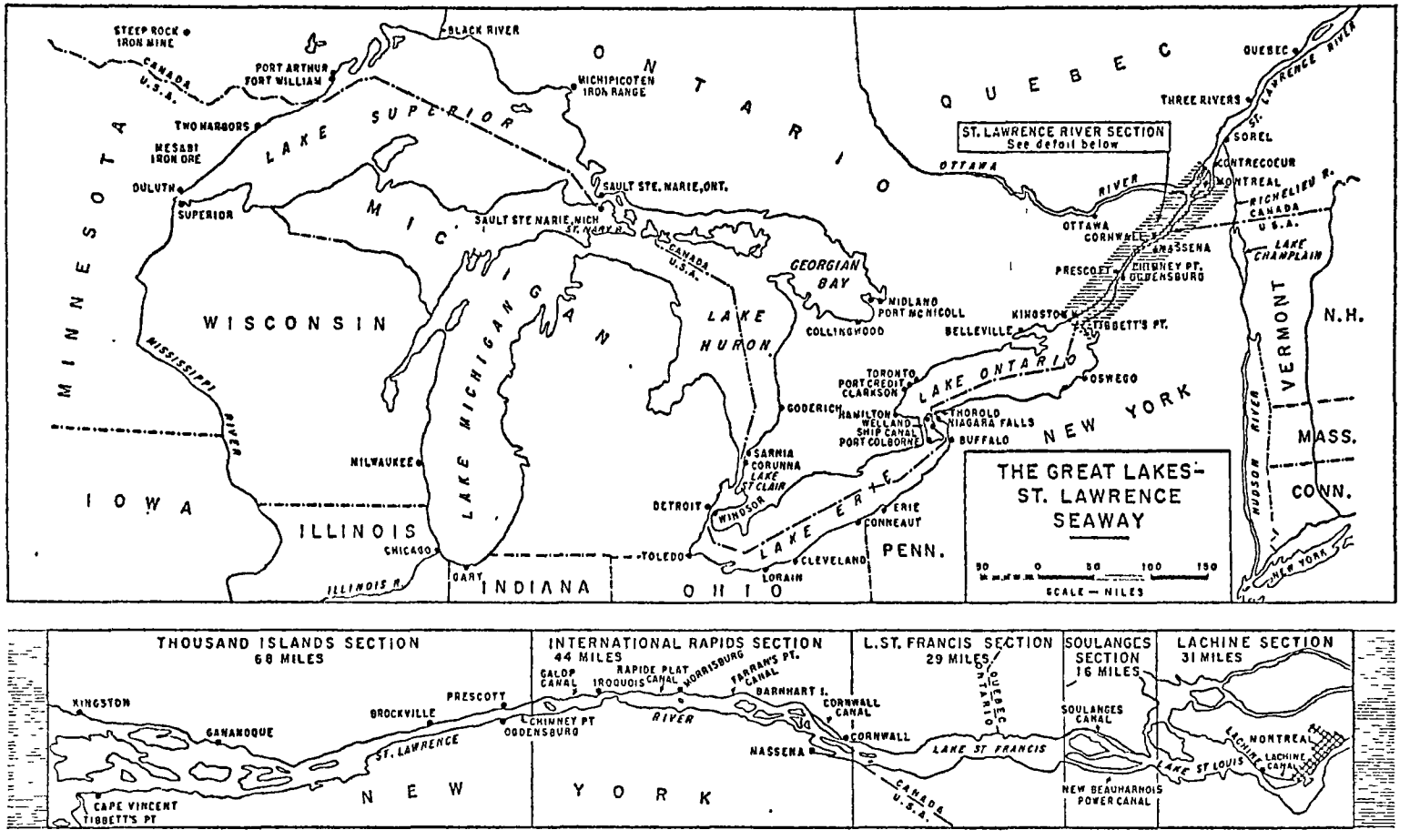

Figure 1. Map of Great Lakes - St. Lawrence Seaway

CHAPTER II

BACKGROUND

This chapter presents a factual background of the St. Lawrence Seaway which opened for navigation in 1959. It includes a brief historical account of the early canalization of the Great Lakes - St. Lawrence waterway, the sequence of events that led to the construction of the St. Lawrence Seaway and the economic expectations of the Seaway.

For the purposes of exposition and clarification, the following terms used in this study are defined: (a) Great Lakes - St. Lawrence waterway, which includes the Gulf of St. Lawrence, the St. Lawrence River and the Great Lakes; and (b) St. Lawrence Seaway, or Seaway, which refers to the St. Lawrence River section of the waterway extending from Montreal to Lake Ontario.

1. Early Canalization

The opening of the St. Lawrence Seaway, in 1959, added another chapter to the history of the Great Lakes - St. Lawrence waterway which, with its lakes and tributaries, stretches over 2,340 miles in length, extending from the Atlantic Ocean into the heart of the North American continent.

The St. Lawrence River was first discovered and explored by Jacques Cartier during the 16th century in his quest for a passage to the Far East. Cartier's expedition up the St. Lawrence River to the Lachine Rapids made him realize that, although the waterway had many attributes, it nevertheless presented several obstacles that seriously hampered navigation. These navigational impediments included four major rapids or sets of rapids, as well as narrow and shallow sections of the river. It was to take many years of human effort before this magnificent waterway could be transformed into a viable transportation route.

Some attempts[1] were made in the seventeenth century to improve the St. Lawrence River through canal building but it was not before the first half of the nineteenth century that the first canal building period began. The rapid growth of agriculture, industry and trade that the North American continent was experiencing at the turn of the nineteenth century, along with the increasing size of vessels on the St. Lawrence River, had made the construction of canals a sine qua non. The importance of this inland waterway to the economic development of the continent was becoming more obvious to the North American people who saw it as "the broad highway over which vast populations

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1 A plan was devised by Dollier de Casson in 1680 to build a canal to by-pass the Lachine Rapids. It was started in 1700 but never completed due to lack of funds.

would enter the interior wilderness to carve for themselves rich kingdoms in the heart of North America".[2]

The first canal on the St. Lawrence River was built in 1825. The Lachine Canal, as it was named, stretched from the village of Lachine to Montreal. It extended 8½ miles, was five feet deep and had six locks of 100 by 20 feet in dimensions. The Cornwall Canal, by-passing the Long Sault Rapids, followed fifteen years later with locks of comparable dimensions to those of the Lachine Canal.

The navigational improvements created by the opening of these two canals proved insufficient, however, and widespread dissatisfaction with the slow canalization of the St. Lawrence River was strongly expressed. This fact was emphasized by Lord Durham in his famous Report in which he cited the lack of co-operation between Upper and Lower Canada in undertaking navigational improvements on the St. Lawrence River as a major reason for the then existing economic stagnation in Canada.

The Union of the two Canadas, in 1841, placed the Government on a sounder financial basis which permitted it to undertake more intensively further navigational

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2 W.R. Willoughby, The St. Lawrence Waterway - A Study in Politics and Diplomacy, Madison, University of Wisconsin Press, 1961, p.7.

improvements to the St. Lawrence River. The Beauharnois Canal, to by-pass that river section connecting Lake St. Francis with Lake St. Louis was constructed in 1845. The completion of the Williamsburg Canal in 1847 enabled the set of rapids between Long Sault and Prescott to be circumvented. Improvements were made to the Lachine Canal, giving it a minimum depth of 9 feet, in 1848.

During the first half of the nineteenth century, additional works were also undertaken to improve navigation on the Great Lakes, particularly at Niagara Falls and at Sault Ste. Marie. Work on the Welland Canal began in 1824 and was completed five years later, thus bringing the dream of creating another seacoast along the shores of the Great Lakes that much closer to realization. The Canal, 27½ miles in length, had 40 wooden locks with dimensions of 110 feet in length, 22 feet in width and 8 feet in depth. With the completion of the second Welland Canal, in 1850, the depth was increased to 9 feet and the number of locks measuring 150 feet by 26 feet was reduced to 27. The building of a canal, in 1855, to overcome the St. Mary's Falls at Sault Ste. Marie, provided the North American people with a navigable waterway having a minimum depth of 9 feet from the Atlantic Ocean to the head of Lake Superior.

Interest in canal building declined during the fifties and sixties, due largely to the rapid development of Canadian and American railroads which took over the larger share of the east-west traffic.

The second period of canal construction was ushered in on July 1st, 1867, when the Confederation of Canada created a new political organization equipped with a sounder financial and legislative position to carry out public works. The first step taken was the appointment of a Royal Commission whose task was to study the canals of the country. The following year, the Commission's report strongly urged the Federal Government to initiate a program of canalization on the St. Lawrence River and Welland sections which would provide a canal system of greater depth and with locks of uniform dimensions. The Commission considered the existing canals outmoded due to the ever-increasing size of vessels on the Great Lakes and the St. Lawrence River.

The Government responded favorably to the Commission's recommendations and, in 1873, ordered work to begin on a new Welland Canal which opened in 1883 with a depth of twelve feet. By 1887, the canal had been deepened another two feet and was equipped with locks 270 feet long and 45 feet wide, allowing the passage of vessels carrying over

two thousand tons of cargo. On the Montreal - Lake Ontario section, larger locks were in operation at the Lachine Canal in 1883, the Soulanges Canal replaced the old Beauharnois in 1899 and improvements were also made to the Cornwall and Williamsburg canals in 1904. With the United States and Canadian locks already in operation at Sault Ste. Marie since 1895, a fourteen foot passage was now available for navigation from the Atlantic to the head of Lake Superior. Thus, another stage in the history of canalization on the Great Lakes - St. Lawrence waterway had ended.

It was not long before the improved waterway became the target of sharp criticism and demands for a much deeper canal system were heard once more. The principal complaint was that the fourteen-foot canal system was inadequate since it failed to accommodate most of the world's ocean vessel fleet. Because of the restrictive dimension of the locks, the system soon became congested with small size vessels.

Agitation for the development of Canadian waterways, particularly the Great Lakes - St. Lawrence, culminated in the initiation of the fourth Welland Canal project which started in 1913. Because of World War I and other factors, the construction was interrupted at various

stages and was not completed until 1932. The new Canal reduced the number of locks from the previous twenty-six to eight, with dimensions of 800 feet by 80 feet.

2. The St. Lawrence Seaway.

Although traffic greatly increased following completion of the new Welland Canal, the Great Lakes - St. Lawrence canal system still remained inadequate. The major problem lay in the St. Lawrence River section whose small and numerous locks made navigation either impossible for large vessels or very slow and costly for those vessels that were able to transit. This bottleneck restricted the efficient use of the waterway and hampered the full development of the Great Lakes - St. Lawrence region.

It was as far back as 1895[3] that both Canada and the United States acknowledged the necessity for a deep waterway into the interior of the continent. But it took over half a century of procrastination, negotiation and debate before agreement was finally reached to make effective use of the Great Lakes - St. Lawrence water route. In May of 1954, the U. S. Congress passed the Wiley-Dondero Act which established an American agency to improve the

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3 In that year Canada and the United States created a Deep Waterway Commission to examine the technical and economic feasibility of a deep water canal between Lake Ontario and Montreal.

Montreal - Lake Ontario section of the St. Lawrence in co-operation with the Canadian agency, the St. Lawrence Seaway Authority, set up in 1951, when Canada had decided to undertake the project alone if necessary. Construction began in 1954 and five years later the project had been completed.

The outmoded 14-foot system, with its 30 locks, was replaced by a modern 27-foot passage with only half the number of locks, each measuring 800 by 80 feet and comparable, in size, to those of the Welland Canal. Five of the locks were built on the Canadian section of the St. Lawrence River and two on the U. S. section. Mention should be made of the fact that facilities for hydroelectric power were constructed in the St. Lawrence River as part of the St. Lawrence Seaway navigation project.

3. Expectations of the Seaway

It was generally agreed, prior to the opening of the St. Lawrence Seaway, that the project would have a marked impact on the economy of Canada.[4] More specifically, the major beneficial effects foreseen at the time were that:

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4 See for example: Statement on the St. Lawrence Seaway by the Honourable Lionel Chevrier, Minister of Transport, in the House of Commons, December 4, 1951; The St. Lawrence Seaway and the Canadian Economy, research report prepared by the Department of Trade and Commerce, Ottawa, 1951; and Royal Commission on Coastal Trade, Ottawa, 1957.

(a) The Seaway project would encourage further industrial development in the Great Lakes - St. Lawrence region because of the availability of lower transportation cost for basic raw materials and of cheaper hydroelectric power.

(b) The grain trade would greatly benefit from the cheaper transportation route. New market outlets for Canadian grains would open up as grain became available at a more competitive price with other world grain exporters. Western farmers would enjoy significant savings on grain shipped via the Seaway.

(c) The deep waterway would permit the Quebec-Labrador mining area to be fully exploited, thus yielding major benefits to Canada's economy by increasing the country's export trade and by creating new employment opportunities for its labour force.

(d) The Great Lakes shores would become another seacoast and the economies of the ports woulf flourish from the increase in trade generated by the Seaway.

Such benefits would, of course, be derived from the added capacity of the Seaway, which, it was estimated, would be handling fifty million tons of cargo before the

end of the first decade of operation.[5] Table 1 shows that the forecast was nearly attained when 49.2 million tons of cargo was transited through the St. Lawrence Seaway in 1966.[6] The effects that this increased tonnage has had on the Canadian Great Lakes ports, the sector most directly affected, are presented in the following chapters.

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5 Forecast made in the St. Lawrence Seaway Authority, Report of the Tolls Committee, Montreal, 1958, Table A, Appendix I.

6 A 5 week strike of Seafarers International Union members in 1967 and a 3 week strike of Seaway employees in 1968 contributed to the drop in traffic in those years.

TABLE 1

Forecast and Actual Cargo Tonnage Attained on the St. Lawrence Seaway 1959 - 1968 (in millions of short tons).[1]

YEAR	FORECAST	ACTUAL
1959	25	20.6
1960	29	20.3
1961	33	23.4
1962	37	25.6
1963	41	30.9
1964	44	39.3
1965	47	43.4
1966	48	49.2
1967	49	44.0
1968	50	48.0

(1) Short ton: 2,000 lbs

Source: St. Lawrence Seaway Authority, Report of the Joint Tolls Committee, Montreal, 1958, Table A, Appendix I.

St. Lawrence Seaway Authority, Traffic Report, Annual publication.

CHAPTER III

IMPACT OF SEAWAY ON TRADE

This chapter examines changes in volumes and patterns of trade at the Canadian ports in the Great Lakes due to the opening of the St. Lawrence Seaway in 1959. Part one analyzes the impact on the total cargo trade and part two deals with the major commodity groups.

In this paper, the Great Lakes ports, as defined by the Dominion Bureau of Statistics,[1] include all Canadian ports situated along the Great Lakes and St. Lawrence River above Montreal and, for all practical purposes, include all ports of the Province of Ontario.

For the purpose of this analysis, the total cargo trade handled at the Great Lakes ports is divided into the following segments:

(a) Lakes coastal trade refers to the domestic trade between the Canadian ports in the Great Lakes.

(b) Lakes foreign trade refers to the international trade between the Canadian ports and the United States ports in the Great Lakes.

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1 Dominion Bureau of Statistics, Shipping Report,

(c) Seaway coastal trade refers to the domestic trade between the Canadian ports in the Great Lakes and the Canadian ports outside the Great Lakes.

(d) Seaway foreign trade refers to the international trade between the Canadian ports in the Great Lakes and foreign ports outside the Great Lakes.

The difference between Seaway and Lakes trade is that the latter is confined to the Great Lakes, in other words, it is an interlake and intralake trade, while the former extends beyond the Great Lakes by way of the St. Lawrence Seaway.

1. Changes in Trade Volumes.

In order to analyze the changes in trade volumes at the Great Lakes ports effected by the Seaway, two time periods are used, namely, pre-Seaway and post-Seaway. The former is represented by the average tonnages between the years 1956-58; the latter by averages between the years 1966-68. The mean of the three years in each period is used so that an abnormal year will not unduly bias the analysis.

The volumes of cargo trade handled by the Great Lakes ports for each trade segment during both time periods are shown in Table 2. As evidenced by the data, the impact of the new waterway was felt mainly in the Seaway

TABLE 2

Total Cargo Tonnage Loaded and Unloaded at the Canadian Great Lakes Ports, Pre-Seaway and Post-Seaway Periods[1] (in millions of short tons).

TRADE	PRE-SEAWAY		POST-SEAWAY	
	Tonnage	Percent of Grand total	Tonnage	Percent of Grand total
Lakes coastal	23.0	39%	20.2	30%
Lakes foreign	28.5	48%	28.9	44%
Lakes total	51.5	87%	49.1	74%
Seaway coastal	7.2	12%	14.4	21%
Seaway foreign	0.7	1%	3.2	5%
Seaway total	7.9	13%	17.6	26%
Grand total	59.4	100%	66.7	100%

(1) Pre-Seaway: Average tonnages for 1956, 1957, and 1958
Post-Seaway: Average tonnages for 1966, 1967, and 1968

Source: Dominion Bureau of Statistics, Shipping Report, Annual publication.
Dominion Bureau of Statistics, Canal Statistics, Annual publication.

trades. The Seaway foreign trade grew from a pre-Seaway average of 700 thousand tons to a post-Seaway average of 3.2 million tons, representing a fourfold increase and the greatest percentage growth of the four trades. There also has occurred a notable increase in the Seaway coastal trade; from a pre-Seaway average of 7.2 million tons, it has doubled to a post-Seaway average of 14.4 million tons, representing the largest tonnage increase. Both Seaway trades, combined, have increased their relative share of total traffic at the Great Lakes ports from thirteen per cent in the period 1956-1958 to twenty-six per cent in the period 1966-1968.

The Lakes segment of the total cargo trade, in contrast to the Seaway segment, has shown no growth. The decline in the Lakes coastal trade of 2.8 million tons has more than offset the small increase of 400 thousand tons in the Lakes foreign trade.

The percentage growth in Seaway tonnage handled at the Great Lakes ports over the period has exceeded that for all Canadian ports over the same period, as revealed in Table 3. However, because of the decline in the Lakes segment of total Great Lakes tonnage the comparative importance of Great Lakes tonnage relative to

TABLE 3

Great Lakes Port Tonnage Compared to Total Canadian Port Tonnage (in million of short tons).

Period	Total Canadian	Great Lakes Lakes	Great Lakes Seaway	Great Lakes Total	% Great Lakes Total Canadian
Pre-Seaway	159.6	51.5	7.9	59.4	37%
Post-Seaway	250.5	49.1	17.6	66.7	27%
Tonnage growth	+64%	-4%	+122%	+12%	

Source: Dominion Bureau of Statistics, Shipping Report, Annual publication.

Dominion Bureau of Statistics, Canal Statistics, Annual publication.

total Canadian tonnage has declined from an average of thirty-seven per cent in the pre-Seaway period to twenty-seven per cent in the post-Seaway period.

The impetus given by the Seaway to ocean shipping has not led to any increase in the proportion of foreign trade to total trade handled at the Great Lakes ports, as shown in Table 4. Moreover, the importance of foreign trade at the Great Lakes ports relative to that for all Canadian ports has declined as evidenced by the index of foreign specialization. This index, or coefficient, is the quotient of the percentage of foreign tonnage at the Great Lakes ports divided by the percentage of foreign tonnage for all Canadian ports. If the coefficient were 1.0, it would indicate that foreign trade is as important at the Great Lakes ports as at the Canadian ports as a whole. If the coefficient were greater than 1.0, it would mean that foreign tonnage was relatively more significant at the Great Lakes ports while a figure of less than 1.0 would indicate less significance at the Great Lakes ports. An analysis of the tonnage statistics for the pre-Seaway and post-Seaway periods indicates that foreign trade was relatively less important at the Great Lakes ports than for all Canadian ports during the pre-Seaway period and it has remained so.

TABLE 4

Relative Importance of Foreign Trade at the Canadian Great Lakes Ports, Pre-Seaway and Post-Seaway.

Period	% of Foreign to Total Trade All Cdn. Ports	Great Lakes Pts.	Index of Foreign Specialization.(1)
Pre-Seaway	52%	51%	.98
Post-Seaway	54%	51%	.94

(1) the quotient of the percentage of foreign tonnage at the Great Lakes ports divided by the percentage of foreign tonnage for all Canadian ports.

Source: Dominion Bureau of Statistics, Shipping Report, Annual publication.

2. Changes in the Nature and Patterns of Trade.

In order to examine in greater detail the impact of the St. Lawrence Seaway on the trade in the Great Lakes, it is necessary to break up the cargo totals presented in part one. The multitude of commodities that make up the overall trade in the Great Lakes are grouped into a more manageable total of five groups, namely grain, iron ore, coal, petroleum and general cargo.

Table 5 shows that since the opening of the St. Lawrence Seaway, in 1959, there has been an upward trend in tonnages handled by the Great Lakes ports for coal, iron ore, petroleum and general cargo and a declining trend for grain. Coal has become the most important group of commodities handled by the ports, followed by grain, iron ore, petroleum and general cargo. This order differs from that of the pre-Seaway period when grain was by far the most significant, followed by coal, iron ore, petroleum and general cargo. Iron ore and general cargo have been the more active commodities having increased their share of total tonnage by four and three per cent respectively while grain has experienced a decline of twelve per cent.

TABLE 5

Total Cargo Tonnage Loaded and Unloaded at The Canadian Great Lakes Ports, by Major Commodities, Pre-Seaway and Post-Seaway (in millions of short tons).

Commodity	Post-Seaway tonnage	Post-Seaway Per cent of total	Pre-Seaway tonnage	Pre-Seaway Per cent of total	Pre-Seaway rank
Coal	15.7	24%	12.8	22%	2
Grain	15.5	23%	20.6	35%	1
Iron Ore	12.5	19%	8.9	15%	3
Petroleum	8.2	12%	7.4	12%	4
General Cargo	6.7	10%	4.2	7%	5
Other(1)	8.1	12%	5.5	9%	
Total	66.7	100%	59.4	100%	

(1) Miscellaneous bulk commodities

Source: Dominion Bureau of Statistics, Shipping Report, Annual publication .

Dominion Bureau of Statistics, Canal Statistics, Annual publication .

The changes in volumes and patterns of trade for each group of commodities and the role played by the St. Lawrence Seaway in effecting these changes are analyzed in the following sections.

Grain [2]

An important commodity handled at the Great Lakes ports is grain which largely consists of wheat. Most of the grain originates from the Prairies and is destined for domestic markets in Eastern Canada and foreign markets overseas, the latter being by far the more significant movement.

Canadian grain exports, which represent from half to two-thirds of the annual grain production in Canada [3] are shipped out of three main terminals: namely Vancouver, on the Pacific; Churchill, on Hudson Bay; and Thunder Bay at the head of the Great Lakes. There was much speculation, prior to 1959, as to the impact that the new waterway would have on the routing of Canada's grain exports. [4] It was generally felt that, because the Seaway would provide a more direct and convenient eastbound route and bring about a lowering of lake freight rates, Thunder Bay would be able to

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2 Comprises wheat, barley, oats, rye, flaxseed, rapeseed, soybeans and corn.

3 Dominion Bureau of Statistics, Grain Trade of Canada, Annual publication .

4 See for example: T.C. Hills, The St. Lawrence Seaway, Methuen, Montreal, 1959, p. 138; and Montreal Research Council, The Impact of the St. Lawrence Seaway on the Montreal Area, Montreal, 1958, p. 128.

attract a larger share of total Canadian grain exports. Table 6 shows, however, that the percentage share of grain exports moving through Thunder Bay has been declining while that passing through the Pacific outlet has been increasing; the Pacific share has risen from a pre-Seaway average of forty-two per cent to forty-four per cent in the post-Seaway period.

An important factor contributing to the failure of Thunder Bay to attract a greater share of Canadian grain exports is the development of new markets in Asia, namely India, mainland China and Japan; markets which can best be served by the Pacific route.[5] A second influence has been the decided advantage in the costs of moving grain via the Pacific route since 1958 for grain shipments that traditionally were moved via the eastern route. Figure 2 reveals how the lowering of ocean freight rates in 1958 has improved the cost advantage of the Pacific outlet. Prior to that time, it was less costly to export grain from lower St. Lawrence ports via Thunder Bay. This

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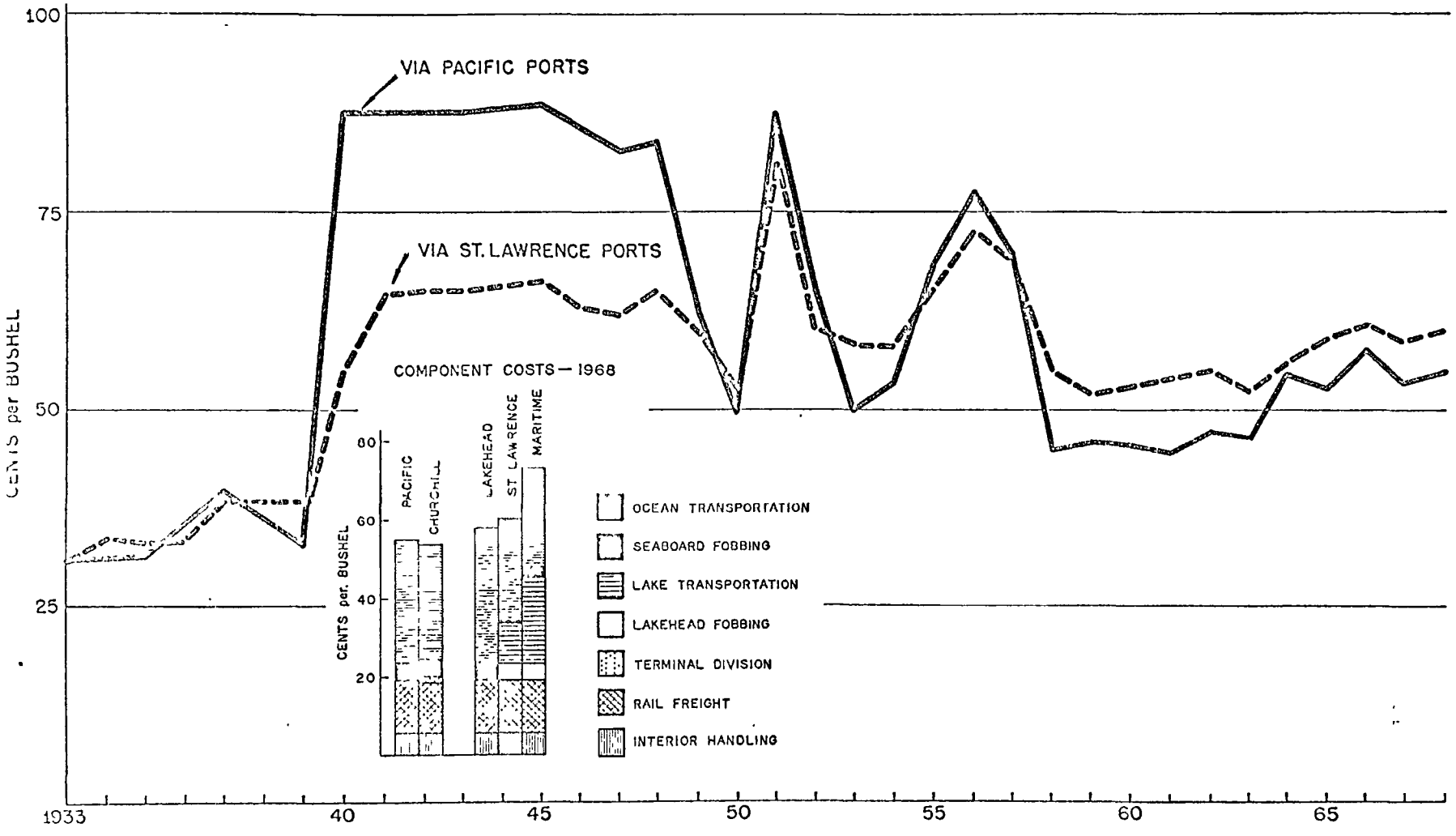
5 The percentage of total Canadian grain exports destined to Asia has grown from 21 per cent in the crop year 1957-1958 to 41 per cent in 1967-1968. (See Table 1, Appendix 1). Nearly 90 per cent of this grain trade to Asia is normally shipped out of the Pacific Coast (See Table 2, Appendix I).

TABLE 6

Canadian Grain Exports by Terminal, Pre-Seaway and Post-Seaway (in thousands of bushels).

Terminal	Pre-Seaway Volume	Pre-Seaway Per cent of total	Post-Seaway Volume	Post-Seaway Per cent of total
Pacific	219,180	42%	140,701	44%
Thunder Bay	281,588	54%	164,182	51%
Churchill	22,550	4%	15,839	5%
Total	523,318	100%	320,722	100%

Source: Board of Grain Commissioners, Canadian Grain Exports, Annual publication .



For figures, see Table 3, Appendix I.

Figure 2. Average Costs of Moving Wheat, Canada to the United Kingdom, 1933-1968

is explained by the fact that, due to the longer distance by sea from the Pacific coast to Europe than from the lower St. Lawrence to Europe, the higher ocean freight costs for grain exported from the Pacific coast more than offset the greater interior transport costs for grain shipped from the lower St. Lawrence. The lowering of grain freight rates on the Great Lakes - St. Lawrence waterway since the opening of the Seaway as shown in Table 7 has not been sufficient to offset the lowering of the ocean freight rates.

Although the above analysis has shown that the St. Lawrence Seaway did not bring about any increase in the relative share of Canadian grain exports moving eastward, it did, however, alter the pattern of grain movements on the Great Lakes - St. Lawrence waterway.

Prior to 1959, there were two main transport patterns used in exporting Prairie grain by way of the eastern route. Common to both was the rail movement of grain from the Prairies to the Thunder Bay terminal. From Thunder Bay, a certain quantity was shipped in large laker vessels to Port Colborne and upper St. Lawrence ports where the grain was reloaded into canallers for the transit via the St. Lawrence River to lower St. Lawrence ports where it was finally transferred to ocean vessels. A

TABLE 7

Ocean and Lake Costs of Moving Canadian Grain to European Destinations, 1956-1968 (in cents per bushel).

Year	Eastern Route			Pacific Route
	Lake[1]	Ocean	Total	Ocean
1956	16.6	34.4	51.0	56.9
1957	16.6	30.5	47.1	49.3
1958	16.6	16.5	33.1	24.3
1959	14.9	16.1	31.0	25.1
1960	14.5	17.4	31.9	25.1
1961	14.3	18.5	32.8	23.7
1962	14.3	19.6	33.9	26.2
1963	11.5	18.5	30.0	24.9
1964	11.5	23.0	34.5	33.8
1965	12.0	25.4	37.4	31.0
1966	12.1	27.0	39.1	35.6
1967	12.1	24.0	36.1	30.4
1968	10.3	26.0	36.3	31.3

(1) From Thunder Bay terminal to Montreal.

Source: Board of Grain Commissioners, Canadian Grain Exports, Annual publication .

second method involved the transfer of grain from Thunder Bay to Georgian Bay ports whence it was railed to lower St. Lawrence and Atlantic ports for transshipment to foreign markets.

These two methods of exporting Canadian grain eastward were inefficient from a logistical point of view but were of benefit to the ports on the Great Lakes since they involved a double handling of the grain shipments, once at Thunder Bay and once more at grain transshipment ports in the Great Lakes. The need for transshipping grain in the Great Lakes was the raison d'être for many of these ports.

The patterns of grain traffic described above underwent a substantial change following the opening of the St. Lawrence Seaway in 1959. Because of the enlarged waterway, it became technically feasible and economically advantageous to move grain in large vessels directly from Thunder Bay to lower St. Lawrence ports or overseas. This change was detrimental to Great Lakes transshipment ports for it meant that grain moving out of the Thunder Bay terminal and destined for overseas markets no longer required transshipment at these ports. This adverse impact is reflected in Table 8 which shows the significant

decline in grain tonnage handled at the Great Lakes ports since 1959. The Lakes coastal traffic, consisting of downbound movements from Thunder Bay to Great Lakes transshipment ports has decreased from a pre-Seaway average of 14.9 million tons to a post-Seaway average of 6.5 million tons. The switch from a water-rail to an all-water movement of grain accounts for the marked increase in the Seaway coastal trade - from 4.1 million tons in the pre-Seaway period to 7.4 million tons in the post-Seaway period. This change is also reflected in Table 9 which shows that the percentage of total grain received by rail at lower St. Lawrence ports has decreased from 26 in the pre-Seaway period to 1 in the post-Seaway period. For the Maritime ports, the percentage has dropped from 100 to 79. Thus, although the percentage of total grain exports transported eastward has not increased since 1959 the Seaway has, however, attracted from the railways a greater share of the eastern grain movement.

Direct grain shipments by ocean vessels from Thunder Bay to overseas destinations were expected to increase following completion of the Seaway. However, the growth in this segment of the grain trade has been moderate. The main reason for the lack of direct overseas grain

TABLE 8

Grain Tonnage Loaded and Unloaded at the Canadian Great Lakes Ports, Pre-Seaway and Post Seaway (in millions of short tons).

Trade	Pre-Seaway Tonnage	Pre-Seaway Per cent of Grand total	Post-Seaway Tonnage	Post-Seaway Per cent of Grand total
Lakes coastal	14.9	72%	6.5	42%
Lakes foreign	1.6	8%	1.0	6%
Lakes total	16.5	80%	7.5	48%
Seaway coastal	4.1	20%	7.4	48%
Seaway foreign	(1)	-	0.6	4%
Seaway total	4.1	20%	8.0	52%
Grand total	20.6	100%	15.5	100%

(1) __: nil or negligible tonnage

Source: Dominion Bureau of Statistics, Shipping Report, Annual publication .

Dominion Bureau of Statistics, Canal Statistics, Annual publication .

TABLE 9

Receipts of Canadian Grain at Lower St. Lawrence and Maritime Ports, Pre-Seaway and Post-Seaway (in millions of bushels).

Ports	Pre-Seaway Volume	Pre-Seaway Percent	Post-Seaway Volume	Post-Seaway Percent
Lower St. Lawrence Ports				
Vessel Receipts	112	74%	274	99%
Rail Receipts	39	26%	4	1%
Total Receipts	151	100%	278	100%
Maritime Ports				
Vessel Receipts	nil	nil	7	21%
Rail Receipts	36	100%	26	79%
Total Receipts	36	100%	33	100%

Source: Dominion Bureau of Statistics, The Grain Trade of Canada, Annual publication .

shipments is attributed to the fact that laker vessel carriers are able to offer more attractive rates due to the availability of a backhaul cargo for lakers unloading grain at lower St. Lawrence ports. Iron ore shipments westbound from Quebec-Labrador mines to steel plants on the Great Lakes complement the heavy eastbound grain movement and this balanced traffic contributes to a lowering of transport costs on the Seaway.[6]

In conclusion, the more convenient and cheaper method of transporting grain eastward provided by the Seaway has not been sufficient to offset developments in ocean freight rates and international grain market conditions which have prevented the eastern route from attracting a larger share of total Canadian grain exports and has in fact produced a decline in relative share. The pattern of grain movements on the Great Lakes - St. Lawrence waterway has changed completely. Now, the method of shipping grain eastward from the Prairies is via Thunder Bay, through the Great Lakes and St. Lawrence Seaway to lower St. Lawrence ports by laker vessels, there to be transshipped into ocean vessels for the voyage overseas.

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6 G. V. Sainsbury, "Bulk Cargo Traffic in the St. Lawrence Seaway", Writings on Canadian-American Studies, Vol. 3, p.79.

Iron Ore

The iron ore trade in the Great Lakes - St. Lawrence region was an important element in the decision to construct the St. Lawrence Seaway. In the first half of the twentieth century, the principal origin of iron ore that was handled by the Great Lakes ports was the Mesabi Range, in northern Minnesota, which possessed large resources of high-grade ore. World War II greatly depleted the Mesabi reserves of high-grade ore and left mainly ores of low iron content. The search for new iron ore supplies began and, as a result, the great ore body in Quebec Labrador was developed.

The problem that emerged at the time was the great distance from the Quebec-Labrador region to the steel mills located in the Great Lakes region. The two main routes used at the beginning for the transport of the ore from Quebec Labrador were to either bring it by sea to United States Atlantic ports and thence by rail inland to the steel production centres in the Great Lakes region, or to ship it by small canal boats via the shallow St. Lawrence River canal system to Great Lakes ports. Both these routes were considered very costly and attention turned toward the possibility of relocating the steel plants to the East Coast nearer to the Quebec Labrador ore resources. The problem was resolved with the

decision to construct the St. Lawrence Seaway. The steel industry had given its support to the project and had thus provided an important force on the side of the Seaway proponents.

In the pre-Seaway period, the iron ore traffic handled by the Canadian ports in the Great Lakes included two major movements and two minor ones. The larger trades were interlake and involved the shipping of ores from Canadian ports on the north shore of Lake Superior to U.S. Great Lakes ports serving the large steel producing complexes located in the Great Lakes region, and, secondly, from U.S. Lake Superior iron ore ports to Ontario steel mills at Hamilton and Sault Ste. Marie. Of lesser importance were the coastal flows originating from Quebec Labrador and from Lake Superior mines and destined, upbound and downbound respectively, to Canadian iron ore consumers in the Great Lakes area.

The St. Lawrence Seaway did not have any immediate impact on these patterns of iron ore traffic at the Canadian Great Lakes ports.[7] Following the opening of the Seaway,

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7 The Seaway did, however, have an immediate impact on the U.S. Great Lakes iron ore ports which began to receive substantial volumes of Quebec-Labrador ore in 1959 and thereafter.

the Ontario steel mills continued to draw on their traditional source, the Mesabi Range, until 1964 due principally to ownership by the Canadian steel industry of several iron ore mining operations in the United States[8] and also because of a number of technological breakthroughs which made possible the further commercial utilization of the low grade ore in the Mesabi Range.[9] After 1964, the Canadian steel mills began to receive an increasing proportion of their iron ore supplies from the Quebec Labrador region, namely the Wabush mine development where the two steel producers in Hamilton, Stelco and Dofasco, participated with other companies in the development of large iron ore bodies. The switch by the Canadian steel industry from Mesabi Range ore to Quebec Labrador ore after 1964 is reflected in Table 10 which shows an appreciable increase in Seaway coastal trade and a decline in the relative importance of the Lakes import trade from U.S. Great Lakes ports. An increase in the use of domestic iron ore sources by the Canadian steel industry has led to a growth in the Lakes coastal trade from Lake

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8 Donald Kerr, "The St. Lawrence Seaway and Trade on the Great Lakes, 1958-63", The Canadian Geographer, VII, 4, 1964, p. 190.

9 The technique of ore concentration has permitted the exploitation of ore bodies which had not been considered economically feasible.

10 See Table 4, Appendix I.

Superior. The Lakes foreign trade from Canadian Lake Superior ports to U. S. Lake Erie ports was partly displaced by the Quebec-Labrador ore, while the trade to Lake Michigan ports was not affected due mainly to its proximity in comparison to the more distant Quebec-Labrador ore suppliers. As a result of the change in the patterns of iron ore traffic at the Great Lakes ports since 1959, twenty-two per cent of the iron ore handled at the ports now moves via the Seaway as compared to three per cent in the pre-Seaway period.

The total volume of iron ore handled at the Great Lakes ports has increased markedly since the pre-Seaway period. This growth is attributed mainly to a rise in the consumption of iron ore at Canadian iron and steel plants from 5.9 million tons in 1959 to 10.7 million tons in 1968.[11] Ore demand, however, has not increased as much as may have been expected due to the technological advances made after 1959 which have meant that, ton for ton, less ore is needed for the same amount of steel produced than was previously required.[12] Hence the

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11 See Table 4, Appendix I.

12 For example, the electric furnace requires relatively less iron ore than the open hearth furnace in raw steel production.

TABLE 10

Iron Ore Tonnage Loaded and Unloaded at the Canadian Great Lakes Ports, Pre-Seaway and Post-Seaway (in millions of short tons).

Trade	Pre-Seaway Tonnage	Pre-Seaway Per cent of Grand total	Post-Seaway Tonnage	Post-Seaway Per cent of Grand total
Lakes coastal	0.5	6%	2.4	19%
Lakes foreign, E(1)	3.8	43%	4.3	34%
Lakes foreign, I.	4.3	48%	3.1	25%
Lakes total	8.6	97%	9.8	78%
Seaway coastal	0.3	3%	2.7	22%
Seaway foreign	-	-	-	-
Seaway total	0.3	3%	2.7	22%
Grand total	8.9	100%	12.5	100%

(1) E: Exports
I: Imports

Source: Dominion Bureau of Statistics, Shipping Report, Annual publication .

Dominion Bureau of Statistics, Canal Statistics, Annual publication .

potential transport market has been reduced with resulting tonnage losses to the ports.

In conclusion, the main effect of the St. Lawrence Seaway on the iron ore trade handled at the Great Lakes ports was to significantly increase shipments from the Quebec-Labrador area and thus to enhance the importance of the Seaway to the Great Lakes ports. The growth in the volume of iron ore at the ports since 1959 can be attributed largely to a rising demand for ore by the steel industry in the Great Lakes region.

Coal

The coal traffic serviced at the Canadian ports on the Great Lakes is generated by a major interlake trade from U.S. Lake Erie ports to industrial users on Lake Ontario and a relatively minor coastal trade from Nova Scotia mines to the same industrial users in Ontario.

As illustrated in Table 11, these trade patterns have not been altered significantly by the St. Lawrence Seaway. Larger shipments of coal were expected to flow between Nova Scotia and the Great Lakes but this did not materialize after 1959. This may be partly explained by the fact that although ocean vessels engaged in the transport of Nova Scotia coal overseas could go through

the enlarged Seaway locks, the coal-receiving docks along the Canadian side of the Great Lakes were not equipped for unloading coal from these ships. Moreover, the small self-unloading carriers normally used on the Great Lakes had not been designed to withstand the wave and weather conditions of the voyage to Nova Scotia. Trans-shipment at Montreal was therefore still required after 1959, a costly method of transporting the coal from Nova Scotia to the Great Lakes.

The more important factor in preventing larger inroads of Nova Scotia coal into the Ontario market has been the high cost of producing coal in Nova Scotia relative to U.S. imported coal, a situation which has progressively worsened since 1959 and which prompted the Federal Government to end subvention of Nova Scotia coal in 1968 and to gradually phase out much of the mining operation in that province.[13]

Total tonnage at the Great Lakes ports has risen appreciably from a pre-Seaway average of 12.8 million tons to a post-Seaway average of 15.7 million tons, as shown in Table 11. This growth is mainly attributable to strong market demand for coal in Ontario; from 1959 to 1968,

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13 Dominion Coal Board, Annual Report, 1968.

TABLE 11

Coal Tonnage Loaded and Unloaded at the Canadian Great Lakes Ports, Pre-Seaway and Post-Seaway (in millions of short tons).

Trade	Pre-Seaway Tonnage	Pre-Seaway Per cent of Total	Post-Seaway Tonnage	Post-Seaway Per cent of Total
Lakes coastal	-	-	-	-
Lakes foreign	12.8	99%	14.9	95%
Lakes total	12.8	99%	14.9	95%
Seaway coastal	0.1	1%	0.8	5%
Seaway foreign	-	-	-	-
Seaway total	0.1	1%	0.8	5%
Grand total	12.8	100%	15.7	100%

Source: Dominion Bureau of Statistics, Shipping Report, Annual publication .

Dominion Bureau of Statistics, Canal Statistics, Annual publication .

Ontario has had an increase of a third in her coal requirements due principally to a notable increase in the volume of coal used for electric power generation and by the iron and steel industry.[14] A decrease in the ratio of coal required per ton of steel produced, due to the greater efficiency of blast furnaces, has prevented an even greater coal demand by the iron and steel industry.[15]

Petroleum[16]

Petroleum tonnage loaded and unloaded at Canadian Great Lakes ports is derived from a Lakes coastal trade between Ontario's refineries at Sarnia and Toronto and points on the Canadian side of the Great Lakes, and a Seaway trade which includes a coastal movement from Montreal to the Great Lakes ports and an overseas trade directly into the Lakes via the St. Lawrence Seaway.

As evidenced by Table 12, the growth of Seaway petroleum traffic handled at the Great Lakes ports has been moderate, rising from a pre-Seaway average of 1.4 million tons to a post-Seaway average of 2.4 million tons. A

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14 See Table 5, Appendix I.

15 The ratio of coal consumed to steel produced declined from a high of .83 in 1959 to a low of .56 in 1968. See Table 6, Appendix I.

16 Includes crude petroleum and petroleum products, namely gasoline and fuel oil.

restraining influence on this type of traffic on the Seaway has been the National Oil Policy, established in 1961 by the Federal Government. It was decided then that the region west of the Ottawa Valley would be served by products derived from crude oil produced in the Prairies. Imports of crude petroleum and petroleum products were thus prevented from reaching this designated area. This only left the Ontario market east of the Ottawa Valley together with Quebec and the Maritimes as an open market to imported petroleum. The St. Lawrence Seaway, by permitting direct shipments of foreign petroleum into the Great Lakes after 1959 and allowing them to compete with domestic suppliers in Ontario, was one of the factors which led to the Government's enactment of the legislation.[17]

As a consequence of the new policy, crude petroleum imports west of the Ottawa Valley via the Seaway decreased considerably in 1961 and subsequent years.[18] Strict adherence to the National Oil Policy would also have reduced movements of petroleum products, namely fuel oil and gasoline, but because Ontario refineries have been unable to supply the buoyant market demand of that province

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17 J.W. Fraser and W.G. Lugg, Petroleum and Natural Gas Industry in Canada, 1963-1968. Mineral Resources Branch, Department of Energy, Mines and Resources, Ottawa, 1970, p.112.

18 St. Lawrence Seaway Authority, Traffic Report, Annual publication .

TABLE 12

Petroleum Tonnage Loaded and Unloaded at the Canadian Great Lakes Ports, Pre-Seaway and Post-Seaway (in millions of short tons).

Trade	Pre-Seaway Tonnage	Pre-Seaway Per cent of Grand total	Post-Seaway Tonnage	Post-Seaway Per cent of Grand total
Lakes coastal	4.5	61%	5.6	68%
Lakes foreign	1.5	20%	0.2	2%
Lakes total	6.0	81%	5.8	70%
Seaway coastal	1.1	15%	1.9	24%
Seaway foreign	0.3	4%	0.5	6%
Seaway total	1.4	19%	2.4	30%
Grand total	7.4	100%	8.2	100%

Source: Dominion Bureau of Statistics, Shipping Report, Annual publication .

Dominion Bureau of Statistics, Canal Statistics, Annual publication .

for these products, the Government has allowed movements of petroleum products to continue from Montreal and foreign suppliers into the restricted area. The steady growth in these movements since 1959 has enhanced the importance of the Seaway petroleum trades handled at the Great Lakes ports. Seaway coastal and foreign petroleum movements represented thirty per cent of total petroleum tonnage at the ports in the post-Seaway period as compared to nineteen per cent in the pre-Seaway period. The St. Lawrence Seaway by allowing large tankers to proceed above Montreal certainly has facilitated these movements.

General Cargo

General cargo consists of those goods packed in boxes, bags, bales, barrels, crates, drums, etc.. It is very diversified and includes most manufactures and other items of high value. The importance of general cargo to the Great Lakes ports is considerable. General cargo is much more significant than bulk cargo as a source of revenue and employment due to the fact that bulk cargo handling is generally highly mechanized and, therefore, affect only a small part of the labour force, while general cargo requires a diverse labor force.[19]

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19 Guido G. Weigend, "Some Elements in the Study of Port Geography". Geographical Review, Vol. XLVIII; No. 2, April 1958, p. 192. See also Appendix II

Table 13 shows the volumes of general cargo tonnage handled at the Canadian Great Lakes ports in the pre-Seaway and post-Seaway periods.[20] Prior to the opening of the St. Lawrence Seaway, in 1959, movements of general cargo on the Seaway were in relatively small quantities, in ships carrying a maximum of about two thousand tons of cargo; the pre-Seaway traffic averaged 1.1 million tons in the coastal movement and 400 thousand tons in the foreign flow. Much of the coastal traffic via the Seaway included cargo from overseas that had been transshipped at Montreal. With the opening of the deep waterway, large ocean ships were able to navigate the Seaway canals and, as a result, the direct overseas flow of imports and exports of general cargo has nearly tripled. The Seaway coastal tonnage although stripped of much transshipment tonnage, has nevertheless remained at its pre-Seaway level, partly because of the special toll rate assessed on coastal movements of general

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20 The statistical publications employed for this study except for the Seaway Traffic Reports, do not have a separate classification for general cargo. It was necessary for the purpose of this analysis to define general cargo as including all commodities other than those principal bulk commodities listed in Table 1, Appendix III. The 'general cargo data of table 13, therefore includes some miscellaneous bulk commodities. However, this should not unduly bias the analysis since the volume that these commodities represent is insignificant relative to that of the principal bulk commodities.

cargo.[21] The Lakes general cargo traffic which is not in competition with the Seaway traffic was not affected by the new waterway. Total general cargo tonnage at the Great Lakes ports has grown from an average of 4.3 million tons in the 1956-1958 period to an average of 6.7 million tons in the 1966-1968 period. The general economic growth in the Great Lakes region, particularly in the Toronto-Hamilton area during the 1960's has played an important part in this general cargo advance.

Much of the new traffic in general cargo attracted by the Seaway has come at the expense of the East Coast ports and the railroads. The position of general cargo shipments has deteriorated at the East Coast ports of St. John and Halifax; each port experienced a steady and gradual decline in total general cargo handled after 1959.[22] Since much of the general cargo handled at these ports originates from or is destined to distant urban centres in Ontario and Quebec by way of rail transport, the railways have consequently lost this East Coast port traffic to the alternate route of transport provided by the St. Lawrence Seaway.

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21 General cargo movements which originate at one Canadian point and terminate at another Canadian point are assessed at the bulk cargo toll rate. See Appendix IV for Seaway Tariff of Tolls.

22 Grace A. Powell, Foreign Traffic Hinterlands of the Ports of Halifax and St. John. Prepared for National Harbours Board, Ottawa, 1968. p. 66.

TABLE 13

General Cargo Tonnage Loaded and Unloaded at the Canadian Great Lakes Ports, Pre-Seaway and Post-Seaway (in millions of short tons).

Trade	Pre-Seaway Tonnage	Pre-Seaway Per cent of Grand total	Post-Seaway Tonnage	Post-Seaway Per cent of Grand total
Lakes coastal	1.8	42%	2.4	37%
Lakes foreign, E	0.7	18%	1.2	18%
Lakes foreign, I	0.2	5%	0.2	3%
Lakes total	2.7	65%	3.8	57%
Seaway coastal	1.1	25%	0.9	13%
Seaway foreign, E	0.2	5%	0.9	14%
Seaway foreign, I	0.2	5%	1.1	16%
Seaway total	1.5	35%	2.9	43%
Grand total	4.2	100%	6.7	100%

Source: Dominion Bureau of Statistics, Shipping Report, Annual publication .

Dominion Bureau of Statistics, Canal Statistics, Annual publication .

Shippers of general cargo have been slow in taking full advantage of the new opportunities offered by the improved waterway. Because general cargo is associated with a much longer and more diverse set of origins and destinations than bulk commodities, it has been slower to react to the St. Lawrence Seaway. Moreover, because the cost of transporting general cargo relative to its value is of lesser significance than for bulk cargo, the shipper of general cargo is normally inelastic to changes in tranport costs. Other factors have hindered a more rapid growth in general cargo on the Seaway and these include the lengthy transit time, the infrequency of sailings out of the Great Lakes ports as compared with East Coast ports, the relatively short navigation season, the imbalance in traffic and lack of port facilities and harbour improvements.

CHAPTER IV

IMPACT OF SEAWAY ON PORTS

This chapter attempts to determine which of the Great Lakes ports have benefited and which were adversely affected as a result of the St. Lawrence Seaway's impact on volumesand patterns of trade in the Great Lakes. Part one investigates whether there has occurred an increase in concentration of traffic at large ports in the period following the opening of the Seaway. Part two analyzes the changes in cargo volumes at the various ports in the Great Lakes.

1. Concentration of Cargo Traffic

In the preceeding chapter it was shown that the St. Lawrence Seaway had contributed to an accelerated growth of Seaway trade in the Great Lakes and had created new patterns of trade for some commodities, particularly grain. The object of the first part of this chapter is to determine whether these developments have resulted in a redistribution of total Great Lakes trade in favour of large ports; in other words, is there evidence of any increase in

concentration of traffic at the larger ports with relative declines at the smaller ports in the Great Lakes. The method used to answer this question is a relative measure of dispersion known as the coefficient of variation. It is the standard deviation expressed as a percentage of the arithmetic mean.[1] For example, if the index were zero it would indicate no dispersion and thus equal tonnage among all the ports would prevail; an increase in the statistic shows greater dispersion among the ports and thus an increase in inequalities. Table 14 presents the results of applying the index of traffic concentration to the total trade handled at the Great Lakes ports for each year from 1956 to 1968.

The results indicate that traffic has in fact polarized increasingly toward the large ports for the index has increased significantly in the period following the opening of the Seaway; from an average dispersion of 1.63 in the pre-Seaway period the dispersion has risen to an average of 1.84 in the post-Seaway period with a high of 2.02 having been achieved in 1964.[2]

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1 The measure is defined as $V = \frac{\left[\sum_{i=1}^{n} \frac{(Y_i - \bar{Y})^2}{n}\right]^{\frac{1}{2}}}{\bar{Y}}$

where y_i - tonnage at nth port
$\bar{y}$ - average tonnage at all ports
n - number of ports

2 The downward trend in the index after 1964 could be attributed to the fact that small ports are winning business because of more reliable and speedier service.

TABLE 14

Index of Traffic Concentration at the Canadian Great Lakes Ports, 1956 - 1968.

Year	Index	Year	Index
1956	1.69	1963	1.90
1957	1.62	1964	2.02
1958	1.58	1965	1.93
1959	1.76	1966	1.92
1960	1.78	1967	1.84
1961	1.83	1968	1.74
1962	1.78		
Pre-Seaway Average	1.63		
Post-Seaway Average	1.84		

Source: Index computed from Table 11, Appendix I.

In Table 15 a comparison is made of the cargo volumes handled at each Great Lakes port during the pre-Seaway and post-Seaway periods. It gives some indication of where concentration has occurred. Of the large ports[3] in the pre-Seaway period, Thunder Bay, Hamilton, Toronto, Sault Ste. Marie and Sarnia have increased their share of total Great Lakes tonnage from 58 to 67 percent, while Port Colborne, Prescott and Kingston have declined in relative importance due to their diminishing role as grain transshipment ports. Windsor and Port Credit have replaced Prescott and Kingston in the large port category. Lastly, in the post-Seaway period, 76 percent of total Great Lakes tonnage was concentrated in the top eight ports as compared to 70 percent in the pre-Seaway period.

The increase in traffic concentration since 1959 is largely attributed to a general trend in world port development toward polarization of cargo traffic at large ports. This trend has been accelerated and accentuated

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3 Ports with tonnage above the average. See note to Table 15.

TABLE 15

Comparative Cargo Tonnages at the Canadian Great Lakes Ports,[1] Pre-Seaway and Post-Seaway (in thousands of short tons).

Port	Post-Seaway	Pre-Seaway	Pre-Seaway Rank	Per cent Change
Thunder Bay	16,089	12,918	1	+25%
Hamilton	11,104	7,183	2	+55%
Toronto	5,697	4,933	3	+15%
Sault Ste.Marie	4,962	4,517	4	+10%
Sarnia	4,200	3,313	6	+27%
Port Credit	3,254	980	14	+232%
Port Colborne	2,688	4,253	5	+37%
Windsor	2,586	1,415	10	+83%
Clarkson	1,966	1,116	12	+76%
Goderich	1,269	640	17	+98%
Picton	1,182	634	18	+86%
Little Current	1,036	952	15	+ 9%
Prescott	864	2,890	7	-70%
Thorold	688	994	13	-31%
Kingston	590	2,079	8	-72%
Midland	561	1,586	9	-65%
Walkerville	491	645	16	-100%

TABLE 15 (continued)

Parry Sound	413	408	22	+ 1%
Owen Sound	371	417	20	-11%
Michipicoten	359	1,238	11	-71%
St. Catharines	330	355	24	- 7%
Oshawa	317	226	27	+40%
Marathon	317	268	26	+16%
Amherstburg	284	176	31	+61%
McNicoll	239	351	25	-32%
Stanley	239	414	21	-42%
Britt	234	187	29	+25%
Belleville	230	397	23	-42%
Welland	215	180	30	+19%
Cobourg	139	154	33	-10%
Collingwood	124	221	28	-44%
Cornwall	105	421	19	-75%
Kingsville	100	28	35	+254%
Wallaceburg	62	101	34	-33%
Brockville	20	175	32	-89%
Grand total	62,947	56,765		
Mean[2]	1,798	1,624		

(1) Ports of relatively small size and of negligible tonnages have been excluded.

(2) For the purpose of this analysis the mean of total tonnage handled at the Great Lakes ports for the pre-Seaway and post-Seaway periods is used as the demarcation point in order to designate a port as either large or small. Thus, ports with tonnage above the average are classified as large while those below are classified as small ports.

Source: Computed from Table 11, Appendix I

as a result of the St. Lawrence Seaway for the following reasons. Firstly, the Seaway necessitated the expansion of port facilities and the construction of new harbour works in order to accommodate the larger vessels entering the Great Lakes, and since the large ports were in a sounder financial position to undertake these capital improvements, they were therefore able to establish, at an early date, solid trade relations which the smaller ports subsequently found difficult to alter. Secondly, the change after 1959 in the pattern of grain movements in the Great Lakes resulted in several transshipment ports both large and small incurring substantial tonnage losses which had the effect of increasing the relative size of the large non-transshipment ports.

2. The Ports

This section analyzes changes in traffic volumes at the various Great Lakes ports due to the effect of the St. Lawrence Seaway on commodity movements in the Great Lakes. Because of the large number of ports operating in the Great Lakes and the myriad of commodities handled, the analytical task was reduced to manageable proportions by classifying all ports into port groups according to their geographical location. The different regional

groupings include: Upper St. Lawrence; Lake Ontario; Welland Canal; Lake Erie and Lake St. Clair; Lake Huron and Georgian Bay; and Lake Superior. A list of the Great Lakes ports by region is given in Table 16.[4]

The impact of the Seaway on commodity movements in the Great Lakes has resulted in several adjustments in cargo volume handled at the ports. To further render the analysis manageable only the important changes that have occurred in each port region are presented. Moreover, the role of the Seaway in inducing these volume changes has been analyzed in the preceeding chapter and will therefore not be repeated but only referred to.

Upper St. Lawrence

The upper St. Lawrence ports are situated in that region of the St. Lawrence River between Kingston and Montreal. Table 17 shows that these ports as a group have experienced a marked decline in relative importance since the opening of the Seaway; their percentage share of total Great Lakes trade has decreased from an average of 9 per cent in the pre-Seaway period to an average of 2 per cent

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4 Traffic data showing the performance of each individual port over the period 1956-1968 can be found in Table 11, Appendix I.

TABLE 16

Canadian Great Lakes Ports[1] by Geographical Region

Lake Ontario	Lake Huron Georgian Bay	Lake Erie Lake St. Clair	Lake Superior	Upper St. Lawrence	Welland Canal
Belleville	Britt	Amherstburg	Marathon	Brockville	Port Colborne
Clarkson	Collingwood	Kingsville	Michipicoten	Cornwall	St. Catharines
Cobourg	Goderich	Sarnia	Sault Ste.Marie	Kingston	Thorold
Hamilton	Little Current	Stanley	Thunder Bay	Prescott	Welland
Oshawa	McNicoll	Walkerville			
Picton	Midland	Wallaceburg			
Port Credit	Owen Sound	Windsor			
Toronto	Parry Sound				

(1) Ports of relatively small size and of negligible tonnages have been excluded.

TABLE 17

Cargo tonnage at the Canadian Great Lakes Ports by Port Groups, Pre-Seaway and Post-Seaway (in thousands of short tons).

Port Group	Post-Seaway Tonnage	Post-Seaway Percent of total	Pre-Seaway Tonnage	Pre-Seaway Percent of total	Percent Tonnage Change
Lake Ontario	23,885	36%	15,623	26%	+53%
Lake Superior	21,721	33%	18,941	32%	+15%
Lake Erie/ Lake St.Clair	7,960	12%	6,092	10%	+31%
Welland Canal	3,921	6%	5,782	10%	-32%
Lake Huron/ Georgian Bay	3,876	6%	4,762	8%	-19%
Upper St. Lawrence	1,580	2%	5,565	9%	-72%
Miscellaneous (1)	3,754	5%	2,644	5%	+42%
Total	66,700	100%	59,400	100%	+12%

(1) Ports of relatively small size.

Source: Computed from Table 11, Appendix I.

in the post-Seaway period. In tonnage terms as illustrated in Table 17 the decline has been from 5.6 million tons to 1.3 million tons.

The significant drop in port activity in the upper St. Lawrence region has been due almost entirely to losses in grain tonnage handlings. Prior to 1959 grain was received from Thunder Bay and loaded thereafter into canallers for the transit via the St. Lawrence canals to lower St. Lawrence transshipment ports. Due to the new patterns of grain movements created by the Seaway[5] the grain tonnage handled at the major transshipment ports, namely Prescott and Kingston, consequently declined as Table 18 illustrates. Today, the bulk of shipments handled in the upper St. Lawrence port region is still grain, destined not for overseas markets but for domestic consumption in the immediate region. To a lesser degree the ports in this region have also lost transshipment tonnage in other commodities.

Lake Ontario

The Lake Ontario ports, as a group, have increased their share of total Great Lakes tonnage from 26 per cent

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5 For further explanation refer to Chapter III, pp. 25-35.

TABLE 18

Grain Volumes at Principal Upper St. Lawrence[1] and Welland Canal[2] Transshipment Ports 1956-1968 (in thousands of short tons).

Year	Prescott	Kingston	Port Colborne
1956	2,398	1,484	3,786
1957	2,027	1,164	2,860
1958	3,296	1,570	3,540
1959	1,424	1,440	2,006
1960	1,019	901	1,030
1961	1,731	932	1,445
1962	1,247	766	997
1963	1,455	384	1,130
1964	803	435	1,329
1965	960	385	828
1966	795	388	1,160
1967	627	109	654
1968	529	121	540

(1) Prescott and Kingston

(2) Port Colborne

Source: Dominion Bureau of Statistics, Shipping Report, Annual publication .

in the 1956 - 1958 period to 36 per cent in the 1966 - 1968 period, and their tonnage from 15.6 million to 23.9 million tons. This tonnage growth has enabled Lake Ontario to become the principal centre of port activity in the Great Lakes.

This group of ports is the most diversified of all in the Great Lakes in terms of the nature of trade they service and this is reflected in their handling of significant volumes of general cargo; over 75 per cent of Seaway trade in general cargo (Canadian) originates or is destined to Lake Ontario ports.[6] The fact that the hinterland served by these ports is highly industrialized and urbanized contributes to their enviable situation of handling large volumes of general cargo. The chief impact of the Seaway on the Lake Ontario ports was to bring about a growth in their general cargo tonnage, The Port of Toronto in particular has experienced a sharp rise in overseas cargo trade, the greater portion of which consists of general cargo; Table 19 shows an increase in this traffic from 162 thousand tons in 1956 to 1.4 million tons in 1968. To a lesser extent, the Port of Hamilton has also benefited from the general cargo trade generated

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6 See Table 7, Appendix I.

TABLE 19

Overseas Tonnage Growth at the Port of Toronto, 1956-1968 (in thousands of short tons).

Year	Total Trade	Overseas Trade	% Overseas
1956	5,288	162	3%
1957	5,107	204	3%
1958	4,406	303	6%
1959	4,769	721	15%
1960	4,559	777	17%
1961	5,079	925	18%
1962	5,312	1,023	19%
1963	6,167	1,054	17%
1964	5,713	1,248	21%
1965	5,826	1,489	25%
1966	5,595	1,462	26%
1967	5,759	1,497	25%
1968	5,738	1,393	24%

Source: Dominion Bureau of Statistics, Shipping Report, Annual publication.
The Toronto Harbour Commissioners, Analysis of Tonnage - Port of Toronto, 1969.

by the Seaway. Another important change effected by the Seaway in the Lake Ontario port region was to shift the pattern of iron ore shipments from a lake trade to a predominantly Seaway trade west to east. This is reflected in Table 20 which reveals that in 1968 the Canadian steel firms located in Hamilton received 52 per cent of their iron ore supplies from the Quebec Labrador mines in Eastern Canada in contrast to only 19 per cent in 1959.

Welland Canal

The Welland Canal region forms the link between Lake Erie and Lake Ontario. Much of the trade handled by the ports in this region is lake traffic and has not been affected by the Seaway. The sole exception is grain traffic at Port Colborne, located at the point where the Welland Canal enters Lake Erie. This port was formerly of great importance as a transshipment port for grain, but today, the grain trade bypasses this harbour.

Due to the significant reduction in the volume of grain traffic at Port Colborne, as Table 18 illustrates, the Welland Canal region has experienced a decline in its share of total Great Lakes trade from 10 per cent in the pre-Seaway period to a level of 6 per cent in the post-Seaway period. In tonnage terms, the decline has been from 5.8 million to 3.9 million tons.

TABLE 20

Origin of Iron Ore Shipments Received at the Port of Hamilton, 1959-1968 (in thousands of short tons).

Year	Lake Superior Ore Tonnage	% of total	Quebec Labrador Ore Tonnage	% of total	Total
1959	1,632	81%	391	19%	2,023
1960	3,614	94%	244	6%	3,858
1961	3,032	90%	325	10%	3,357
1962	3,946	97%	120	3%	4,066
1963	4,391	97%	155	3%	4,546
1964	4,104	99%	36	1%	4,140
1965	3,900	78%	1,089	22%	4,989
1966	3,608	62%	2,190	38%	5,798
1967	2,408	46%	2,827	54%	5,235
1968	2,875	48%	3,075	52%	5,950

Source: St. Lawrence Seaway Authority, Traffic Report, Annual publication.

Lake Erie and Lake St. Clair

The ports in this region do not trade significantly in commodities which the Seaway would influence. The exception is the port of Sarnia which ships petroleum in significant volumes from its refineries to points along the Great Lakes. The petroleum from Sarnia serves the same market as the petroleum shipped to the Great Lakes via the Seaway, but these two movements are not in competition with one another since the latter only fills a demand requirement which cannot be fully met by Ontario refineries.[7] Undoubtedly, the port of Sarnia along with other Great Lakes ports where petroleum refineries are located would handle more petroleum shipments if refinery capacity was expanded.[8]

The Lake Erie and Lake St. Clair port region has increased slightly its share of Great Lakes tonnage from 10 to 12 per cent. In absolute terms, the ports have increased their total cargo tonnage from 6.1 million to 8.0 million tons. This gain is to some extent attributed to strong regional economic growth during the period examined.

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7 For further explanation refer to Chapter II, pp. 44-47.

8 Given a petroleum shipment of single origin and destination a Seaway movement involves handling the shipment at a single Great Lakes port rather than at two ports in the case of an inter or intra lake coastal movement.

Lake Huron and Georgian Bay

Grain was by far the principal commodity handled by the ports in the Lake Huron and Georgian Bay region prior to the opening of the St. Lawrence Seaway. The grain handled there was received from the Thunder Bay grain terminal via laker vessels and was thence moved by rail to eastern Canadian ports where the grain was transferred to ocean vessels for the overseas voyage. With the new pattern of grain movements established following the opening of the Seaway after 1959, the Lake Huron and Georgian ports as a group have lost significant volumes of grain as revealed in Table 21. This loss in overseas grain traffic was partly offset by increased annual grain receipts for the domestic market in the Ontario area which has enabled the ports in this region to retain most of their share of pre-Seaway Great Lakes cargo trade. The St. Lawrence Seaway has not had as severe of an impact on the grain transshipment ports of this region as it had on others, but it nevertheless prevented any upward growth in their total traffic tonnage which has in fact declined from 4.8 to 3.9 million tons.

TABLE 21

Grain Volumes at Principal Lake Huron and Georgian Bay Transshipment Ports, 1956-1968 (in thousands of short tons).

Year	Midland	Goderich	McNicoll	Owen Sound	Collingwood
1956	1,468	686	500	369	257
1957	1,053	513	145	213	141
1958	1,130	575	393	329	192
1959	1,039	515	311	292	185
1960	816	508	234	244	177
1961	772	484	342	238	170
1962	531	331	184	159	104
1963	521	440	199	198	116
1964	661	482	280	291	125
1965	675	439	269	302	119
1966	634	440	243	267	115
1967	460	484	181	262	159
1968	329	361	201	221	83

Source: Dominion Bureau of Statistics, Shipping Report, Annual publication .

Lake Superior

Grain and iron ore are the principal commodities handled by the Lake Superior ports. As Table 22 illustrates, the impact of the Seaway on the iron ore trade in the Great Lakes led to a decline in ore shipments from the port of Michipicoten to markets in Lake Erie. The iron ore trade from the port of Thunder Bay, however, was only slightly affected by the Seaway due mainly to the fact that the nearness to iron ore markets in Lake Michigan gives the ore handled at Thunder Bay a competitive advantage over the more distant Quebec-Labrador ore.[9] The trend in grain traffic handled at the port of Thunder Bay has during the period 1956-1968 been erratic as table 23 illustrates. The reason is that this traffic is subject to considerable oscillations reflecting the size of harvests and world grain market conditions. The advances in grain volumes at the port of Thunder Bay are attributable mainly to rising export sales of Canadian grain. It is likely that these gains would have been more pronounced had certain negative factors not offset the cost advantage given by the St. Lawrence Seaway to the eastern route vis a vis the Pacific route.[10]

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9 For further explanation refer to Chapter II, pp.36-41.

10 For further explanation refer to Chapter II, pp.25-35.

TABLE 22

Volumes of Iron Ore Shipped From Lake Superior Ports, 1956-1968 (in thousands of short tons).

Year	Thunder Bay	Michipicoten
1956	3,687	901
1957	2,624	983
1958	1,331	1,034
1959	3,239	1,091
1960	2,633	751
1961	2,362	682
1962	3,196	540
1963	3,094	321
1964	3,662	405
1965	3,150	372
1966	2,101	337
1967	3,212	230
1968	4,343	315

Source: Dominion Bureau of Statistics, Shipping Report, Annual publication .

TABLE 23

Volumes of Grain at the Port of Thunder Bay, 1956-1968 (in thousands of short tons).

Year	Thunder Bay Volume	Canadian Grain Exports(1)
1956	9,835	12,289
1957	7,494	11,908
1958	8,355	13,592
1959	7,521	11,284
1960	7,788	11,020
1961	9,347	12,848
1962	5,868	12,845
1963	9,659	11,835
1964	12,028	20,561
1965	11,667	14,461
1966	14,243	20,403
1967	9,967	18,587
1968	7,098	12,354

(1) Crop year ending in respective calendar year.

Source: Dominion Bureau of Statistics, Shipping Report, Annual publication .

Board of Grain Commissioners, Canadian Grain Exports Annual publication .

The St. Lawrence Seaway has generated a modest increase in overseas imports of general cargo at the port of Thunder Bay which serves part of the vast western hinterland. The principal factor contributing to this increase has been the availability of grain as a return cargo for incoming ocean vessels, thus providing them with a balanced inbound and outbound carrying trade which is an important element in water transport efficiency.

Largely due to increases in grain tonnage at Thunder Bay the Lake Superior share of Great Lakes trade has increased from 32 per cent in the pre-Seaway period to 33 per cent in the post-Seaway period. In tonnage terms, the growth experienced has been from 18.9 million to 21.7 million tons.

In this chapter we have seen that following the opening of the St. Lawrence Seaway in 1959 there has occurred a marked rise in the trend toward concentration of cargo traffic at the larger ports in the Great Lakes. The Seaway has had a major influence in this development. The grain transshipment ports located in the upper St. Lawrence, Welland Canal, and Lake Huron/Georgian Bay region

have experienced substantial tonnage losses due to the new patterns of grain movements created by the Seaway. The majority of ports in the Welland Canal and Lake Erie/ Lake St. Clair region handle predominantly lake traffic and have not been affected by the Seaway. Ports in Lake Ontario appear to have benefited most from the Seaway due largely to their handling of most of the overseas general cargo generated by the new waterway. Part of the iron ore trade from Lake Superior ports was lost to the Quebec Labrador ore transported via the Seaway. The main origin of the iron ore received at the port of Hamilton in Lake Ontario has shifted from Lake Superior to Quebec Labrador. As a result of the changes in the Great Lakes since the opening of the Seaway, the Lake Ontario region has become the main centre of port activity in the Great Lakes, followed by Lake Superior, Lake Erie/Lake St. Clair, Lake Huron/Welland Canal, Georgian Bay, and upper St. Lawrence.

CHAPTER V

THE FUTURE

In Part one of this final chapter, a forecast of future Seaway trade into and out of the Canadian Great Lakes ports is given, and in the latter part of the chapter, some of the problems and potentials of the St. Lawrence Seaway and the possible future implications for the Great Lakes ports are discussed.

1. Future Seaway Traffic

The forecast[1] presented in this section considers only the exogenous economic determinants influencing the probable supply and demand of the various components of Seaway traffic. It specifically does not reflect transportation-related elements such as the competitive activities of railroads, trucking and East Coast ports. Thus the forecast contained in this chapter assumes no shifts in transportation patterns to and from the Seaway. In addition, no allowance has been made for the effect upon traffic flows and volumes which might occur should various physical

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1 Based on the study: An Economic Analysis of Improvement Alternatives to the St. Lawrence Seaway System, a final report submitted by EBS Management Consultants to the U.S. Department of Transportation, January, 1969.

changes such as channel deepening, new locks, winter navigation, etc. be undertaken. The effects of these competitive and technological factors are considered in the latter part of this chapter.

Table 24 shows the estimated Seaway traffic to be handled at the Great Lakes ports in 1980. Seaway-generated traffic at the Great Lakes ports is expected to increase from an average of 17.6 million tons for the 1966-1968 period to 23.3 million tons in 1980, thus representing a 32 per cent growth. A brief analysis of the total traffic forecast by major commodities is given below.

Total grain traffic is estimated to increase from an average of 8.0 million tons for the 1966-1968 period to 10.5 million tons in 1980. Specifically the wheat export segment of the grain traffic tonnage is expected to decrease due to a re-orientation of Canada's leading wheat markets from European to Asian countries which can be more effectively served via the Pacific Coast outlet. However, increases in exports of coarse grains to European countries and in wheat traffic for domestic consumption

TABLE 24

Forecast of Future Seaway Traffic at the Canadian Great Lakes Ports (in millions of short tons).

Commodity	Post-Seaway	1980	Percent change
Grain	8.0	10.5	+ 31%
Iron ore	2.7	3.0	+ 11%
Coal	0.8	nil	-100%
Petroleum(1)	2.0	3.2	+ 60%
General Cargo	2.9	4.8	+ 66%
Misc. bulk	1.2	1.8	+ 50%
Total	17.6	23.3	+ 32%

(1) Includes fuel oil only. Crude oil and gasoline are grouped under the miscellaneous bulk category.

Source: Derived from U.S. Department of Transportation, An Economic Analysis of Improvement Alternatives to the St. Lawrence Seaway System, by E.B.S. Management Consultants Inc., Washington, 1968.

in Quebec and the Maritime provinces are estimated to more than offset the decline in wheat export traffic.

Seaway traffic in iron ore from Quebec-Labrador to the Canadian ports in the Great Lakes is expected to increase by 1980 to 3.0 million tons from the 1966-1968 level of 2.7 million tons. This predicted slow growth in iron ore is based on the following: Firstly, the amount of raw iron ore required to produce a ton of steel will continue to decrease because of the trend towards the use of oxygen furnaces and the possibility of a significant development in the use of direct reduction furnaces; secondly, a substantial expansion in Canadian iron ore production is expected in the Lake Superior area which would cut down the traffic from Quebec-Labrador.

Seaway coal traffic to Lake Ontario from the East Coast will have ceased by 1980 due to the plan of the Dominion Coal Board to phase out Canada's coal mining operations in Nova Scotia.

Future Seaway movements of petroleum to the Great Lakes will be determined by Canadian demand for petroleum products in the Province of Ontario. Another important factor will be the extent to which the objectives of the

National Oil Policy can be realized. An increase from an average of 2.0 million tons for the 1966-1968 period to 3.2 million tons in 1980 is predicted. The rate of increase during this period will be moderate as a result of the following foreseeable developments: The expansion in refining capacity in Toronto and Sarnia; and the substitution of other energy sources for fuel oil because of pollution control.

Growth in the general cargo traffic flowing into and out of the Great Lakes ports via the St. Lawrence Seaway is estimated to be relatively substantial but not phenomenal. The main factor on which the forecast is based is the expected strong growth in population, urbanization and industrialization for the Great Lakes hinterland. From an average of 2.9 million tons in the 1966-1968 period, general cargo traffic is estimated to grow to 4.8 million tons by 1980.

Although total traffic tonnage is forecast to grow 32 per cent in the period examined, the benefits generated by Seaway traffic will grow at a more rapid rate due to the fact that the increase in general cargo will be larger than bulk cargo (66 per cent versus 27 per cent).[2]

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2 As discussed in Chapter III, a ton of general cargo generates proportionally more income and employment benefits than a ton of bulk cargo.

2. Competitive Factors

Future competitive factors which were not considered in the above forecast are bound to influence future traffic at the Great Lakes ports. The more important developments which are destined to play key roles in the future of the Great Lakes ports are discussed in general terms below.

Containerization

Significant innovations have taken place in recent years in the methods of shipping and handling cargo. Containerization, the latest development, is destined to alter many of the old shipping patterns. Containerization consolidates a number of individual items into one large shipping unit for easier handling. Container use contributes to a lowering of transportation costs due to savings derived from less damage to goods in transit, less time in transit, less pilferage, reduced cost of packaging, lower cost of marine insurance, etc..

The impact that this new method of transport will have on the ports in the Great Lakes is difficult to evaluate. John R. Iemer, in a recent study,[3] contends

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3 Container Services of the Atlantic, Work Saving International, Washington, 1970, p.93.

that the fully integrated container ships cannot afford the time required to effect the slow transit into the Great Lakes. He notes that, even now, some of the large container ships are too large for the St. Lawrence Seaway locks. Adding to these arguments the aggressiveness of the Atlantic ports and the railways and the head start they have on the trade at this time, Iemer foresees a bleak future for containerization on the Great Lakes and predicts a diversion of general cargo traffic from the Seaway. However, his opinions are not shared by Professor Eric Schenker who, in 1968, published an in-depth study report on present and future containerization in the Great Lakes.[4] He rejects predictions of Seaway general cargo losses for two main reasons. First, Seaway traffic includes only a marginal percentage of general cargo that is suitable for containerization; commodities such as construction and farm equipment, automobiles and various iron and steel products simply do not lend themselves to containerization and must be handled by the conventional methods. Secondly, regarding the Seaway's lockage limitations, Schenker refers to the forecast of shipping

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4 The Effects of Containerization on (U.S.) Great Lakes Ports, Milwaukee, Wisconsin Centre for Great Lakes Studies, 1968, pp. 25-26.

experts who feel that, for the foreseeable future, most of the container traffic on the Great Lakes will be handled by combination ships[5] which can be serviced by the existing Seaway.

A concept that is gaining in popularity is the possibility of some Great Lakes ports acting as feeder ports for overseas general cargo. In other words, containerized cargo would be collected at various ports and shipped to a main terminal for consolidation into a large containership for the overseas voyage. Conversely, inbound container cargo would be unloaded at the terminal port and from there distributed to final ports of destination via other modes of water transport such as barges, for example.

The port of Toronto has been mentioned as a possible terminal point in the event this concept is implemented. The Port of Toronto is ideally located since overseas ships serviced there need only transit the Montreal-Lake Ontario section of the Seaway system whereas, to reach other ports, such as Chicago or Detroit, vessels must transit the entire system - a time consuming and costly voyage, specially for large container vessels.

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5 Ships that carry both containers and other cargo.

Unit Trains

The unit train, a new method of reducing the cost of transporting commodities, is another competitive development which threatens to divert Seaway traffic handled by the Great Lakes ports. A unit train can be described as a block of cars kept together and operated as a train. The unit trains are used only for moving large, regular flows of traffic between points equipped for rapid loading and unloading of the train without breaking it up.

It has been suggested that, because of speedier delivery and the economies present in the use of unit trains, the future east-west inland movement of general cargo in containers will be by unit trains between the Great Lakes region and Atlantic ports below Montreal thereby by-passing the St.Lawrence Seaway and Great Lakes ports. This question has already been discussed in this chapter and requires no further comment.

Another possible diversion of Seaway trade handled by the Great Lakes ports is the unit train carriage of grain directly from the Prairies to the Atlantic ports. The Canadian Wheat Board is currently in the process of studying the feasibility of a new revolutionary system for

the distribution of grain. Large elevators situated at strategic points in the Prairies would collect, clean and grade the grain which would then be dispatched by unit trains to the Pacific and Atlantic ports for transshipment overseas. This new distribution process would provide a more continuous and speedier movement than that offered by the Seaway with its inherent seasonal and lockage limitations.

3. Seaway Potentials.

The losses in cargo traffic by the St. Lawrence Seaway and the Great Lakes ports that the aforementioned competitive factors may create can only be prevented through improvements in the present St. Lawrence Seaway system. Specifically, an extension of the navigation season and/or an expansion of lock dimensions would greatly aid in maintaining the present competitive position of the St. Lawrence Seaway vis a vis other modes of transport. A discussion of these Seaway potentials follows.

Seaway Expansion

Prior to the opening of the Seaway, many saw the new waterway as being obsolete because it limited vessel

sizes to less than 730 feet in length. Since 1959, the size of vessels transiting the St. Lawrence Seaway has increased appreciably while Seaway dimensions have remained static.[6]

The segment of Seaway traffic that would benefit most from an expanded Seaway is bulk cargo which normally is carried in vessels of maximum Seaway size. The use of larger vessels on the Seaway would reduce the unit cost of moving bulk cargo and permit inland vessel carriers to reduce freight rates with the objective of attracting new trade. With respect to the general cargo segment, an expanded Seaway would not have much impetus on this trade since most of the general cargo trade on the Seaway is carried in ocean vessels of less than six hundred feet in length.

Future efforts to expand the St. Lawrence Seaway will certainly be met with strong opposition from various quarters, particularly Atlantic coastal ports and railway interests who have traditionally opposed federal expenditures on the Seaway. Should funds be expended toward Seaway expansion, pressures would undoubtedly be exerted to raise the level of tolls which has remained constant since 1959

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6 See Tables 8 and 9, Appendix I.

despite a marked increase in operational and maintenance costs. However, any attempt to recover future capital expenditures through higher tolls could have the adverse effect of diverting Seaway traffic. A recent study[7] of the responsiveness of Seaway traffic to tolls concluded that traffic on the Seaway could only bear a moderate toll increase despite the need for more than a threefold increase in present revenues in order for the Seaway to meet its future annual financial obligations.

Any future expansion of Seaway facilities will need to be undertaken on a more equitable financial basis than previously in view of the fact that, although the use of the Seaway is equally divided between the United States and Canada, the latter bears two-thirds of the initial capital investment.[8] Recent developments in the U.S. show a renewed interest in the Seaway which could signify that the Americans may be prepared to carry a

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7 D.W.Carr and Associates, The Seaway in Canada's Transportation, Report for the St. Lawrence Seaway Authority, Ottawa, October, 1970.

8 Ibid, p.221.

larger financial burden of capital expenditures on the Seaway than they have in the past.[9]

Winter Navigation

Another limitation which hampers the competitive position of the Seaway is the short navigation season due to the severe winter conditions hampering the system. At the present time, the Seaway officially closes on December 15 and remains so until April 1st, the official opening day. These opening and closing dates can vary from year to year depending on ice conditions; in 1970, for example, the Seaway's opening date for navigation was delayed to April 8th but it remained open until December 19th, the latest closing date since the initial year of operation.

Since 1959, the navigation season on the St. Lawrence Seaway has been prolonged by more than a month.[10] The St. Lawrence Seaway Authority and the St. Lawrence

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9 An amendment to the U.S. Merchant Marine Act has declared the Great Lakes the continent's "Fourth Seacoast" which makes Great Lakes shipbuilders and shippers eligible for all U.S. subsidies and other opportunities that are offered to the other seacoasts. The legislation also changes the financial structure of the Saint Lawrence Seaway Development Corporation by eliminating its obligation to repay the interest on the Seaway debt.

10 See table 10, Appendix I.

Seaway Development Corporation, the two Seaway entities, as well as maritime interests in the Great Lakes - St. Lawrence system are firmly committed to continue their efforts toward further extending the navigation season. Various technological methods being considered to overcome ice conditions include, for example, thermal techniques of controlling ice formation, including solar radiant heat transfer and air bubbling techniques using submerged hoses to surface warmer air; ice destruction techniques which include ice cutting, reinforced hulls, or simply programmed vessel passages to prevent thick ice formation; ice diversion, using ice booms, diversion channels, lock flushing and lift gates in combination with heat, insulation and air techniques. A feasibility study by the U.S. Corps of Engineers on the extension of the navigation season on the Great Lakes - St. Lawrence Seaway concludes that it is technically feasible to prolong the season but recommends an extensive benefit/cost analysis to determine the economic justification of such a project.[11]

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11 President Nixon recently signed an authorization for $6.5 million in order to allow continuation of the study of year round navigation on the Great Lakes St. Lawrence Seaway.

The restricted navigation season is very costly to those dependent on the Seaway; many vessels must be idle for one-third of the year, investment in port facilities lies dormant and workers in port-related occupations are thrown out of work during the winter months. There would be sizable financial advantages to various groups if the Seaway season were extended. The direct benefits created would include transportation savings accruing to shippers and ship owners and additional cargo tonnage for the ports on the Great Lakes - St. Lawrence waterway.

The chief tonnage benefits from a longer Seaway season would result from the increased general cargo traffic such an extension would generate. A major deterrent to utilization of the Seaway is the necessity for a shipper to deal with two shipping services if he ships via a lake port in the summer and a coastal port in winter, a practice which can entail less efficient and more costly service than is the case when a single relationship is maintained. A fully extended navigation season would eliminate this deterrent and place the Seaway in a stronger competitive position to attract general cargo.

The beneficial effects of an extended season on bulk traffic, would be minimal since bulk commodities can normally be stockpiled for use during the closing of Seaway navigation. Season extension would mean that the present volumes would be distributed over the longer period. The extended season would certainly lessen the need for traders of these bulk commodities to maintain large stockpiles over the winter and would thus benefit them in terms of savings on inventory costs.

Insofar as the Great Lakes ports are concerned, it would appear therefore that an extension of the Seaway season would be of greater benefit than larger locks since the former would generate new traffic that would be composed mainly of the general cargo type which is of greater economic value to the ports than bulk cargo.

In conclusion, the Canadian ports on the Great Lakes can expect a reasonable growth in Seaway traffic between 1968 and 1980. Competitive factors threaten to divert part of this traffic to alternate modes of transport. However, the St. Lawrence Seaway is in a position to counteract this competitive threat by undertaking improvements to the physical limitations that prevent the waterway from achieving its full potential as a vital link in Canada's transportation network.

CHAPTER VI

SUMMARY AND CONCLUSIONS

1. After more than half a century of negotiations and debate, the St. Lawrence Seaway project began in 1954. The improved waterway, which opened to navigation in 1959, replaced the outmoded 14-foot system with a modern 27-foot channel and locks measuring 800 by 80 feet, thus providing a uniform throughway over some 2,340 miles, from the Atlantic Ocean to the head of the Great Lakes.

2. The added capacity of the Seaway enabled water-borne carriers to attract traffic from competitive modes of transport and, in some cases, to generate entirely new traffic. This additional traffic, combined with the altered patterns of trade created by the Seaway, had far-reaching effects on the Canadian ports in the Great Lakes.

3. The Canadian Great Lakes ports derive their traffic from two main trades: a Seaway trade and a Lakes trade Since 1959, the Seaway trade has increased its relative importance to the Great Lakes ports while the Lakes trade has experienced a decline in its relative contribution to total traffic handled at the ports. Seaway traffic generates

26 percent of total tonnage at the ports in comparison to 3 percent in the pre-Seaway period. These changes are due to new patterns of trade created by the Seaway and to the additional traffic that the new waterway has generated since its opening.

4. Despite the impetus given to ocean shipping by the St. Lawrence Seaway, the proportion of foreign trade handled at the Great Lakes ports has not increased.

5. Contrary to expectations, the more direct and convenient Seaway route and the lowering of lake freight rates it effected did not produce any increase in the relative share of total Canadian grain exports. Developments in ocean freights rate and international grain market conditions have contributed to the failure of the eastern route to attract a greater share of Canadian grain exports. The St. Lawrence Seaway has, however, gained a larger share of Canadian grain moving eastward mainly at the expense of the railroads and East coast ports. The Seaway has eliminated the need to transship grain into canallers and as a consequence grain volumes handled at Great Lakes transshipment ports have declined substantially.

6. The Seaway had a delayed impact on the iron ore traffic handled at the Great Lakes ports due to ownership patterns and to the revival of Lake Superior ores. Since 1964, however, an increasing proportion of the iron ore reaching Great Lakes ports originates from the Quebec Labrador region and transits the Seaway. The new waterway did not bring about an absolute increase in iron ore traffic at the Great Lakesports but it has enhanced its importance to the ports; iron ore shipments via the Seaway constitute 22 per cent of total iron ore tonnage at the ports compared to 3 per cent in the pre-Seaway period. Increases in the iron ore handlings since 1959 are attributed to rising demand on the part of the steel industry.

7. The Seaway failed to generate the increase in coal traffic from Nova Scotia to Great Lakes consumers that had been anticipated. The lake trade between U.S. Lake Erie ports and Canadian ports on the Great Lakes has continued to be dominant, due to the better competitive position of U.S. coal producers.

8. Petroleum traffic into the Great Lakes has experienced an increase due to the Seaway but it has been restrained

since 1961 by the National Oil Policy which seeks to prohibit some petroleum imports west of the Ottawa Valley. Seaway petroleum shipments represent 30 per cent of total petroleum tonnage at the Great Lakes ports compared to 19 per cent in the pre-Seaway period.

9. General cargo traffic is one segment of Seaway traffic that has had a marked effect on the Canadian Great Lakes ports. The direct flow of imports and exports of general cargo has steadily increased in spite of the limitations of the Seaway system in servicing this type of cargo. Much of the new traffic has been attracted from the railroads and East coast ports.

10. The changes in trade volumes and trade patterns that were created by the new waterway has contributed to an increase in concentration of cargo traffic at large ports in the Great Lakes. The ability of larger ports to attract a greater share of the traffic is largely attributed to their sounder financial position which has enabled them to undertake the expensive improvements in port facilities necessitated by the Seaway.

11. Some ports in the Great Lakes have benefitted from the Seaway while others were adversely affected by the changes it created.

12. The Upper St. Lawrence ports have experienced a steep decline in relative importance since the opening of the St. Lawrence Seaway, mainly because of the loss of their important function as grain transshipment ports.

13. The Seaway has had a positive impact on Lake Ontario ports whose tonnage has increased appreciably, in absolute terms, and in their relative share of total Great Lakes tonnage. Most of the valuable general cargo traffic generated by the Seaway has gone to these ports, particularly the Port of Toronto. Lake Ontario has become the principal centre of port activity in the Great Lakes.

14. The Welland Canal ports, as a group, have suffered a decline in relative importance since 1959, due to the sharply diminished volume of grain traffic at Port Colborne, a once important grain transshipment port. The traffic handled by other Welland Canal ports was not significantly influenced by the Seaway.

15. The Lake Erie and Lake St. Clair ports were not greatly affected since the ports in this region do not trade significantly in the commodities which the Seaway has influenced.

16. In the Lake Huron and Georgian Bay region, the impact of the Seaway was felt on the grain transshipment ports, but less severely than on other transshipment ports since the former have continued to handle significant volumes of grain for domestic consumption in adjacent areas.

17. The Lake Superior ports have added only slightly to their relative share of total Great Lakes tonnage because of negative factors which have prevented the Thunder Bay grain terminal from attracting a larger share of Canadian grain exports. Part of the iron ore trade from Lake Superior has been displaced by the new Quebec Labrador source. A modest increase in overseas shipments of general cargo has been generated by the Seaway.

18. Seaway trade at the Canadian Great Lakes ports is expected to increase one third in the period 1968-1980. The general cargo segment of the trade is forecast to experience the largest percentage growth.

19. Future technological and competitive developments will have implications for future Seaway trade at the

Great Lakes ports. The onset of containerization and unit trains threaten to divert Seaway cargo trade away from the Great Lakes ports. Improvements in the present St. Lawrence Seaway system such as the extension of winter navigation and the expansion of locks would greatly aid in maintaining the present competitive position of the Seaway vis-à-vis other modes of transport.

20. Although faced with strong challenges, indications are that the St. Lawrence Seaway should continue its role as a vital transportation asset for the country as a whole and, in particular, for the Canadian Great Lakes ports and the communities they serve.

21. This study could be expanded to take into account the impact of the Seaway on the Great Lakes region in terms of the income and employment benefits created from the increase in trade, the indirect income generated through the multiplier effect, and the new industries attracted to the region. Other research recommended is a study of the impact of the Seaway on other segments of the Canadian economy in order to arrive at a comprehensive assessment of the extent and distribution of the direct and indirect benefits of the St. Lawrence Seaway.

APPENDIX I

TABLE 1

Percentage of Total Grain Exports by Countries of Destination, 1956-1968.

Crop Year Ending	East and West Europe	Asia	Other
	%	%	%
1956	75	11	14
1957	70	15	15
1958	64	21	15
1959	71	20	9
1960	67	20	13
1961	60	33	7
1962	53	40	7
1963	59	34	7
1964	73	21	6
1965	57	35	8
1966	66	29	5
1967	53	41	6
1968	53	41	6

Source: Board of Grain Commissioners, Canadian Grain Exports, Annual publication .

TABLE 2

Percentage Distribution of Canadian Wheat Exports, by Clearance Sector and Country of Final Destination, Crop Year 1969 - 1970 (in thousands of bushels).

Destination	Pacific	Eastern	Churchill
East and West Europe	44%	51%	5%
Africa	2%	98%	-
Asia	86%	14%	-
W. Hemisphere	45%	55%	-
Total	42%	52%	6%

Source: Board of Grain Commissioners, Canadian Grain Exports, Crop Year 1969-1970.

TABLE 3

Estimated Average Costs of Moving Canadian Wheat from a Mid-Prairie Point to Antwerp/Rotterdam, 1956-1958 (in cents per bushel).

Crop Year Ending	Via Pacific Ports	Via Churchill	Via Thunder Bay
1956	77.8	58.0	72.8
1957	70.2	57.9	68.9
1958	45.3	42.6	55.0
1959	46.1	41.2	52.3
1960	46.2	41.0	53.2
1961	44.6	41.5	54.1
1962	47.2	45.6	55.2
1963	46.7	42.0	52.1
1964	55.0	46.2	56.0
1965	52.4	46.2	58.9
1966	57.4	51.9	51.1
1967	53.2	47.3	58.6
1968	54.9	53.5	60.2

Source: Board of Grain Commissioners, Canadian Grain Exports, Annual publication .

TABLE 4

Domestic and Foreign Ore Consumed by the Canadian Steel Industry, 1959 - 1968 (in thousands of short tons).

Year	Domestic Ore[1] Volume	% of total	Foreign Ore Volume	% of total	Total Volume
1959	2,936	50	2,928	50	5,864
1960	2,997	50	3,039	50	6,036
1961	2,300	37	3,861	63	6,161
1962	2,397	36	4,234	62	6,631
1963	2,783	37	4,826	63	7,609
1964	3,119	39	4,927	61	8,046
1965	3,599	41	5,089	59	8,688
1966	4,871	55	4,056	45	8,927
1967	5,537	66	2,829	34	8,366
1968	8,486	79	2,252	21	10,738

(1) Quebec Labrador and Lake Superior

Source: Dominion Bureau of Statistics, Iron Mines, Annual publication .

Dominion Bureau of Statistics, Iron Mining Industry, Annual publication .

TABLE 5

Consumption of Coal in Ontario, 1959 - 1968

(in thousands of tons).

Year	Electric Power Generation	Iron ore Steel Industry	Transport	Domestic	Other Industrial
1959	478	4,435	697	1,572	5,161
1960	414	4,065	450	1,393	4,618
1961	568	4,324	368	1,178	4,288
1962	1,780	4,433	340	972	4,098
1963	3,125	4,620	345	919	4,032
1964	3,487	4,758	360	715	4,148
1968	6,500	6,006	N/A	N/A	3,754

Source: D. Wm. Carr, The Seaway in Canada's Transportation, Report for the St. Lawrence Seaway Authority, Ottawa, October, 1970.

TABLE 6

Coal Consumed per ton of Steel Produced in Canada, 1959-1968 (in millions of short tons).

Year	Steel Production	Coal Consumption	Coal/Steel Ratio
1959	5.90	4.91	.83
1960	5.80	4.58	.78
1961	6.48	4.78	.74
1962	7.17	4.93	.69
1963	8.19	5.19	.63
1964	9.12	5.32	.58
1965	10.06	5.29	.53
1966	10.02	5.31	.53
1967	9.70	5.33	.55
1968	11.19	6.29	.56

Source: Dominion Bureau of Statistics, Iron and Steel Mills, Annual publication .

Dominion Bureau of Statistics, The Primary Iron and Steel Industry, Annual publication .

TABLE 7

Distribution of Seaway General Cargo Traffic at the Canadian Great Lakes Ports, 1968 (in thousands of short tons).

Port Group	Volume	Percent of Total
Lake Ontario	874	77%
Welland Canal	129	12%
Lake Erie/ Lake St.Clair	76	7%
Lake Superior	44	4%
U. St. Lawrence	4	-
Lake Huron/ Georgian Bay	2	-
Total	1,129	100%

- : less than 1 percent.

Source: St. Lawrence Seaway Authority, Traffic Report, 1968.

TABLE 8

Distribution of Transits on the St. Lawrence Seaway by Length of Vessel, 1959 - 1968.

Year	Less than 500'	500' to 599'	600' to 699'	More than 700'	Total Total
	%	%	%	%	%
1959	92	4	3	1	100
1960	88	8	3	1	100
1961	85	8	4	3	100
1962	81	10	5	4	100
1963	75	11	8	6	100
1964	72	13	9	6	100
1965	70	15	8	7	100
1966	64	17	10	9	100
1967	62	16	11	11	100
1968	58	17	11	14	100

Source: St. Lawrence Seaway Authority, Traffic Report, Annual publication .

TABLE 9

Average Tonnage per Transit on the St. Lawrence Seaway, 1959 - 1968

Year	Cargo tonnage	No. of Transits	Average tonnage per transit
1959	20,351,711	7,930	2,566
1960	20,310,346	6,869	2,956
1961	23,417,720	6,892	3,397
1962	25,593,600	6,351	4,029
1963	30,942,890	6,285	4,923
1964	39,309,029	6,779	5,798
1965	43,382,864	7,330	5,918
1966	49,249,358	7,341	6,708
1967	44,028,638	6,921	6,361
1968	47,953,850	6,576	7,292

Source: St. Lawrence Seaway Authority, Traffic Report, Annual publication .

TABLE 10

Opening and Closing Dates of Navigation on the St. Lawrence Seaway, 1959-1968.

Year	Opening Date	Closing date	Length of Season
1959	April 25	December 3	222 days
1960	April 18	December 3	229 days
1961	April 11	November 30	233 days
1962	April 23	December 7	228 days
1963	April 15	December 13	242 days
1964	April 8	December 7	243 days
1965	April 8	December 17	253 days
1966	April 1	December 15	258 days
1967	April 1	December 15	258 days
1968	April 8	December 14	250 days

Source: Dominion Bureau of Statistics, Canal Statistics, Annual publication .

TABLE 11

Cargo Volumes Loaded and Unloaded at the Canadian Great Lakes Ports, 1956-1968 (in thousands of short tons).

Year	Amherstburg	Belleville	Britt
1956	172	417	28
1957	184	421	322
1958	173	352	210
1959	179	313	202
1960	181	299	169
1961	182	137	189
1962	192	272	173
1963	189	259	255
1964	234	207	297
1965	186	337	7
1966	244	330	293
1967	312	177	217
1968	296	184	193

TABLE 11 (continued)

Year	Brockville	Clarkson	Cobourg	Colborne
1956	187	1,100	147	4,697
1957	174	1,167	158	3,681
1958	163	1,081	157	4,380
1959	103	841	159	3,335
1960	113	1,240	153	2,604
1961	66	1,618	130	2,965
1962	63	1,800	143	2,857
1963	60	1,727	165	2,852
1964	36	1,680	157	3,563
1965	33	1,934	158	2,925
1966	24	2,217	149	3,423
1967	12	1,648	160	2,273
1968	24	2,034	108	2,368

TABLE 11 (continued)

Year	Collingwood	Cornwall	Goderich	Hamilton
1956	291	528	766	7,538
1957	161	483	541	7,816
1958	210	252	614	6,194
1959	207	190	602	7,486
1960	193	206	789	8.150
1961	185	184	842	7,788
1962	118	173	791	8,229
1963	134	172	891	8,935
1964	137	92	874	9,393
1965	130	135	1,078	10,294
1966	123	104	1,072	10,719
1967	167	109	1,409	10,593
1968	83	101	1,326	11,999

TABLE 11 (continued)

Year	Kingston	Kingville	Little Current	Marathon
1956	1,757	29	913	-
1957	1,430	29	1,206	-
1958	3,050	26	737	268
1959	1,720	36	761	274
1960	1,285	42	809	266
1961	1,365	42	703	287
1962	1,102	46	553	281
1963	649	50	630	275
1964	683	48	1,100	242
1965	675	122	1,151	326
1966	763	117	951	280
1967	481	97	1,042	326
1968	527	83	1,115	326

TABLE 11 (continued)

Year	McNicoll	Michipicoten	Midland	Oshawa
1956	509	1,251	1,911	197
1957	153	1,251	1,477	227
1958	393	1,211	1,371	254
1959	368	1,199	1,252	275
1960	342	862	987	332
1961	379	740	944	284
1962	225	639	645	260
1963	281	404	613	245
1964	323	468	733	277
1965	375	442	724	303
1966	296	411	722	338
1967	221	306	540	273
1968	201	361	422	342

TABLE 11 (continued)

Year	Owen Sound	Parry Sound	Picton	Port Credit
1956	472	439	325	1,306
1957	332	424	657	1,169
1958	447	362	919	4 466
1959	408	565	921	573
1960	349	429	1,030	709
1961	346	359	1,365	383
1962	263	382	1,101	744
1963	306	306	1,098	1,519
1964	419	349	1,391	1,972
1965	411	421	1,199	1,979
1966	394	413	1,220	2,997
1967	372	397	1,135	3,246
1968	347	428	1,192	3,519

TABLE 11 (continued)

Year	Prescott	St. Catharines	Sarnia	Sault Ste.Marie
19				
1956	2,838	333	3,568	5,441
1957	2,392	362	3,331	4,620
1958	3,441	369	3,042	3,491
1959	1,520	451	3,031	4,577
1960	1,101	373	3,295	4,703
1961	1,834	408	3,163	5,752
1962	1,344	316	3,371	5,231
1963	1,496	313	3,445	5,753
1964	1,105	386	3,795	5,681
1965	1,307	272	4,175	5,403
1966	1,031	324	4,431	5,038
1967	832	323	3,912	4,604
1968	730	342	4,259	5,245

TABLE 11 (continued)

Year	Stanley	Thorold	Thunder Bay	Toronto
1956	453	1,027	15,446	5,288
1957	430	977	12,097	5,107
1958	359	977	11,211	4,406
1959	401	960	12,692	4,769
1960	398	886	12,106	4,559
1961	388	711	13,434	5,079
1962	366	789	11,913	5,312
1963	396	831	14,629	6,167
1964	351	824	18,398	5,713
1965	398	675	17,038	5,826
1966	380	717	19,509	5,595
1967	336	667	15,270	5,759
1968	-	681	13,488	5,738

TABLE 11 (continued)

Year	Walkerville	Wallaceburg	Welland	Windsor
1956	648	38	195	1,494
1957	737	108	193	1,697
1958	551	131	152	1,054
1959	539	72	174	1,629
1960	446	132	127	1,363
1961	445	74	123	1,114
1962	475	74	118	1,628
1963	503	55	100	1,915
1964	471	80	127	2,057
1965	480	35	162	2,416
1966	485	52	263	3,077
1967	491	59	189	2,950
1968	496	74	193	3,202

Source: Dominion Bureau of Statistics, Shipping Report, Annual publication .

APPENDIX II

The Importance of General Cargo to a Port's Economy.

In 1953, a pioneering study was performed by the Delaware River Port Authority* in order to estimate the direct port expenditures derived for each ton of cargo handled by the port. One of the major findings of the study was that since many bulk commodities are handled mechanically, while general cargo is loaded and unloaded manually, a ton of the latter generates much more income for the port. The results of the study are summarized below.

Value of a Ton of Cargo to a Port's Economy

Commodity	Income Generated
General Cargo	$11.33
Crude Oil	7.67
Grain	4.24
Ore	2.11
Coal	1.81

The income for each type of cargo was computed by totalling vessel disbursements in port, port terminal income, rail and motor freight credited to the area, vessel crew expenditures in port, and the revenue earned by such auxiliary services as steamship agencies, foreign freight forwarders and customs house brokers, public warehousing companies, and marine insurance companies.

*The Value of a ton of Cargo to the Area's Economy, Philadelphia 1953.

APPENDIX III

List of Principal Bulk Commodities Handled at the Canadian Great Lakes Ports.

Wheat	Crude petroleum
Corn	Fuel oil
Oats	Gasoline
Barley	Salt
Rye	Limestone
Flaxseed	Sand
Soybeans	Gravel
Coal	Stone
Coke	Pulpwood
Iron Ore	Scrap Iron and steel

APPENDIX IV

Title

1. This tariff may be cited as the *St. Lawrence Seaway Tariff of Tolls.*

Interpretation

2. In this tariff,

(a) "Authority" means The St. Lawrence Seaway Authority;

(b) "Bulk cargo" means such goods as are loose or in mass and generally must be shovelled, pumped, blown, scooped or forked in the handling and, without limiting the generality of the term or otherwise affecting its meaning, shall be deemed to include:

(i) barley, buckwheat, corn, dried beans, dried peas, flaxseed, rape seed and other oil seeds, flour, grain screenings, mill feed containing not more than 35% of ingredients other than grain or grain products, oats, rye and wheat, loose or in sacks;

(ii) cement, loose or in sacks;

(iii) coke and petroleum coke, loose or in sacks;

(iv) domestic package freight;

(v) liquids carried in ships' tanks;

(vi) ores and minerals (crude, screened, sized or concentrated, but not otherwise processed) loose or in sacks, including alumina, bauxite, coal, gravel, phosphate rock, sand, stone and sulphur;

(vii) pig iron, scrap iron and scrap steel;

(viii) pulpwood, poles and logs, loose or bundled;

(ix) raw sugar, loose or in sacks;

(x) woodpulp, loose or in bales;

(c) "Cargo" means all goods aboard a vessel whether carried as revenue or non-revenue freight, or carried for the vessel owner, except empty containers having a cubic capacity of six hundred and forty feet or more, ships' fuel, ballast or stores, or crew and passengers' personal effects.

(d) "Corporation" means the Saint Lawrence Seaway Development Corporation;

(e) "domestic package freight" means cargo, the shipment of which originates at one Canadian point and terminates at another Canadian point, or which originates at one United States point and terminates at another United States point, but shall not include any import or export cargo designated at the point of origin for transshipment by water at a point in Canada or in the United States;

(f) "general cargo" means all goods not included in the definition of bulk cargo under paragraph (b) above;

(g) "passenger" means any person being transported through the Seaway who has paid a fare for passage;

(h) "pleasure craft" means a vessel, however propelled, that is used exclusively for pleasure and does not carry passengers;

(i) "St. Lawrence Seaway" includes all facilities and services authorized under the St. Lawrence Seaway Authority Act, Chapter 242, Revised Statutes of Canada, 1952, and under Public Law 358, 83rd Congress, May 13, 1954, enacted by the Congress of the United States, and including the Welland Canal, which facilities and services are under the control and administration or immediate financial responsibility of either the Authority or the Corporation;

(j) "Seaway" means the St. Lawrence Seaway;

(k) "tolls" means the total assessment levied against a vessel, its cargo and passengers for complete or partial transit of the Seaway covering a single trip in one direction;

(l) "tons" means, unless otherwise stated, a unit of weight of 2,000 pounds;

(m) "vessel" means every type of craft used as a means of transportation on water, except a vessel of or employed by the Authority or the Corporation.

Tolls

3. (1) The tolls shall be as set forth in the Schedule hereto;

(2) The tolls under this tariff are due from the representative of each vessel as soon as they are incurred and payment shall be made to the Authority at Cornwall, Ontario, within fourteen days of the date of billing by the Authority. An additional charge for non-payment within this period may be levied in the discretion of the Authority in an amount not to exceed 5 per cent of the amount due.

(3) The tolls for the section between Montreal and Lake Ontario shall be paid 73 per cent in Canadian dollars and 27 per cent in United States dollars. Payments for transit through locks in Canada only shall be made in Canadian dollars, and payments for transit through locks in the United States only shall be paid in United States dollars.

(4) The tolls for transit of the Welland Canal shall be paid in Canadian dollars and shall accrue to the Authority.

Security for Payment

4. The representative of each vessel shall provide the Authority with security, satisfactory to the Authority, for payment of tolls.

Description and Weight of Cargo

5. (1) A cord of pulpwood shall be deemed to weigh 3,200 pounds.

(2) (a) 1,000 f.b.m. of sawn softwood lumber with less than 15% moisture content shall be deemed to weigh 1,700 pounds,

(b) 1,000 f.b.m. of sawn softwood lumber with 15% moisture content or over shall be deemed to weigh 2,100 pounds,

(c) 1,000 f.b.m. of sawn hardwood lumber with less than 15% moisture content shall be deemed to weigh 2,500 pounds,

(d) 1,000 f.b.m. of sawn hardwood lumber with 15% moisture content or over shall be deemed to weigh 3,100 pounds.

(3) The tonnage used in the assessment of tolls shall be calculated to the nearest 2,000 pounds.

Schedule

	Tolls	
	Montreal to or from Lake Ontario	Lake Ontario to or from Lake Erie (Welland Canal)
	$	$
1. For transit of the Seaway, a composite toll, comprising		
(1) a charge per gross registered ton, according to national registry of the vessel, applicable whether the vessel is wholly or partially laden, or is in ballast. (All vessels shall have an option to calculate gross registered tonnage according to prescribed rules for measurement in either Canada or the United States.)	.04	.02
(2) a charge per ton of cargo, as certified on ships' manifest or other document, as follows:		
—bulk cargo	.40	.02
—general cargo	.90	.05
(3) a charge per passenger	3.50	4.00
(4) minimum charge, subject to the provisions of subitems (1), (2) and (3) above:		
—pleasure craft	14.00	16.00
—other vessels	28.00	32.00

2. For partial transit of the Seaway:

(1) Between Montreal and Lake Ontario, in either direction, 15 per cent per lock of the applicable toll.

(2) Between Lake Ontario and Lake Erie in either direction, (Welland Canal), 50 per cent of the applicable toll, no toll to be assessed unless at least one lock is transited, or with respect to Lock 1 of the Third Canal at Port Dalhousie, Ontario.

(3) Minimum charges:

—pleasure craft, $2.00 per vessel per lock transited.

—other vessels, $4.00 per vessel per lock transited.

3. For transit Lake Ontario to or from Lake Erie:

(a) *Complete Transit*

A lockage charge, per lock, which may be shared by cargo or passenger vessels in tandem and is subject to a fifty per cent reduction for cargo vessels in ballast:

	1967	1968	1969	1970	1971
	$	$	$	$	$
(i) cargo or passenger vessels.....	20.00	40.00	60.00	80.00	100.00
(ii) pleasure craft.....	3.00	3.00	3.00	3.00	3.00
(iii) other vessels.....	5.00	5.00	5.00	5.00	5.00

(b) *Partial Transit*

Between Lake Ontario and Lake Erie, in either direction, fifty per cent of the net lockage charge, per lock, calculated in accordance with subsection (a), for cargo or passenger vessels which take on or discharge their entire load of cargo or passengers between Locks 1 and 8 of the Welland Canal, with a charge of $3.00 per lock for pleasure craft transits and $5.00 per lock for the transit of other vessels.

(c) *Minimum Charges*

Fifty per cent reductions for cargo or passenger vessels in tandem, in ballast and making partial transits apply to amount otherwise remaining due. Minimum payment for cargo or passenger vessels would be twelve and a half per cent, per lock, which would apply to a vessel making a partial transit in ballast and in tandem.

Note: The composite toll under items 1 and 2 of this Schedule for transit of the Welland Canal are suspended effective July 18, 1962.

Source: St. Lawrence Seaway Authority, Ottawa, Canada.

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