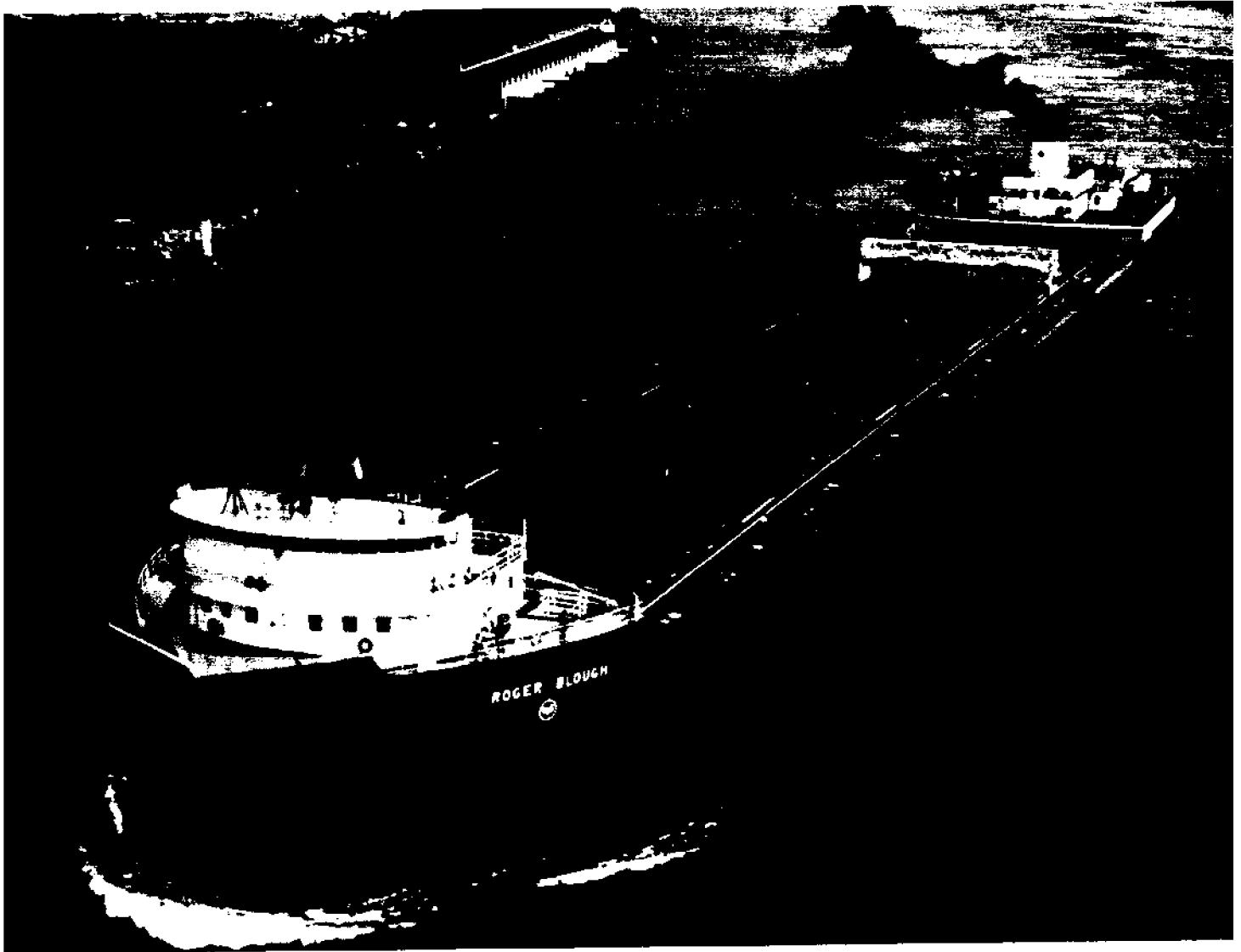


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# IS GREAT LAKES SHIPPING AN UNDERUTILIZED ECONOMIC RESOURCE



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*"Our basic problem is getting the research done. No one university has the full capacity. I think the University of Michigan is outstanding in the United States in ship research. I think we here at Michigan State do more on demand and economic analysis. At one time, the University of Wisconsin did the best studies on ports. We've got to put it all together just like the region has to put the action program together, and I would like to hear some words of advice from some of you about how you get cooperative research done between universities of various allegiances and rivalries. We need the effort right now. The task of economic development has never been more urgent. The region can no longer take for granted that it's going to develop. The region's universities have a major role. How do we put our acts together and make the most of this waterway?"*

*-John Hazard-*

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Albert G. Ballert  
Great Lakes Commission  
2200 Bonisteel Boulevard  
Ann Arbor, Michigan 48105

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## INTRODUCTION

Dr. Eugene F. Dice  
Extension Program Leader  
Sea Grant Advisory Service

In the period of late 1981-early 1982, the Marine Advisory Service\* sponsored the bringing together of a Great Lakes Shipping Framework Committee. Consisting of university faculty and representatives of key agencies of state and federal government, its purpose was to generate a series of significant Great Lakes shipping topics believed to warrant university research attention. Its final task consisted of presenting a seminar on "Michigan's Great Lakes Transportation: The Economic Future in Perspective" to a selected audience of key university, industry, and government representatives.

Because of the quality of presentations and the significance of the issues, the Advisory Service has chosen to print selected items and important questions under the title "Is Great Lakes Shipping an Underutilized Resource". Other publications in this series include: "Great Lakes Shipping and Markets for Michigan's Forest Products: A Preliminary Economic Inquiry" and "Grain Transportation on the Great Lakes/St. Lawrence Seaway". Individual copies are available free at the Extension Sea Grant offices listed under the back cover.

### LIST OF FRAMEWORK COMMITTEE MEMBERS AND SPEAKERS

#### Framework Committee Members

Dr. Howard Bunch  
School of Naval Architecture and Engineering,  
University of Michigan

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\*The Marine Advisory Service of the Michigan Sea Grant College Program functions as a part of the Michigan State University Cooperative Extension Service.

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## TABLE OF CONTENTS

	Page
Opening Remarks . . . . .	1
G. Robert Adams	
History and Long Range Outlook . . .	3
Dr. John Hazard	
Short Range Implications for Shipping on the Great Lakes . . . . .	12
Jim Fish	
Michigan's Port Needs Study . . . . .	15
John O'Doherty	
Comments on Forest Products Shipping Opportunities . . . . .	19
Robin Bertsch	
Coal Shipments on the Great Lakes .	21
Dr. Howard Bunch	
Summary Statements, Questions and Answers . . . . .	26
Bud Thar	
List of Research Priorities . . . . .	33
Directory of Extension Sea Grant Offices . . . . .	33

## OPENING REMARKS

G. Robert Adams  
Assistant Deputy Director  
Bureau of Transportation Planning  
Michigan Department of Transportation

How can we work together to attempt to bring a more cohesive approach to water navigation on the Great Lakes and make it possible to achieve our economic objectives in the Great Lakes region through the use of water transportation? I see that as being a much more difficult problem than one might suspect, and that's for a variety of reasons. One of the sort of startling experiences I had while chairing the Great Lake's Basin Commission's standing Committee on Transportation was to find out how little agreement there is about the issues relating to water transportation. I remember asking what I thought was a very simple question which would be answered very quickly, and that was what size ship can transit the Soo Locks? After somewhere between half an hour and an hour of discussion I had no answer. In fact, I knew less after the discussion that I did in the beginning. And I would not even hazard what size ship can transit the Soo Locks. I don't know.

That seems rather strange because we know that during the navigation season many, many ships go through the Locks. They either get struck or run aground, or they pass through there. So there is someone out there that knows what size ship can get through the Locks. The problem, it turns out at least from my perspective, is rather simple. The problem is that some people know the physical dimensions of the Locks and they could discuss what size ship could physically transit the Locks. But there are operating characteristics associated with going through the Locks that may influence the physical size of the ship. Things like squat, the phenomenon of the ship settling in the water as it accelerates, and the maneuverability of the ships. There are also regulatory issues, and my sense was that the Corps of Engineers has one set of regulations about the size of ship that they think should

transit and the Coast Guard a second set.

One might ask why should there be a problem with a simple question like this, and why should I be concerned about it. As I said, we know there are practical answers. But as someone who has a responsibility to encourage our legislature to provide money for certain things, I find it very difficult to admit that I can't tell you what size ship can go through the Soo Locks. It places in the minds of legislators and congressmen some question as to whether we really know what's going on at all. Certainly, if I were to give you a set of dimensions, the likelihood is that before this day is over I would be contradicted by someone who has a different point of view. I think this issue is important for a number of reasons. One being that if we can't even answer the obvious questions with some sort of unanimous point of view, how can those in our democratic process who have to make decisions decide what needs to be done? How can they make decisions if they are constantly bombarded by different sets of data coming from the experts? If we can't even answer the obvious questions with some sort of unanimous point of view, how can we deal with the complex questions?

More and more, investors, legislators, and congressmen need answers. And what they are getting, unfortunately, is not answers—it's alternative points of view. They need better analysis. They need to better understand the issues and the problems and have some sense of potential solutions. And more and more, they want numbers. We have moved from qualitative planning to quantitative planning. And they need the experts who provide the information to agree on the basics, so that they can get past the basic issues they have to deal with. It is very, very difficult to

explain to a congressman or to a legislator some of the complex relationships that have to be worked through in order to achieve a marketing program for the Great Lakes, or to convince them that we need a new lock at the Soo to provide a balance to the Poe Lock, or that user charges as proposed by the administration are not good for the Great Lakes, if they are constantly bombarded by a variety of understandings of the simple things like what size ship can currently transit the Soo Locks.

One of the things I think has resulted is the rise of the lawyers and the law in all this because they have an approach for dealing with issues. The idea of finding of facts, rules of evidence, and an adversary approach in which they can interrogate the experts and then come to some conclusions. But I don't believe that approach is the appropriate approach for the kind of public policy issues that we are dealing with in the Great Lakes. What we need is more and better analysis, we need more use of the scientific method, we need rigor, and to be able to explore some of the basic questions and come to agreeable answers. Answers that at least the majority can agree with. We need discipline and above all of these others, we need cooperation.

Our efforts to assure a positive economic future in the Great Lakes will depend on our efforts to provide this cooperative approach, and I think the contribution of the academic community working with the governmental entities to work our way through these problems is probably the only solution we have. I think the direction that we are going now with a more and more legalistic approach will just compound our problems. So I commend you for the meeting today. I think it will be fruitful, and I am very pleased to be here to spend the day with you.

## HISTORY AND LONG RANGE OUTLOOK

Dr. John Hazard  
Professor of Marketing and Transportation  
School of Business  
Michigan State University

The Great Lakes-St. Lawrence system was up until the time of the Seaway the biggest inland waterway system in the world in terms of traffic movement. Close to 200 million tons move over the Great Lakes as illustrated in Figure 1. The basic rhythm was iron ore and grain downbound, coal was the major backhaul commodity, and the Seaway section of the St. Lawrence was generating about 10 to 12 million tons of traffic a year. Commerce moved through the St. Lawrence system by passing through twenty-one hand-turned old wooden locks. It was carried in miniature ocean ships and French family canallers. The system was almost entirely internal in orientation.

After five years of construction, the Seaway was opened to the ships of the world in 1959. At that time the new Seaway locks could accommodate 75% of the ships on the high seas. So ships moved in very rapidly. The lake ports, despite media propaganda to the contrary, were totally unprepared. Not a single new wharf had been built from Duluth, Minnesota, to Toronto, Canada, in the five years the Seaway was under construction. The ships literally inundated the lakeports. At times, fifty to sixty of them lined up off Detroit to look at the city, waiting to a cost of \$2,500 to \$5,000 a day for a berth. We were unprepared for the Seaway at its advent. But by 1973 the traffic through the St. Lawrence moved up to five times what it had been in 1954. Despite the slow and painful preparations, the system was moving about 57 million tons by 1973.

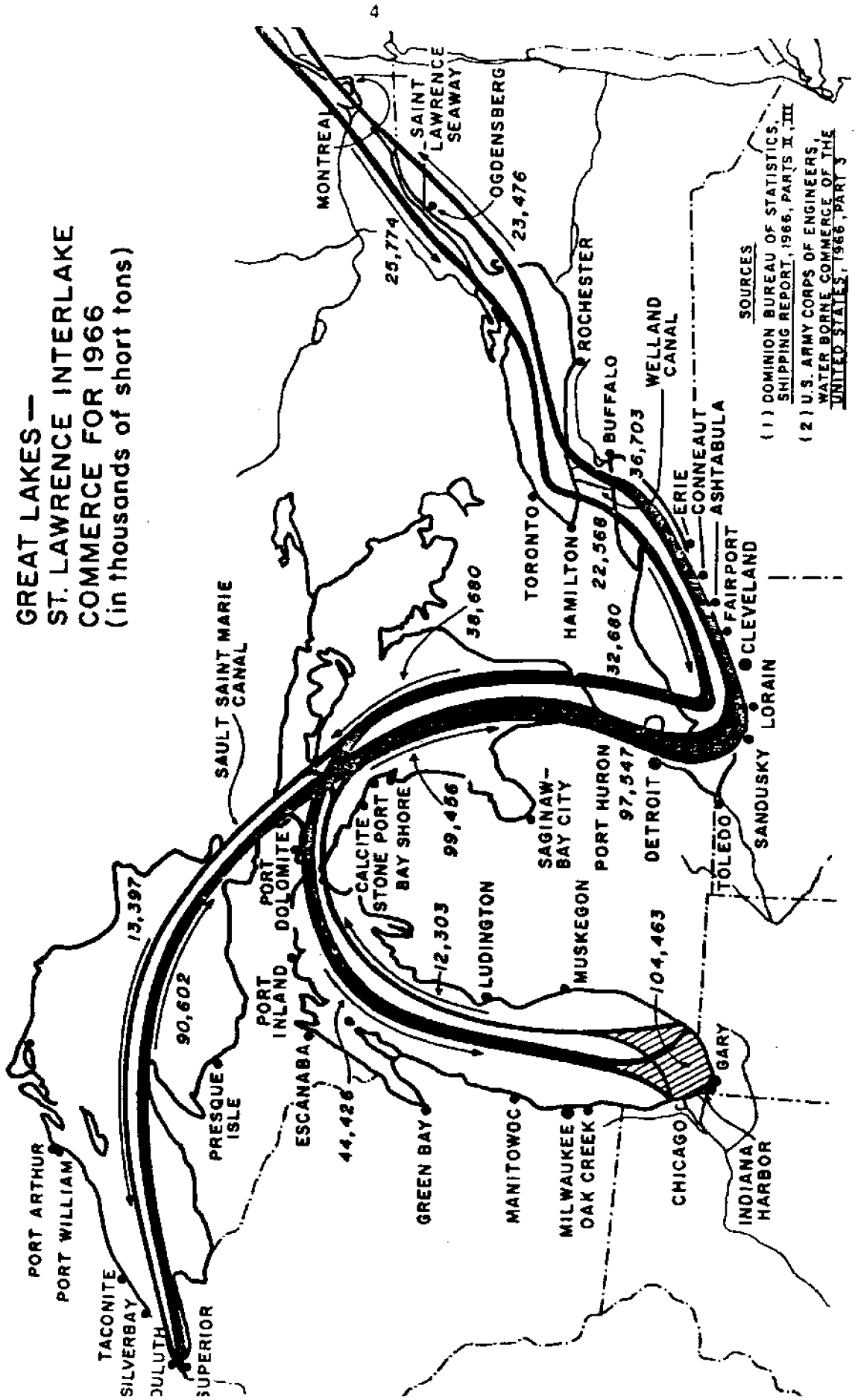
The Seaway had opened the region up to direct overseas commerce. The economic hinterland to the lakes had become the narrow area in the watershed as illustrated in Figure 1. Suddenly the Seaway opened economic access to at least twelve states and three provinces, as shown in the shaded

area in Figure 2. It became an international route in a very short period of time, embracing what I call the Mid-Continent Region, composed of central Canada and the central United States. Traffic moved from as far out west as Colorado, as far down south as the Ohio River, as far north and west as Alberta. Some general cargoes moved through the Seaway from Los Angeles, California, and from Houston, Texas. The customary Seaway hinterland (the territory that is most economically accessible to the Great Lakes and the Seaway) included the approximate 1,250,000 miles of the hinterland illustrated in Figure 2.

The Seaway was constructed as a system wide deep water dimension. The 95,000 miles of Great Lakes is 95% naturally navigable and only the connecting channels prevent the lakes from draining themselves. The hard rock dolomite that controls the flow of water through the system requires navigation works. The problem areas include the Soo Canal, the Mackinac Straits, the Detroit River, the Welland Canal, and the St. Lawrence section of the Seaway. When construction started, the St. Lawrence section had only a 14 foot depth. All of the upbound channels except the Welland were at 22 feet upbound and 25 feet downbound. So each of the connecting channels had to be deepened in order to take the system down to 27 feet. Port Huron, Michigan, was the only port that had 27 foot natural navigation. The Port of Chicago, the largest export-originating city in the United States, perhaps in the world, had a 22 foot waterway reaching in through the Calumet River to Lake Calumet where they had to create a port on an 18 foot garbage dump. The river had to be excavated 6 miles inland passing beneath 16 bridges, 10 of them mainline rail.

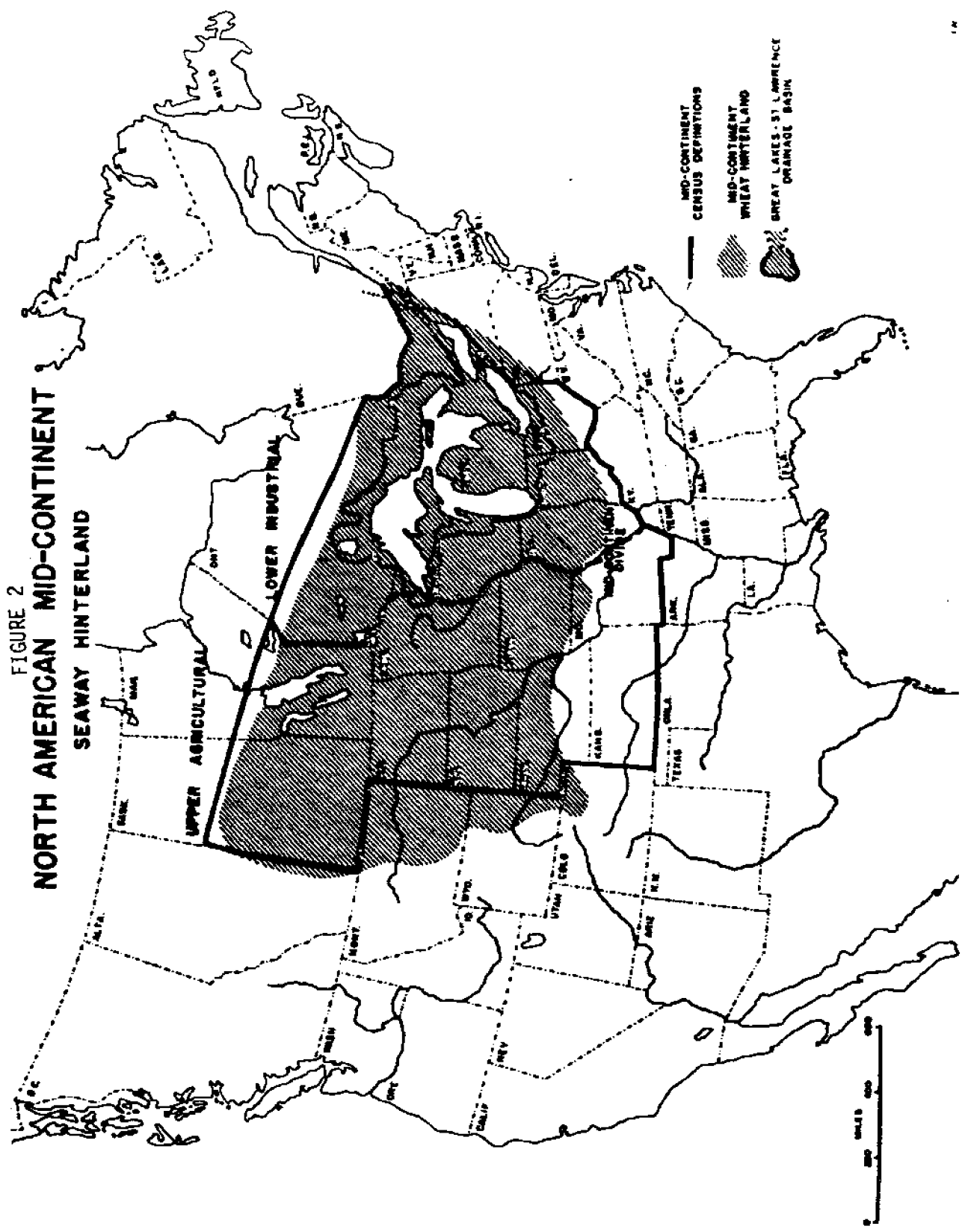
FIGURE 1

GREAT LAKES —  
ST. LAWRENCE INTERLAKE  
COMMERCE FOR 1966  
(in thousands of short tons)



SOURCES  
 (1) DOMINION BUREAU OF STATISTICS, SHIPPING REPORT, 1966, PARTS II, III  
 (2) U.S. ARMY CORPS OF ENGINEERS, WATER BORNE COMMERCE OF THE UNITED STATES, 1966, PART 3





Initially, a ship would load to half of its capacity and be pulled out backward in order to have access to the Seaway. The City of Chicago had committed 22.5 miles of its 23 mile waterfront permanently to public parks. This merely illustrates one of the major problems of gearing the Lake Port cities to ocean commerce.

## A DYNAMIC SYSTEM

The Great Lakes-St. Lawrence system is a transportation system as well as a multiple purpose resource. The three elements of the system are the regional requirements which introduce the demands of the system, the ships which carry the commerce, and the waterway which has to be adjusted to the ship. Each of the elements interacts on the others and if the elements respond properly, we have a dynamic system growing and changing with regional demands.

The dynamics of the system depend upon the number of elements, the clarity of objectives, and who makes the decisions. In bulk cargoes such as iron ore, the response patterns are fairly clear. The steel companies own the mines or they have captive mines, they own the car dumping system at the upper lake ports, they own the ships, they unload ore at the lower lake ports, and they carry it to the blast furnaces. One party makes the major decision. In the instance of general cargo, there is a whole complex of interstices that has to make coordinated decisions. It becomes extremely difficult for the region to work out who, when, and where of decision making on general cargoes. The waterway allows a larger ship to come in. The ship produces economies that change the hinterland and attracts traffic, the traffic then demands a larger ship, the larger ship presses against the waterway, the waterway has to be adjusted to accommodate the larger ships, etc. For general cargoes, a whole new complex of trade intermediaries had to be introduced. But despite the difficulties, the elements became interactive and dynamic until 1973. What we did basically was to build an 800 by 27 foot over-the-sill water-

way—about twice the dimension of the old locks. That introduced new ships which offered economies which generated the demand which produced the commodity flow through the system.

The Great Lakes-St. Lawrence must be viewed as dynamic including the waterway itself. The waterway, in my impression, has to be looked at as merely a right-of-way that has to adjust to the traffic volume or else it rapidly becomes functionally or physically obsolete. If it does not expand, it becomes questionable as to how long it will remain. When we were engaged in constructing the Seaway, everyone talked about the giant steps, 7 locks to replace the old 21 locks. But within 10 years of its construction, it became partially functionally obsolete to commerce outside and within the system. My position at the initiation of construction was that within the 50 year lifetime of the locks, a third generation of ships would emerge. They would certainly be larger than the ships today, maybe twice as large. I was wrong. They were more than twice as large. The ocean tanker went up from about 24,000 deadweight tons to 250 to 500 thousand tons. The dry bulk tramp ship, which was at 12 thousand tons, went up to 60 thousand tons. And even within the lakes, the largest lakers advanced from 715 footers with 25 thousand tons capacity to 1000 footers of 50 to 60 thousand ton capacities. No element in the system may be considered as fixed.

## POTENTIAL CARGOES

What is the outlook for Great Lakes-St. Lawrence commodity traffic? How can the traffic be properly estimated and forecast? This is a major problem for continued research and analysis. Properly researched, all of the elements must be considered: regional demands, vessel technology, and innovations adjusted to the demands. The supply of services, the waterway development itself, the ports as an auxiliary to the system and inland carrier access must also be considered. All must be examined

simultaneously because if you change any one of them, the others have to be changed in an accommodating way. The time immediate, short range, and long range must be projected. There have been 18 studies of potential Seaway traffic. I made 2 of them myself in 1954 and 1956. We have a fairly comprehensive analysis of overseas potentials, both the area and the commodities as far down as 5 decimal point descriptions. The latest was just completed by DRI & ACRES Associates and it projects cargo traffic through the Seaway to the year 2000. There is room for continuing research in this area—both on non-commodities such as coal and on the implications of commodity movements to ports and regional industries.

The interlake traffics, which have a larger potential, have not been very well measured and the interlake passenger services have been altogether forgotten. Researchers have just kind of backed away from those potentials.

#### Break-Bulk, Unitized, and Bulk Ships

The types of ships should also be examined. The overseas fleet has break-bulk, unitized, and bulk ships. But ordinary standardized container ships were built too large for the present Seaway locks. There are all kinds of unitization occurring beyond the standardized container ship, even putting containers on the bulk ships. Bulk ships, particularly the self-unloaders, have been an innovation. But tentatively we've lost enormously in our diversity and flexibility of interlake shipping. The hybrid, as shown on Figure 3, is a combination with some of the carrying capacity of their mother, the laker, and some of the seaworthy characteristics of their father, the ocean going ship. Barges on the lakes and altogether new types of shipping such as was developed by Dow Chemical Company, ships that could operate on the lakes, the river system that connects the lakes, and on out into the Gulf of Mexico should be examined. Little research of this type is going forward at present.

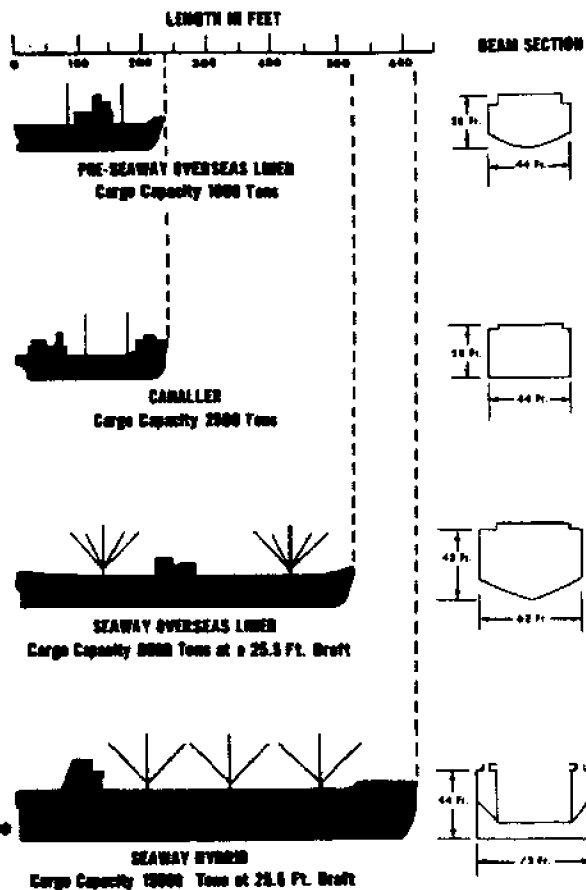
The ships in the Seaway overseas trades have experienced an evolution. As Figure 3

makes clear, the pre-Seaway ships were minatures with limited carrying capacities of 1,600 to 2,600 tons. With the opening of the Seaway, overnight the overseas liner introduced into the trade could carry 6 times the amount of miniature pre-Seaway ships. The lakers able to move over the Seaway could carry 10 times the old French canalier loads. The hybrid which evolved was a combination. It has part of the carrying capacity of its mother and part of the seaworthiness of its father. It can also go through the Seaway and provides, despite the limitations of the locks, a remarkable economic access to world markets and sources.

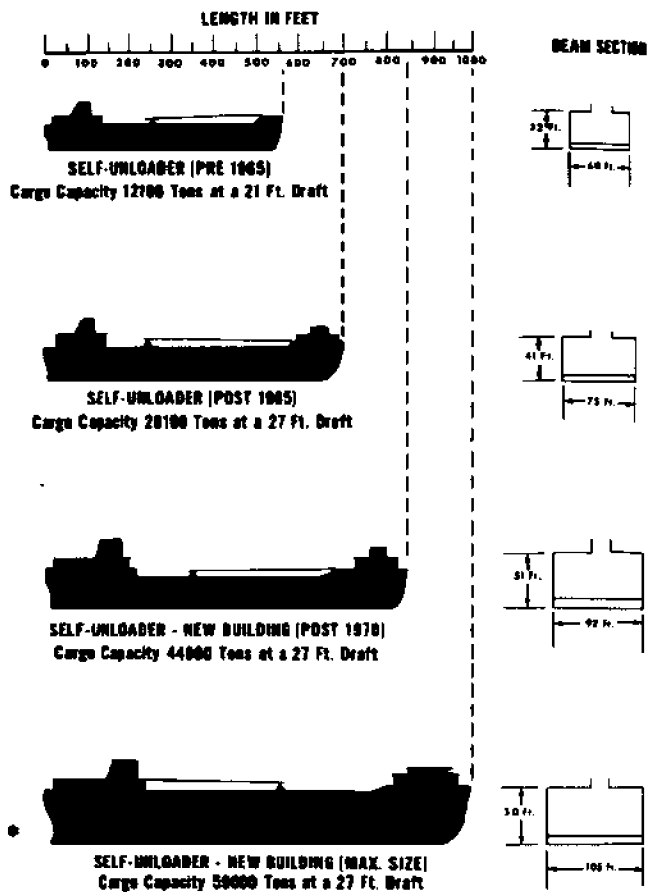
Innovation, as everyone realizes, is not just building a better ship or a better mousetrap. It also involves determining whether the right conditions for enterprise formation and entrepreneurship exists in the lakes. And I think those of us like Art Chomistec of Dow, who struggled with this thing for 20 to 25 years, have concluded that there has been little indigenous enterprise for overseas shipping in the lakes. We've always been tryin to attract the American lines which are already operating out of the Eastern seaboard ports. They come in, give us a few seasons of relatively poor service, and then they pull out again and go back home. Can you create an indigenous enterprise that is committed and dedicated to the lake service and that is all?

That has been one of the things we haven't been able to find. The other issue is the need for government policy to be administered in such a way as to give a fair shake to new lines in the lake trades. For instance, many of the defense, aid, and agriculture 480 cargoes originate in the mid-west. They cannot move out unless an American ship is present and the American lines have darn near embargoed the Seaway. That makes it very difficult for the region to export government assured cargoes originating in this section. Tanks leaving from Centerline (Detroit) moving within a few blocks of the terminals on Jefferson Avenue and going overland at a \$20,000 addition transportation cost and on into the

**OCEAN/SEAWAY VESSELS  
STANDARD TYPES**

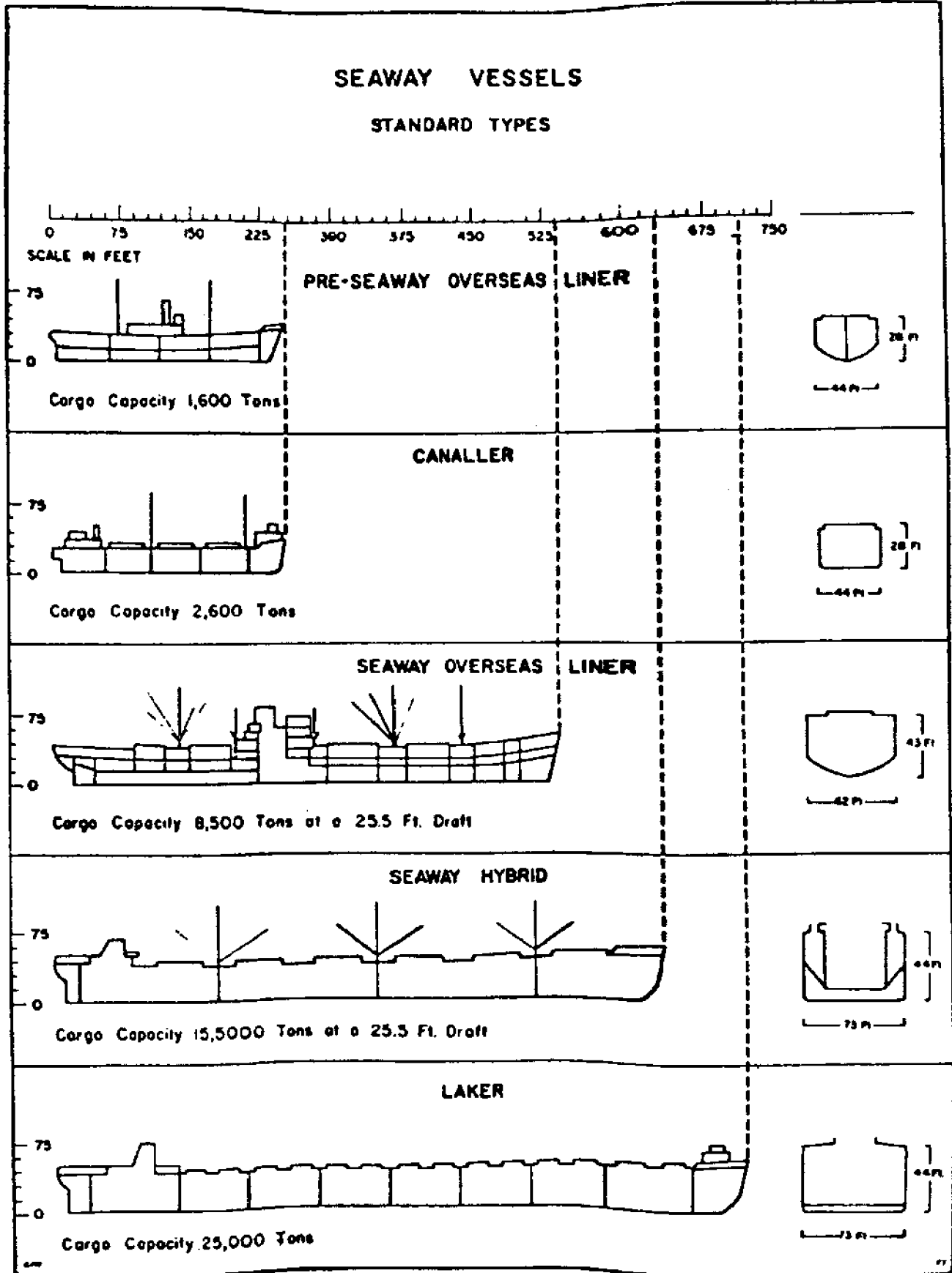


**GREAT LAKES VESSELS  
STANDARD TYPES**



\*NOTE: Northwest Regional Transportation Study, Michigan Department of State Highways and Transportation, August 1978, p. 28.

FIGURE 3



overseas service by American flag ships waiting for the cargo in the eastern ports. This requires an even hand in administering the law. It also requires marketing effort. We'll talk about one of the aspects of marketing later, the Great Lakes-Seaway Marketing Corporation which could transcend some of the regional problems and perform some very positive functions.

### Traffic Studies

A recent study was completed by DRI & ACRIS Associates confirming Seaway traffic potentials. It projects an increase of St. Lawrence traffic from 53.5 up to 89 million tons by the year 2000 despite all of the problems that I mentioned along the way. The Welland section is a critical section because it has less capacity than the St. Lawrence. The Welland, the canal between Lake Erie and Lake Ontario, would move up in the upbound service only from 17.8 to 23.7 million tons. Most of the increase would be iron ore upbound. The Welland downbound, however, would move up from 46 million to 66 million tons, most of it grain. The total would move up to 89 million tons by the year 2000. Some time before that, my calculations show, it would be necessary to duplicate locks at the Welland or go to year-round operation to accommodate the increased traffic. And if the locks are duplicated, why not duplicate at the size to accommodate future shipping.

The interlake fleet also needs an examination. The Canadians have done a thorough and definitive job. We haven't done much for a long time. But bulk carriers, barge fleets, and roll-on, roll-off ships need to be examined. The latter, which are now operating between Osewgo and Toronto, have not been utilized as well in the lakes as they could, particularly with the remarkable escalation in truck costs that are going around the lakes. Why not haul them cross lake with these quick roll-on, roll-off ships? Passenger carriers we've forgotten altogether, cruise ships, vehicle carriers. High speed surface effects vessels could run from city center of Milwaukee to city center of Muskegon at 80 knots, instead of flying over

as we do and spending 65 minutes in each airport. There are, in short, a number of ship innovations that should be investigated.

### Waterway Development

In waterway development, I think the Welland Canal is the most vulnerable part of the route. The St. Lawrence section of the seaway is single locked as well. The first step is better utilization of existing facilities. The second step is to extend the season and the final one is lock duplication. If the locks are duplicated, they should be built for ships of the future instead of ships of the present. The interlake channel expansion, interlake connecting cutoff channels, the interlake passenger routes would be scenic routes, water safety, turbulence effect of large ships on channels as mentioned by Bob, are all projects warranting examination. Ships tend to squat and create some turbulence in the narrow connecting channels.

### Port Development

A number of developments in the lake ports need to be examined. They were created by heroic characters who were kind of one-man bands; like Harry Brochel of Milwaukee, Max Cohen of Chicago, Lou Purdy of Toledo. They were hard driving men who ran the whole show and could name every one of the longshoremen on the docks. That age is probably over. A new type of organization is required and a new kind of relationship with the city and states are required. Personnel requirements, market programs which Jim will mention, sources of financing, new modes of organization to spread out, and decentralize the work should be examined. Other things in terms of short range expansion and ultimately relocation of some of the port plants because they have to move the traffic around the cities instead of through the city center.

### Equitable Inland Access

Cooperative port approaches to achieve equitable inland access are necessary. They

need some precedent cases. Another approach is to establish principles so the inland carriers will give lake ports equal access to inland traffic. Deregulation is hurting the lake ports, but it need not be abandoned altogether. Rather, a new coordinative type of regulation with through rates, equitable service, proportion rates, and equitable divisions thereof is required. Compulsion is less likely in the future. The rails and the trucks are running much freer and much less subject to Interstate Commerce Commission scrutiny.

### Competitive Battle

The lake ports have had a very difficult time and they have been fighting a losing battle. As they fought this battle, their hinterlands have been progressively circumscribed. Despite this circumscription, we still have substantial traffic potential. To turn this around and realize the potential will require new regional approaches, task forces, other regional agencies, independent marketing corporations, state, provincial cooperation. Jim will be able to tell you about the Great Lakes-Seaway Corporation.

I understand that Ken Boyer proposed some research on looking into the impacts of deregulation, especially rail deregulation on the port access. This is the kind of thing we should be doing. I understand from Mike Parsons and others that they are starting some ship technology studies that will be companion pieces. It is a problem as I will mention that goes beyond any one University or any one research organization and then becomes a problem of how do you put it together.

Our basic problem is getting the research done. No one University has the full capacity. I think the University of Michigan is outstanding in the United States in ship research. I think we here at Michigan State do more on demand and economic analysis. At one time the University of Wisconsin did the best studies on ports. We've got to put it all together just like the region has to put the action program together, and I would like to hear some words of advice from some

of you about how to get cooperative research done between universities of various allegiances and rivalries. We need the effort right now. For example, the task of economic development has never been more urgent. The region can no longer take for granted that it's going to develop. The region's universities have a major role. How do we put our acts together and make the most of this waterway?

## SHORT RANGE IMPLICATIONS FOR SHIPPING ON THE GREAT LAKES

Jim Fish, Executive Director  
Great Lakes Commission

You should be aware that I am a generalist, I come not from an economist's point of view nor a political point of view, per se. If I had to characterize how I look at things, it's probably in the 19th Century context of political economy. A geopolitical and geoeconomic base is where we really come out when we're dealing with this large region—an economic heartland of the nation and, in fact, the political heartland. It covers 8 states touching these lakes, which have to agree politically on some decisions with regard to the lakes. Or if they don't agree, get run over roughshod by a Federal Government that may have decision makers from other parts of the country who are somewhat less familiar with the lakes. It also includes two provinces of Canada. In that sense, it's two nations. The seaway that we take for granted is really a small part ours and a large part theirs. The Welland Canal is wholly Canadian owned. Of the 7 locks that replaced the 21, 5 are operated by Canada. The discussion at the time it was built was, "if you guys in the United States don't get off of your tail, we will build the St. Lawrence Seaway and it will be ours." As I understand, in some of the discussions that are now going on relating to future improvements for the year 2000 and after, Canada is again saying you better think about what you are going to do because we still own right-of-way to build a new system without you. I think this is some of the political reality that we need to keep in mind as we go along.

One of the political and economic realities of this system is that it is a big, big secret. The 200 million tons a year that were moving before the seaway opened on the lakes are still moving. Most of the people in the rest of country think the Great Lakes are lakes. Lakes in the rest of the country tend to be those things you ride on in a motorboat with anywhere from a 3 to a 75 horsepower motor, and you cruise across

and you cruise back in nice calm little bodies of water. And they simply don't know what this resource is, reaching over 2000 miles from the Atlantic Ocean into the very center of the country. It simply isn't understood. Bob Adams and I testified last summer before the Merchant Marine Committee and his comment afterwards was: "They simply didn't understand when we mentioned the Great Lakes. Their eyes just seemed to glaze over." It was an extraordinarily accurate appraisal of what happens most of the time when you go to Washington to speak about a Great Lakes issue. There is a lot known about the lakes in this room and around the area, but it's very closely held by very few people. John's earlier comment, for instance, about the steel companies knowing the value of the lakes. They don't talk about it a great deal. There isn't any great promotion by the steel companies that says, "we produce our steel because we have the Great Lakes." They know a lot about it, but they don't talk about it.

The Great Lakes Commission, at the request of the ports and the states, undertook a study to see if there couldn't be some kind of an effort made to better promote shipping via the lakes and ultimately help the basic economy, whether it's agriculture or the industrial economy that we enjoy—at least most of the time. What we came up with was the idea that there should be an independent, free-standing promotion unit which would promote shipping via this route. That has been reviewed by the states, and the recommendation of the steering committee is that an organization be formed, that funds begin to be collected for the support, primarily from private enterprise, the states and the ports that would benefit, and that it start functioning next January, which would give it a chance to make some difference in a shipping season in 1983.



It remains to be seen how well the various Great Lakes interests will support that. There is competition between the ports, there is competition between the industries, and that has been very good competition historically. I think the question that has to be answered is: When is competition, as an absolute, counter productive? When is it better to joint together to promote a region, while retaining most of the competition that you have? When can you essentially profit more from a joint effort? I think there is good evidence that this can be accomplished, from other analogous groups around the country and other port ranges. I'm encouraged that we are moving ahead. I also think it's an absolute necessity to reeducate the region itself and the nation on the assets we have—because we have a vital national asset.

One other thing in terms of this system. The self-unloaders were mentioned earlier and you will recall Montreal was the end of the seaway system. It's not the end of the freshwater system, nor is it the end of the Lake system. Lake vessels can move out almost to the opening of the Gulf of the St. Lawrence to the Atlantic Ocean. We operate here with two systems. We operate with an interlake to the mouth of the St. Lawrence system, by the lake vessels that we have historically known. At that point, the lake vessels can go no further. They're structurally built for the lakes, not for the ocean. As I understand it, the waves behave differently on the ocean than they do on the lake. This is one of the basic issues, but there are those two systems. They overlap because the ocean vessels go all the way to Duluth, as well as lake vessels. What we are seeing now in the bulk commodities and particularly in the emerging commodity of coal, is that rather than an ocean vessel coming in to pick it up, the lake vessel takes it to meet an ocean vessel and then transfers it by the self-unloading technology.

We have responded to that technology, to the constraints and the limits of the system. I think that it is in that ability to respond that we are going to see some recovery in the long term. Certainly, the self-unloading

technology which has been around for 50 years here, will in terms of bulk commodities, make the biggest difference in our remaining competitive, both in our domestic market and with imported products and imported raw materials, as well as new export possibilities.

With regard to exports, I think there is something that we can focus on and maybe this is moving into the research area. But everybody wants to export. I don't care where you are in the world, the goal is to export. If you have to import, it should be a low value raw material. The export is to be the high value commodity. From the lakes we have a phenomenal imbalance, which is the cause of some of the congestion in the system. Ships tend to get from one place to the other and then back again. You've got all these ships going by with nothing in them except ballast water. And that's a serious problem. I think we have to look at what it is we can bring back if we are going to make efficient use of the interlake system, and of the system all the way through the seaway. What is it that we might need here that can be imported via the seaway system.

This brings to mind the sequence of finished material and raw materials. Our lakes primarily move raw materials or partially finished materials. We need to look at how we balance some of those things off. Are there some new opportunities there. We are trying to address the competition, if you will, between the Gulf and East Coast to move these cargoes, which move around now in some cases through this marketing organization. There is going to have to be a great deal more done in that area.

We are going to have to address ultimately the question of equity within a national system. User fees are not a new concept. We've had them for 20 years in terms of toll, but now there is the proposal to do it through the whole country. How this system which has had those fees fits in with a national system, if that comes to pass, will be critical to the economy of the

system, of this region, and I think probably critical to the economy of the nation. I'm not sure how that is going to be accomplished. I have a few ideas on it, but I don't think anyone knows how quickly that will come to pass or how much impact it will have. The efforts in Congress, at least on the House side, are to find out, in the words of the chairman, "what the hell is going to happen" when we do this. I think that's an area where we all need to concentrate, on what difference does it make if it costs .06 or .25 cents a ton more to move a cargo, or maybe \$1.00 a ton more. I know that a dollar a ton translates to two or three cents a bushel on grain. And I know that grain moves in the international market and sales turn on quarters of a cent a bushel. I think that is going to make some difference but I don't know who is going to eat it. We don't know if it's going to be the buyer, if it's going to be the carrier, if it's going to be the grain marketing firm, or if it's going to be the farmer. I can tell you where to place the bets on that one, but it's just going to have to be seen.

I want to re-emphasize what Bob Adams said in his introductory remarks: Discipline within the system, whether it's within the research system, or whether it's in the operating system of the ports, the labor unions, the shippers, the carriers, a corporation. This is a system which has, I think, a unique disability compared to the rest of the systems in the country, and a unique opportunity.

That unique disability is that once a ship enters, or commits to enter, the St. Lawrence Seaway, it's got to come in, do it's business, and get out. It is captive for that period of time. If they're having a problem, they simply have to buy out and run. That is not completely true on the other sea coasts of this nation because there are a series of independent ports where, if things are screwed up in Baltimore, they can take a small loss and move that cargo somewhere else, and they do it regularly. Here it is a little trickier to do that. I think that's also a unique opportunity. If this system in and of itself disciplines itself and cooperates

within the competitive system, we can offer probably a better ultimate service and better opportunity for the carriers, the shippers, and ultimately the buyers. We have to look at both sides of every one of these items, but within the context, as Bob so appropriately pointed out, of discipline and cooperation.

## MICHIGAN'S PORT NEEDS STUDY

John O'Doherty  
Director of Port Planning  
Michigan Department of Transportation

Last fall, the Michigan Department of Transportation published the state's first port needs study. I'd like to touch on some of the high points of that study, and perhaps deal also with some of the extensions we have in mind in the next update of the study. The study had its legal basis in Act 51 of the public acts of 1951. This act, with its several amendments, requires that a needs study be performed for all modes of transportation and updated each 4 years. In 1976, Public Act 246, which was the highways and transportation appropriations bill, specifically authorized the performance of the statewide port needs study. In this first study, ferry service subsidies, vessel acquisitions, and port authority subsidies were not included. Ferry service needs were included in the Railroad Needs Study. The purpose of the port study was to identify port needs for both public channels and private facilities, to establish criteria to assist us in developing priorities, to evaluate economic justification for investments in port areas, and finally, to develop a basis for making specific recommendations on port investments.

The first activity was the definition of goals and objectives which provided a bound within which the needs study was conducted. Simultaneously, we collected data (which we call the port inventory), in 3 categories, viz. the harbor inventory, the terminal inventory, and the land parcel inventory; and I will describe in a little more detail the elements that went into each category. Before we could develop port standards, we had to define the role that each port played in the state's marine transportation system. To this end, we developed a functional classification scheme that separated ports according to their function rather than their physical characteristics. From the functional classification system, we derived a series of port standards. Port standards represented

desirable characteristics against which our physical inventories could be measured. Then we had the task of coming up with traffic projections. The traffic projections and port standards and physical inventory would all be used to generate a series of physical deficiencies. We then made assumptions with respect to the economic environment, particularly inflation rates and unit costs, and used this information together with the physical deficiencies to define our financial needs. The planning horizon over which the study was conducted was approximately 12 years, ending in 1990.

The 4 goals and objectives could possibly be summarized in 4 terms: efficiency, stability, environmental protection, and safety. The 59 commercial ports in Michigan were arranged according to their functional classification. I will talk more about the functional classification systems a little later in the presentation. The functional classification system consists of 5 categories indicated by 5 different symbols. Copies of the study are available for those who wish to have it.

The harbor inventory dealt with the public parts of the ports, the navigation channel, the turning basins, and port capabilities in accommodating various sizes and types of vessels. In the terminal inventory, we dealt with port components owned and operated by the private sector, such as terminals and facilities of private operators and transportation carriers. We collected information on port capacities to handle various commodities, both in intermodal transfers and in the loading and unloading of ships. The land parcel inventory contained a fairly thorough collection of the characteristics of all land parcels in the state's commercial port areas. We collected information such as the utility services available, the connections to the

rail-highway system, the zoning characteristics of the parcels, and acreage. We also cross-referenced each parcel to the Department of Transportation's 2300 zone system. With this 2300 zone number, we could produce plots and maps.

The basis for functional classification is really a measure of importance of the port based on the types of traffic and the services operated. It should not be based entirely on physical size or tonnages of commerce handled. Each classification category was hierarchically organized. There were 5 categories: overseas ports, Great Lakes-St. Lawrence seaway ports, single purpose deep-draft ports, local service ports, and a fifth category which we called occasional or potential ports.

The general characteristics of overseas ports were that they should be able to accommodate both ocean vessels and lake vessels. These ports are generally public ports, they have channel depths of at least 27 feet, they handle a diversity of commodities, they provide inter-modal connections to other carriers, and they serve large hinterlands. There are 4 such ports: Detroit, Muskegon, Port Huron, and the Saginaw River. The second tier of ports caters primarily to Great Lakes and St. Lawrence Seaway commerce. They provide direct service between Great Lakes ports, they are public, they have channel depths ranging from 18 feet to 27 feet, they are able to handle diverse commodities, and they have limited ancillary services such as customs health, immigration, etc. The third category of ports are what we call the single purpose deep-draft ports. Generally, these ports cater to single users and are generally unavailable to the public. They have channel depths ranging from 18 to 27 feet and generally cater to specific commodities, such as iron ore, limestone, etc. They have few or no services, and they serve very small hinterlands. Generally, these ports are privately owned and are located principally in the northern part of the state. For example, Port Inland and Rogers City are owned by large mining companies. The next category is local service ports which cater principally to the highway and railroad sys-

tems. And finally, there are ports which are considered to be occasional or potential. They have in the past supported traffic but are either presently inactive or they have future potential.

Having classified the ports according to functional classification, we were ready to develop a series of standards for each port. We developed these standards based on functional classification using 5 major categories:

- (1) Public navigation channels - for those we used quantitative depth measurements.
- (2) Terminals - we divided those into 4 categories: general cargo and containers, neo-bulk, bulk, and passenger/vehicle.
- (3) Modal transportation interchanges with other modes - railroad, highway, marine, and pipeline (marine would be ship-to-ship).
- (4) Management or development structure of the port - this identified the administrative structure, whether there was a port authority there or port commission or development agencies.
- (5) Administrative services available - banking, brokerage, customs, health inspections, etc.

For this iteration of the needs study, we were successful in developing quantitative standards only for the public navigation channels. For the other characteristics, we used a qualitative measurement indicating the desirability, or otherwise, of having that characteristic in that type of port. In future, we intend to be more quantitative, especially in developing standards for terminals.

In respect to traffic projections, we found that this was one area in which we did not have much knowledge. For this iteration, we generally based our projections on past traffic trends with certain exceptions. For minerals, grains, and forest

products, we based our growth rates on those that had been projected by the U.S. Army Corps of Engineers. For bulk commodities, especially coal, iron ore, and crushed limestone, traffic increases were projected. Coal was expected to increase because of the Clean Air Act of 1970 which required conversion of power plants from oil to low sulphur coal. We expected general cargo to decline slightly, reflecting the continuation of the trend toward very large ocean vessels and containerization. With respect to economic assumptions and costs, between 1981 and 1990, which was the horizon period for the study, we projected annual inflation would fall somewhere between 6% and 10%. Therefore, we did alternative calculations for 6%, 8%, and 10%. We assumed that maintenance dredging would cost approximately \$3.00 a cubic yard based on 1981 prices. For capital improvement dredging, which is new dredging, we calculated the costs for 3 levels: low, medium, and high. Low was \$10.00 a cubic yard, medium was \$20.00 a cubic yard, and high was \$30.00. We found that the cost of new dredging could vary anywhere from \$5.00 to \$50.00 depending on the nature of the dredged material. For our terminal costs, we also calculated the cost based on 3 levels: small, medium, and large. A small terminal was \$1 million, a medium terminal was \$5 million, and a large terminal was \$20 million.

Table 1 shows the summary of the capital deficiencies calculated in millions of 1981 dollars. The various categories of construction, for capital, were: improvement dredging, that is new dredging to take a port from one standard to another; the construction or enlargement of terminals; and the provision of inter-modal connections. Terminal costs need to be explained. For a small terminal, we included the possible improvement of facilities like providing bulkheads, or improving existing terminal. Medium terminals could have included construction of a general cargo or bulk terminal and a large terminal could have been a grain exporting elevator or multi-purpose bulk terminal. In this study, we did not calculate the cost of inter-modal connections, which we intend to do in future revisions. Three quarters of all the capital

deficiencies are for terminals, and over half of these are in ports that serve Great Lakes traffic. The total deficiencies were almost \$200 million for the period 1981 through 1989. Operating costs, as shown in Table 2, included the cost of doing maintenance dredging. We found that that was a cheaper deficiency: two-thirds of the deficiency occurs in ports that support overseas traffic. We have not included the costs of maintaining the connecting channels which, for Michigan channels, run approximately \$11 million per year.

Table 3 is a summary of the total fiscal needs, a summation of operating and capital costs by port type for low, medium, and high assumptions. Almost all the needs are in ports serving overseas and Great Lakes traffic. The very severe effects of inflation may be inferred from the table. We calculated the initial cost in 1981 dollars, deflated those to 1977 dollars to be consistent with the other components of the transportation needs study, and then inflated those 1977 dollars on annual basis using 6%, 8%, and 10% inflation. Deficiencies ranged from \$263 million, assuming 6% inflation for the low case, all the way up to \$532 million for the high case, assuming 10% inflation.

Table 1

**Michigan Port Deficiencies (1981-1989)(Capital)**  
(Millions of 1981 Dollars)

Port Type	Improvement Dredging	Terminals	Intermodal Connections	Total
Overseas	\$20.8	\$ 55.8	\$0	\$ 76.6
Great Lakes	\$32.9	\$ 78.3	\$0	\$111.2
Single Purpose	\$ 1.2	\$ 2.8	\$0	\$ 4.0
Local Service	\$ 0	\$ 5.6	\$0	\$ 5.6
Occasional/Potential	\$ 0	\$ 0	\$0	\$ 0
<b>Total</b>	<b>\$54.9</b>	<b>\$142.5</b>	<b>\$0</b>	<b>\$197.4</b>

Table 3

**Total Port Fiscal Needs (1981-1989)**  
(Millions of 1981 Dollars)

Table 2		Table 3			
Michigan Port Deficiencies (1981-1989)(Operating) (Millions of 1981 Dollars)		Total Port Fiscal Needs (1981-1989) (Millions of 1981 Dollars)			
Port Type	Maintenance Dredging	Port Type	Low	Medium	High
Overseas	\$21.6	Overseas	\$ 98.1	\$118.8	\$139.5
Great Lakes	\$ 9.9	Great Lakes	\$121.5	\$154.8	\$188.1
Single Purpose	\$ 1.8	Single Purpose	\$ 5.4	\$ 6.3	\$ 7.2
Local Service	\$ 0	Local Service	\$ 5.4	\$ 5.4	\$ 5.4
Occasional/Potential	\$ 0	Occasional/ Potential	\$ 0.0	\$ 0.0	\$ 0.0
<b>Total</b>	<b>\$33.3</b>	<b>Total</b>	<b>\$230.4</b>	<b>\$285.3</b>	<b>\$340.2</b>
		1977 Dollars	\$162.9	\$202.5	\$241.2
		1977 Dollars (6% Inflation)	\$263.1	\$325.9	\$388.5
		1977 Dollars (8% Inflation)	\$308.3	\$381.7	\$454.8
		1977 Dollars (10% Inflation)	\$360.5	\$446.6	\$532.3

## COMMENTS ON FOREST PRODUCTS SHIPPING OPPORTUNITIES

Robin Bertsch  
Forest Resource Development  
Forest Management Division  
Michigan Department of Natural Resources

I would like to discuss a current situation and an opportunity as it relates to the forest products industry. I believe Michigan's forest products industry is but one example of many where we have an opportunity to capture more of the economic benefits of that industry.

The United Nations Food and Agriculture Organization recently predicted worldwide demand for wood and wood products is going to double by the year 2000. That, combined with the world's diminishing forest land base, makes one wonder how we can meet that demand.

Currently, the United States is a net importer of wood products; yet by the year 2000, we could meet all our domestic needs and double our exports of wood products! Two regions of the United States, the Pacific northwest and the south, currently produce a major portion of our forest products. These regions have pretty much developed to their full potential with little room for additional growth. The Lake states region, however, has a large surplus of wood fiber at relatively low cost. It becomes apparent, based on earlier mentioned facts and predictions, that growth experienced in world-wide markets will be experienced in the Lake states.

Michigan is a case example. We have one of the largest commercial forest land bases in the United States, approximately 17.5 million acres. At current forest management levels, we are removing one-third the timber we could be removing annually. Attempting to capture more of this potential and related economic benefits is part of our challenge.

I recently attended a meeting in Stevens Point, Wisconsin, that dealt with the export of forest products. It was pointed out that

our greatest opportunity for export of wood products lies in the markets of Japan, China, Europe, the far east, and Canada. A success story of one lumber company at Cornell, Wisconsin, was cited. Beginning operations 5 years ago, their marketing objective was to meet domestic demand. Today they are exporting 80% of the products they produce for foreign markets.

One example of their marketing success was to take a marginally profitable lumber mill by-product being marketed locally as firewood and turn it into a highly profitable product by marketing it in Europe for use in mouse traps. The company ships its product via containers on the Great Lakes. They find they are less susceptible to fluctuations in the United States economy by development of high quality, long term overseas markets.

Bruce DenUyl mentioned a Scandinavian experience we recently went through in Michigan. An insect infestation on some of our state lands will cause the loss of some wood fiber unless markets are soon found to absorb this material. A Swedish firm was found to be interested. Shipping wood chips from Bay City to Sweden was considered. A comparative analysis of shipping wood chips on the Great Lakes in 25-30 thousand cubic meter vessels versus 60 thousand cubic meter vessels on the Gulf proved uneconomical.

A second alternative, shipping the product in an unprocessed roundwood form, was considered. Swedish regulations required a debarked product. This regulation combined with vessel size limit of 30 thousand cubic meters also proved to be uneconomical. Hence, the market was lost.

What this points out is the opportunity

before us to capture more of a growing forest products industry market; and some problems we must address, such as shipping on the Great Lakes, in so doing. I was pleased to hear that vessel design for forest products on the Great Lakes is on the horizon. That can only enhance our economic development activities.

Thank you.



## COAL SHIPMENTS ON THE GREAT LAKES

Howard Bunch  
Naval Architecture & Marine Engineering  
University of Michigan

This presentation will look at three topics. First of all concentrating almost exclusively in the area of coal and coal movements. As part of that, we will summarize what the movements look like today: their origins, their destinations, what their purposes are relative to the Great Lakes, and we'll tell you a little bit about some of the research projects that we have been conducting at the University to try to optimize the movements of this cargo on the Great Lakes. Finally, we will draw some conclusions and give you some recommendations.

I would like to acknowledge one of my associates, Paul Vickers, who put together some of the background material, and he has been working with me very closely on two of the projects that we have been involved in.

First of all, let's quickly look at the movements of Great Lakes coal as we see it on the Great Lakes today. What we're finding is that about three million tons a year are moving eastward out of Canadian ports in the Thunder Bay area. It's been moving from Canada, meaning that it is essentially a Canadian shipment. This is Canada's equivalent to our western coal. From the Powder River Basin of Montana in the far west, approximately 6 to 7 million tons a year are coming into the United States and transshipped at Duluth, moving primarily down into the St. Clair River for use at the Detroit Edison facility. Another major movement is about 2 million tons of what we might call Illinois Valley coal. It's primarily moving up and through the Chicago port but it could be any one of the ports along the southern Lake Michigan area, moving primarily around and through and into some of the ports along Lake Michigan, Lake Huron, and into Lake Erie.

The major movement of coal that we find in the United States today on the Great

Lakes is, in fact, the north-south movement that originates in what we might call, generically, Appalachia. It's high quality, controlled (11 to 12 thousand BTUs per pound), what we would call our steam and metallurgical coal, on a scale of about 35 million tons a year. It's moving primarily through four ports on Lake Erie. One major movement is from Toledo, primarily directed into the Detroit area. Just for the record, approximately 12 million tons is moving through Toledo. Another movement is primarily from northern Ohio up into Canada, and there we're seeing about 20 million tons a year going through the Ohio ports. Some of the movement is finding its way into the export market, and that's one of the major markets that we find occurring today. In fact, one of the most interesting movements that we've seen ever in the Great Lakes coal was a movement that took place last summer in which there were a total of six lakers that were loading Appalachian coal out of northern Ohio ports, moving it out into the St. Lawrence system, and transshipping it onto deep draft ocean-going vessels bound for the far east. The significance of that movement is in the eyes of many a major new thrust area for coal movements out of the Great Lakes essentially into the export market.

Of significance relative to the present coal movements is the fact that the northern Ohio ports support facilities have a capacity to handle much more coal than is presently being handled. Just as an example, Conneaut is only shipping about 57% of what the port could handle. Competitors are running at 100% of capacity and, in fact, there are significant waiting times for ships as they load coal in those ports. That waiting time is coming down quite rapidly. But nevertheless, you do find a waiting time in existence in the Atlantic coast ports for coal that's coming out of Appalachia that

would be going into the export market. Another thing of significance is that the traditional rhythm of movements has been a downriver movement for metallic ores and rocks, and an essentially modest upriver movement for coal, until fairly recently, when we began to see Powder River Basin coal coming through Duluth into the Detroit area. That trend of the rhythm won't be reversed. Perhaps certainly we'll see major increases in western coal moving to the east.

What do we see coming in the future? Well, what we have seen so far is the fact that the coalers that we are encountering on the Great lakes are primarily in three classes. They are coalers that have the ability to move through the St. Lawrence Seaway and make movements from Lake Erie to Lake Ontario through the Welland Canal. Then we find coalers that are above 740 feet in length and essentially locked into the Great Lakes. To give you a picture of the two extremes that we are dealing with, the largest you can find right now that has access to all five lakes is approximately a 730 foot vessel. The largest one that has access to and can make movements through the upper lakes is a thousand foot vessel that can make the transit through the St. Mary's River and the Soo Locks. Interestingly, we only have two vessels in the Great Lakes today that are dedicated exclusively to service that would be above the 730 foot. And both of those vessels, to our knowledge at least, are confined to serving western coal movements from Duluth down to the Detroit Edison Plant. One is the Bell River, a thousand footer, and the other one is a 770 footer, the St. Clair. Those two vessels are dedicated to the movement of western coal to the Detroit Edison plant. In all, we have approximately 40 to 50 vessels that are in Great Lakes service as coalers. But they are all under the 730 foot dimension. That does not mean to say though that there are not vessels, some of the other thousand footers that could be pressed into service as coalers should the ore trade go down and there be a need for the movement of coal.

As we began to look into this project of trying to make some forecasts, we found that

we were really looking at two particular trades. This is a gross over simplification because there are great differences in coal. A plant that is designed to operate, let's say, on Illinois coal would have difficulty operating on western coal and would have great difficulty in operating in some instances on Pennsylvania coal. So the ability of a plant to utilize a specific type of coal is a function of the boiler settings, the ability to remove the ash, the ability to handle the particular sulphur content, the scrubbers, etc. And coal varies as a function of moisture content, as a function of BTU, as a function of a whole host of factors that specifically relate to the design, and applicability of a plant boiler to accommodate that particular product.

We project that there is, in the domestic market, on the basis of low-order projections, a relatively small, almost static, rate of coal movement from within the Great Lakes over the next 30 years. On the high order we see a projection that is about 35 to 36 million tons per year. Conversely, the movements into the export market are significantly greater, even on the basis of the low order, we see approximately a 70% increase; and on the basis of a high order estimate, we are looking at approximately 100% increase.

Of these two areas, the most interesting is the domestic market for a variety of reasons. Because of the follow-on economic benefits that can accrue to the economy through the movement of domestic coal, are strongly associated with electrical generation; and if we were to see movements of coal, we would, in fact, begin to see that would be strongly tied to increases of generation, which would increase our relative position in the electric generation grid in the United States. Export movements are a different matter. It may or may not have strong economic benefits to us as a nation. It might take some imagination, in fact, for people in Michigan to understand if there are, in fact, any benefits accruing to them for movement of coal that originated in Decker, Montana; came to Duluth, Minnesota; moved on a thousand

footer to Bullalo, New York; or moved on a 730 footer all the way up to the St. Lawrence Seaway; and then totally into export. But, nevertheless, the fact does remain that there are strong trends and economic factors that would suggest that there will be increasing movements of coal into export in the years ahead.

In the Department of Naval Architecture, we have done a couple of research projects in the last two to three years toward optimizing the economics that might be of interest. One of the problems that you deal with when you are looking at the Great lakes transit system is the bottleneck in moving through the restricted waters. The St. Mary's River particularly, but all of the waterways, have some bearing upon the freedom of movement. The one that we were particularly interested in has been the movement that takes place in the upper Great Lakes; and in that regard, we have done two studies.

One study was to look at how we could increase the vessel size beyond the current restrictions approximately 1100 feet or 1000 feet by slightly over 100 feet. We did some trade-off studies in using our computer and we found that if we were confronted with one constant that we couldn't vary, relative to the restrictions, and that constant would be the depth of the water that you were dealing with, we would have an optimum vessel size that would be approximately 1250 feet by 156 feet on the beam. That vessel size is fixed. We couldn't vary the other major factor, the depth of the vessel. So we said that we had a 27 foot draft constraint, and that we would optimize on vessel length at a 1250 foot by about 156 on the beam.

We took that vessel and began to do some exercises as to how we could manipulate the water restrictions to make the vessel move through the system. The authorities require that we maintain a relationship between the beam of the vessel and the width of the waterways. And currently, that restriction on single passage or one-way traffic is that the minimum channel relative to the beam of the vessel is about three times the beam

of the vessel. So, all of the studies that have looked at making larger vessels compatible with the system have essentially looked at widening the channel. We asked the question: What if we held the channel constant, increased the beam of the vessel, and tried to maintain our margin of safety by putting more sophisticated control systems on the ships so that we could, in fact, make a transit through the system, still be as safe, but have a very, very accurate command and a responsive control system similar to what the 747 has approaching for a landing. At that point the comparisons actually stop as to what a 747 is responding to and what a ship is responding to. Nevertheless, we tried to look at what we could do if we manipulated a control system rather than manipulating channel width.

That study was done in two parts. My part of the study was to attempt to look at what costs we could encumber in our system and still not exceed the costs of dredging. And this chart very simply illustrates that relationship. What you are looking at on the X axis is a ratio of channel clearance to ship's beam, you have a ship that just fits the channel. But we did a series of studies relating the existing system, and this difference is because as we increase the length of the ship, we have to make some accommodations in the turning basin, which we said we were still going to have to do. We were still going to widen the channels to handle that. And we find that if we were to arbitrarily say that we wanted to have a ship that would navigate in a channel which was only twice the width of the ship, depending on the costs of modifying the Great Lakes to accommodate a ship of that size using the normal dredging, we would have somewhere around 4 billion dollars that we could spend on control systems and still have better economics assuming the control system provided the same degree of safety. All that we are saying in this particular investigation is that an exciting way to look at the feasibility of increasing vessel size in the Great Lakes might be for us to look at putting some sophisticated control systems in place. The economics indicate to us that we would

have lots of money to play with before we would, in fact, come anywhere close to what it would cost to dredge the system. There's lots of work to be done in this area and like Will Rogers said, "I'm just an idea man."

The second study, which we're just now completing, was a study in which we assumed that we do not have the possibility of widening the St. Marys River. But we still want to try to put this larger vessel into the Great Lakes and the only really restricted place that we have to overcome, where the costs are almost prohibitive, is the St. Marys River Soo Locks transit. So let's say that we would like to see if we could make a transit from a port that's on the western side of Lake Michigan. We took our optimum size vessel and postulated that we were going to make a movement of a cargo of western coal from Escanaba to Buffalo. We were comparing that movement through one of several alternatives. First, our origin port would be Decker, Montana, again. We were going to make that movement, number one, through transit that ultimately arrives at the Burlington Northern Docks at Duluth. We put it on a thousand footer, the largest ship that could make the transit, and move it through Lake Superior through the Soo Locks, St. Marys River, and ultimately to Buffalo. We were going to compare the cost of that, as our existing system, with a movement through Escanaba onto a 1250 footer, and make this transit without any modification in the system except at perhaps Buffalo where they have to dredge. And we make that movement through the Mackinac Straits, the St. Clair and Detroit Rivers, and finally to Buffalo.

Then, because we were dealing with a movement that is contesting essentially the Burlington Northern, we decided that we would look at a movement through a competing railroad which took us through Chicago and up to Milwaukee and make the movement that way to see what the economics were in that system. Well, to make a long story short, this movement was quickly eliminated because of the economics. We went all the way through it but relative to this discussion, suffice it to say that we quickly resolved our

analysis down to comparing the Escanaba movement with the Duluth movement. Let me very quickly give you those figures that we came up with.

We found that the rail transit from Decker to Duluth was \$9.35 a ton. The water movement from Duluth to Buffalo was \$6.59 a ton using a calculation that we have for these types of analyses. The total cost is \$15.94 a ton. By making the movements through Escanaba, supposedly to get the benefits of a longer transit season, being on the lee of the Upper Peninsula, we found that rather than \$9.35 a ton we're looking at an approximate cost of \$12.29 to Escanaba. The movement from Escanaba to Buffalo was \$4.34 a ton making the transit cost \$16.62 a ton. So we found, after long periods of analysis, that today the Escanaba movement still can't compete with the Duluth movement. But in the event that the system ever becomes saturated, number one, or in the event the question comes to expand this particular facility, and you began to lay off the capital cost of expanding the St. Marys River or building a new lock to support a larger facility, and if that capital cost were laid against the cost of the coal that is being moved, the Escanaba movement would become tentatively competitive.

Well, those are two studies we've looked at and this gives you some idea of the flavor of the programs of research that we are undertaking at the University of Michigan. Very quickly, our conclusions were that there is a significant growing importance of coal as an energy source to the Lake Michigan region because it suddenly begins to place us in a much more favorable position relative to electrical generation. There's a growing importance of the lakes as a transportation road for the movement of coal. We feel there is a need to improve the economics of movement to enhance the competitive position of the Great Lakes and to provide general economic benefit to our national economy. We feel that there should be increasing research primarily in two areas, separate and apart from designing the ships. We need to examine the

relationship between the lowered waterway transportation costs and commitments to increase installed electrical generation capacity. We think that as we lower those costs the Great Lakes region becomes much more competitive, and electrical generation has tremendous fallout benefits for our economy. We also strongly say that there should be in-depth analyses to look at the costs and benefits of moving the Great Lakes states' coal into export movement.

## SUMMARY STATEMENTS, QUESTIONS, AND ANSWERS

Bud Thar  
Associate Director  
Battle Creek Unlimited

I considered showing you a movie this afternoon, something like Moby Dick, Love Boat, or On The Waterfront. That's the closest to where we've been today. We often think of the Great Lakes in terms of the resources it has for shipping and attractive beaches. But we often don't think of the muscle for movement of big business goods this country depends on in this region. If you and I were to make a triangle between Lansing, Pittsburg, and Chicago, we would have 60% of the industrial capacity of the nation. We have well-developed internal transport muscles, but our ports are adolescent in terms of transportation systems in the world. The Great Lakes are like a teenager because in the 300 years of our country's ports, for only 26 years have we had the waterway. The time has come to market it.

If I were to talk about ideas about the future for research and action for Great Lakes shipping, I'd insist upon selected areas of investigation and marketing as most important. Chicago's a Rip VanWinkle, sleeping through a revolution there's just no two ways about it. It is the most underused muscle in the lakes.

The largest shipments in the United States by rail are from New York to Chicago and the second greatest by rail is Chicago to New York. That has to say something about waterway user fees. Think about the implications and alternatives. That's why Chicago, as a port, is a Rip VanWinkle. I haven't come up with a movie title for Detroit, but the potential for development of an underutilized resource appears appropriate.

In terms of inland and private use of ports, Detroit is excellent. Shipping of steel pellets, coal, and other raw materials has been successful. In international movement

where real growth for Michigan is going to be, two-thirds of United States exports go to the Pacific basin. Michigan needs to market there in selected developing economies. The state of Georgia has 5 offices abroad to push their ports in Greece, Japan, South America, and Singapore; you name it, and they're doing it. We have more productivity in this triangle I spoke about than Georgia and the south coast. We don't have 5 offices for marketing product and shipping.

I want to ask the panel to develop the next step for Michigan. As you know, an action agenda needs to be developed. We need to stretch for each other the vision and implementation of a growth process. The issues: (1) What does the future of Great Lakes transportation look like, and (2) areas of needed university assistance.

Before I commission the panel, North Carolina was in a similar position to Michigan in the late '50s and early '60s. Tobacco was not in as it had once been, cotton was having tough times, and the textile industry was declining fast. The state decided to look at manpower development. Governor Hodges, later to be the Secretary of Commerce, decided that they needed to do something. When they talk about manpower, they talk about what type of professional and industrial base they wanted to bring to the state. It is always bipartisan, with complete support from everyone. In fact, the head of the research triangle that resulted was born in Grand Rapids and went to Michigan State. It's a billion dollar project now with one-third research and development.

A Honda Accord is an automobile which nobody heard about 6 years ago; as a recent car, it had to be marketed. This is a region that's done very well, but we haven't told

the story and sold the waterways of Michigan's products.

There are two things going for us right now. Energy which is coal, and grain which is food. Think about the triangle and the fact that over 85% of our food exports come from a half a dozen states bordering Chicago, Illinois. The United States is one of three net exporters of grain in the world, along with Australia and Canada. Much of what Canada moves goes through the waterway system. What research ideas and practical application do we think is critical for shipping success?

We are fortunate to have foresighted thinking here today. A strong asset of the Sea Grant Program is it brings together the best university thinkers in a way not unlike the research triangle does in North Carolina. It's a taste of what can be done in Michigan and the region.

It is imperative to recognize here in Michigan the north coast of America is accessible to the world. Much work is going to need to be done here in the United States. Last summer a friend from the U.S. Department of State, who has been the economic officer in Japan, viewed Lake Michigan and said he never realized it was such a body of water. He had attended Harvard College and Fletcher School of Law and Diplomacy, yet was uninformed about the midwest. Some work will need to be with the best exporters in the country, such as the U.S. Department of Agriculture in Washington, D.C. Our story is important because we do have the size of ships that can go to ports all over Africa, the Far East, and South America.

History books make the Great Lakes look like it would be impossible to navigate through them. There's a water table that shows a several hundred foot jump between the lakes. You wouldn't get the notion of this being the north coast of America. Over 20% of the jobs in Michigan depend on exports. The work of 1 out of 5 people in the state. Michigan is 1 of the 5 states that export \$6 billion or more a year. Illinois,

Ohio, Washington, California, and Texas are the other states that are the big exporters of the republic.

We need to grow up knowing like my friend from Valencia, Spain, who said, "God travels over the waters of the world . . .". Some people view us as landlocked and we are not at all. I'd like to invite your questions and insights to give us more ideas. Who will be first?

This is the kind of research you find Japan doing. A few years ago the governor of Mississippi had an occasion to be asked by the Japanese if they could talk to him. He made all the informational resources in the state available to them regarding manpower and industry. And they said, okay governor, we've already looked at that. In the previous 5 years they had come to know more about the state of Mississippi than the governor; and it's interesting in that when they went and located their firm there, they had all these questions down. Not unlike the way we should do it with our surpluses. You have a very good point. We should look at these things.

The Japanese businessmen have offered the governors of this country and people \$10 billion in resources to put into capital investment. Be very careful to watch where that goes. It will go to the ports, and natural resources they want to extract from this country to do more of what they're doing. That's in Japan's interest. It's in our interest to do it ourselves. It shows you how their minds would go about this very issue, what you're talking about for economic development, when they have to process things, and upgrade themselves in the mature markets of the world. They are very wise at that. It's Japanese, Inc. I wish it could be United States, Inc., when we go abroad to do things. Not in a way that's exploitive, but in a way that's creative for people in other countries.

During the American Revolution, they say that less than a third of the people supported the movement. It's a question of how effectively we can keep winning the

hearts and minds of people. If you are going to have growth in any industry, and I'm talking about agriculture, too, it's going to be through exports. We have a fairly saturated market in this country and we're going to have to export. You and I aren't going to put more cars in our garage, but there are places in South America, Africa, and other oil countries in the Pacific basin who are going to buy products including food. So if we want to sell more tart cherries, we've got to think about agriculture in Germany and other places, and that's why all of us have a lot at stake.

#### Summary: Jim Fish

Let me take questions kind of in order in terms of the future of the Great Lakes transportation. I like Bud's reference to the area and some of our city areas as adolescent. I think if you look at how this region has performed basically over the last 100 years, it has performed as an adolescent. The various states have each done their own thing and we've had the resources and the economic conditions to do these things. Each state could go off and grab this or grab that, and they were the adolescents who in effect knew it all, had the strength to go slam, bang ahead. I think in a maturing atmosphere or maturing company we may not have that opportunity anymore. We have to work together. We have to, in a sense, create ourselves as a region. The south has done this and has had a very significant economic revitalization.

Great Lakes transportation helps our economy, but functions well when our economy functions well. This spring we don't have lake carriers going out. People have called me and said how come traffic is down at the Soo Locks? And my answer was very simple—the economy went down. That's the

answer. That's why we are not shipping so much on the lakes. Great Lakes transportation generally goes as the Great Lakes economy goes. If we work together on it, if some of the initiatives that the governors are taking right now work together, if cooperative marketing and promotion of this region as a good place to do business is put in place and is successful as a commitment of both state governments and industry, then I think our future looks healthy. I think it looks pretty good. If we don't do that kind of thing, I don't think it looks that great.

With regard to specific issue areas for research, one of the last points that John O'Doherty made was user fees. I think we have to look at user fees not only in terms of what they do to transportation, but also in terms of what they do to the industrial base we have. How do user fees change the competitive position for specific companies or specific industries, vis-a-vis those industries located in other areas of the country, possibly on a salt water coast? I think those are very critical issues in terms of our long-term economic sufficiency in this area.

With regard to naval architecture and marine engineering, Howard spent a fair amount of time with the optimum vessel, a 1250 foot, 156 beam vessel. It seems to me that we also have to consider that those vessels move to a very few points and a very limited trade. And if the lake, and I don't now whether this is accurate or not, but if the lake freights follow the international, I understand then half the trade in the year 2000 will move in super vessels. We have to understand then that half the trade will move in small vessels; and it may be that our focus, in terms of real efficiencies and in terms of this Great Lakes system and its access to the international market, ought to be on those small vessels which might have more impact on our economy here than the super vessel.

Further, in the control system, and control systems for our limited channel were mentioned, there's another limited



channel called the St. Lawrence Seaway. One of our serious problems, in terms of the request for season extension, is a precise all-weather navigation system that can keep the system functioning later in the year. From the first of December, now we go to 8 hours a day navigation time on the St. Lawrence Seaway (daylight only navigation). For those last 2 to 3 weeks of the system operation we could increase the capacity by 2 times if we could simply go day and night full-time with a land based, precise all-weather navigation system. Ultimately, that probably has to be a drop-on, drop-off system which will permit ocean vessels not requiring that system for other navigation regions of the world to pick it up at an entrance point on the seaway and drop it off on the way out.

In marketing, we need to spend a fair amount of time on two areas. One is identification of upbound cargoes, whatever they might be, and I don't have the foggiest idea of what they might be. The only thing that comes to my mind, traditionally, is agricultural supply side and that's a very difficult market to crash because we have most of the supply side of agriculture available already. But I think we need to give some serious attention to that because the numbers that you saw from Dr. Hazard, and the predictions of traffic that say congestion will come downbound in terms of tonnages, moving more downbound and certainly not anymore upbound. If we balance that system, we benefit our economy in 2 ways. One, we get raw materials we may need; and two, we get a rate structure that's more balanced for export products. In that area, I think we need a more intense market identification, of emerging markets, and if you will, world port pairs where we can tie into an ongoing market. We keep looking for cargoes, looking for things to go out, and looking for things to come in. If we can begin to pair those up, focusing on market development efforts, I think we'll come out much better.

In the coal area, just for some comparative numbers to add to what Howard said, last year's 1.6 million tons overseas were 4.8% of the United States over-

seas exports of seam coal. That's 5% of the market. The year before we weren't there. I don't know whether that's going to continue, but I can tell you that this year the information that reaches me is that there are about 2.7 million tons committed already, on the books, for movement out the seaway. Whether that will hold up or not, I don't know. I think we need to look at export coal as a potential, for it represents revenue to the seaway; and if we can promote a movement like that, number 1, how much does that accelerate the move toward capacity? And secondly, how much can it accelerate revenues to hold the tolls if we keep those under a national user fee system, to hold them in line so that our other products continue to be relatively competitive.

One last thing—our systems of bulk handling on the lakes are among the most sophisticated, if not the most sophisticated, in the world. I think we need to look at those a bit and do some fine tuning. Right now, we can handle large granule materials phenomenally efficiently—coal, iron ore pellets, and stone. We have yet to make significant improvements on the self-unloading side for small granule materials. We might want to look at that as a technology improvement. The grains: can we move those to a full self-unloading mode and maybe supply some of the vessel to vessel transfer technology that is being implemented in coal on the St. Lawrence in the small granule materials.

#### John O'Doherty - Summary

I find when I consider these questions, that there are still a lot of imponderables that haven't been answered. I would like to mention some of the issues and constraints that I see as being absolutely essential here. As I go through them, I see that most of them obviously are political, but they do require a good technical investigation.

Following are some of the important issues:

- (1) **Cost** recovery proposals that would affect **future** maintenance and improvement **dredging** in the system. I think that with **respect** to cost recovery, we have to **carefully** consider the possible effects, **not** only financial, but the economic effects, that various alternatives being **proposed** can have.
- (2) **There** is also the question of what happens **to** the St. Lawrence Seaway and its capital debt of \$110 billion. Will the debt **be** forgiven; and if not, what would that **do** to the competitiveness of the Great Lakes/St. Lawrence Seaway system?
- (3) **Another** issue is that of marketing and **promotion**, which was touched upon this **morning** by Dr. Hazard and Mr. Fish. **Attention** has to be paid to marketing **and** promotion.
- (4) **There** are also constraints with **potentially** wide-reaching implications. The **question** of environmental protection, **winter** navigation, the disposal of dredge material (an issue that we are constantly **encountering** at the state level), the **lock size** limitations on the St. Lawrence Seaway, the vulnerability of the large **lock** at Sault Ste. Marie, the Poe Lock, **and** the possible need for duplication of **this** lock. We have reached the point **where** a substantial number of ships moving through the Sault St. Marie **connecting** channel must use the larger **lock**; and as time goes by, more of the **ships** being built will be required to use **that** lock. In the event the Poe Lock **were** damaged, we would find ourselves **in** a very vulnerable position.

As far as potential research is concerned, I would recommend development of adequate **demand** prediction techniques with the **developmnt** of adequate data bases. We have a **rudimentary** data base, but we lack the **broad** base that we need to make adequate **projections**.

Other questions also require **consideration**:

- (1) The effects of deregulation of other modes, especially truck. We haven't really addressed that issue and truck deregulation is proceeding rapidly. I am aware of very little useful truck data and this void must be filled.
- (2) The economic impacts of proposed user fees also need investigation. It's a relative easy task to predict the financial impacts of various proposals, but economic effects are much more difficult to quantify. What could be the effects on diversion of trade, loss of jobs, etc.?
- (3) And finally, what will be the effects on Great Lakes commerce brought about by user fee increases on the inland waterway system? The inland waterway system is likewise facing some changes at the federal level. Fuel taxes are being proposed for that system, and it would shift not only from the inland waterway system to rail, but perhaps from the inland waterway system into the Great Lakes system as these changes come about.

#### Dr. Hazard - Summary

It is not an exaggeration to say that we are losing the Seaway battle. I have been in it long enough to see the contraction of the hinterland and decline of general cargo services. Despite that, the estimate is for increased bulk traffic. It is a very favorably situated waterway. It is also the mirror image of the regional economy and symbolic of what's happening to the region.

When I started my studies, the mid-continent was the foremost region in the United States and Canada, larger than the whole Soviet economy. At the interior of the country, it was a very unique economy with Chicago 200 miles farther from the ocean than Moscow. No continent nor country in the world had ever accomplished that kind of peculiar interior development. Most have developed along the coastal periphery. So the waterway was very definitely gauged then to tap into that

economy, to allow it a direct export option, to allow it access to world materials. It has borne down very heavily on its resource base and iron ore and it needs external support in a very dramatic way.

The region never has been capable of viewing the waterway in a systematic way, as an integral part of its economic development. We here have been looking at it in a more integrated way today. Research attention has been moving, as Howard said, from the ship and its optimum size to control systems that allow us to utilize the waterway without expanding it. We are now faced with user charges which may have to be paid to expand the waterway. That's looking at it in an integrated way. No one has gotten into the port development an aspect that I mentioned was very important, especially as it concerns the diversified general cargo trades. We also must look to the ports for inland access. Do we have the land support systems that reach effectively from the port to the inland locations and shippers? Do we have the marketing promotion and wherewithall to convince the shipper that he should make use of this facility? Can we get thousands of them to combine their cargoes, so as to attract international ships on weekly or semi-weekly schedules? Can we get enough ship service to make the waterway grow in an accruing developmental pattern reversing the present decline.

We are looking at the Seaway in an integrated way. We're facing head-on the issues and problems as John O'Doherty and Paul Nickel have raised them. We are no longer glamorized or star-struck by the Seaway. As Jim said, we are seeing it in a far more mature way and starting to look at the warts and the difficulties of regional development as well as the glamor aspects. So when I say we are losing the economy battle, it's like a fighter in round 10 being told by his manager you are losing the battle. You've still got 5 more rounds to go and you can win it. But you're losing it to this point.

I'm hopeful that we can all together generate enough enthusiasm and capability to win the battle for the Seaway.

### Questions and Answers

Q. I keep wondering why everything we are talking about is big commodity stuff. It seems that the water has been traditionally used for shipping that kind of unfinished goods. You talk about the upbound cargo. It seems like the perfect trail to get all kinds of consumer goods that Chicago needs. We all need imports.

A. (Hazard) The thing I tried to show at the beginning is the kind of big decision pyramid that comes when we get into general cargo, packaged goods. We have the shipper, the carrier, the intermediary, the port, and getting those lined up is so much harder than getting the steel and iron ore moving. We've had a devilish time even though for years the ships coming to Detroit were offering rates to world trade areas that were lower than ocean rates out of New York, saving the full overland transportation cost. Most of our small shippers and intermediate size industries didn't even know what the rates were. They didn't even know what the schedules were. At the peak of the Seaway development, which I think is around 1972, we had only 18% of the value of the exports leaving the state of Michigan going through our own ports, despite the fact that they could have gone at substantial economies and the service was frequent.

Q. It seems like finished products could demand a higher freight rate, too.

A. (Hazard) They can and they can pay it, but getting the act together is the problem. That was one of the reasons that we came up with the idea of a Seaway Marketing Corporation which could transcend the very parochial interests of the individual intermediaries in the chain.

Q. Do we have freight forwarders?

A. (Hazard) We have international freight forwarders, customs brokers on imports, and everything else. But each one optimizes its own function and does not carry through clear to the exporter on one side and the

importer on the other side. We have nothing that will reach across. We have 3 terminal companies in Detroit. And each one of them goes to Europe and tries to negotiate with the lines to stop at their terminal, but not at the other two. Detroit and Toledo are at war with each other over a small share of the traffic moving from the Great Lakes states. They are at war with Chicago and Milwaukee, who battle each other over where a ship is going to stop and no one could give a damn. The big war, the big competition is with Montreal, New York City, and Baltimore, and they are not playing these little games for a small share of a cargo.

Q. I work with the PL480 program (surplus grain) and I'm amazed at the way they allocate, in the lakes particularly. They have a ship stop in Green Bay and Milwaukee and Chicago rather than have it stop at one place and load it all on. They try to make it more equitable and allocate it out to all those, but it ultimately makes it more expensive for shipping because it's got to keep stopping and opening and setting up and hooking up.

A. (Hazard) One of my former Norwegian students told me if you would only put the cargoes in Milwaukee where it costs half to load it, we'd stop, we'd be delighted to come in and handle this; and he was then working for an American line, incidentally. But it's scattered out. We need to consolidate our ports so that the ship can come through and top off its load and not have to wait around.

Q. How did the Gulf ports do it, how did they get it together? You're talking about how the south is developed so much more than we are in this respect.

A. (Hazard) There is a whole series of things.

They learned to develop their waterways, they have enormous wallop when it comes to dredging channels. New Orleans spent more, incidentally, after the Seaway passed dredging its 200 mile channel up 38 feet to Baton Rouge, Louisiana, than we spent on the Seaway altogether. And we had a toll collecting waterway. The Corps of Engineers'

provided a free grant to New Orleans. Baltimore got more free grant after we got our small piece of the Seaway and it was not nearly as controversial as getting the Midwest to support the Seaway. Chicago, Cleveland, and Buffalo all opposed the Seaway. This was a highly protectionist, insular region. We had a toll hearing at Chicago after the Seaway was under construction where 3 people showed up. Two to object to building the Seaway and a third opposed to any tolls on the waterway that was already being built. No one showed up to positively capitalize on the hearing or discuss tolls in an intelligent way. So you are dealing with a region, that despite its advanced development, just does not have an external orientation. And it didn't have any in its educational system. At that time it had 4 projects in its research portfolio. We were not dealing with the Michigan economy in an intelligent way. I might add, John, and that I'm sure you know, that Louisiana's opening its inland waterway research center within the next month.

It doesn't pay to be honest. Senator Vandenburg from Michigan went for the Seaway if it were a toll waterway; and that created more controversy because tolls lost many constituents who didn't want to pay tolls. And the Seaway still had the opposition of the eastern ports and the railroads. If it had been a free ticket, strictly a pork barrel, we'd have been better off because with tolls we lost friends and still had our enemies.

LIST OF RESEARCH PRIORITIES  
IDENTIFIED BY THE  
FRAMEWORK COMMITTEE

- (a) Impact of environmental constraints on potential for coal-fired vessels in the next 5-20 years.
- (b) Trade for tug-barge system under construction.
- (c) Export potential for Great Lakes manufacturers.
- (d) Export potential for Great Lakes raw materials.
- (e) Potential of lakes as internal shipping system.
- (f) Study of intermodal transportation.
- (g) Alternate methods of dredge disposal.
- (h) A study of Great Lakes ports in terms of their individual economic availability for the future. State and regional priorities for port development and use.
- (i) Coordinated marketing.
- (j) Redesign of the Great Lakes/SLS system operation.
- (k) In-depth analysis of user charge/cost recovery on Great Lakes heavy industry.
- (l) Development of adequate demand prediction techniques.
- (m) Development of adequate data base with provision for update.

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