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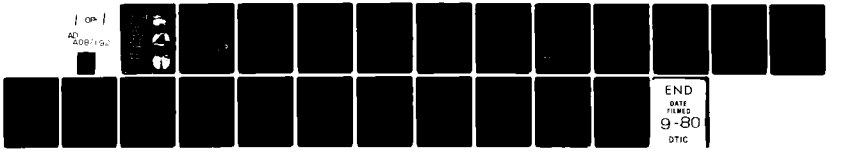

Summary Report

LEVEL II

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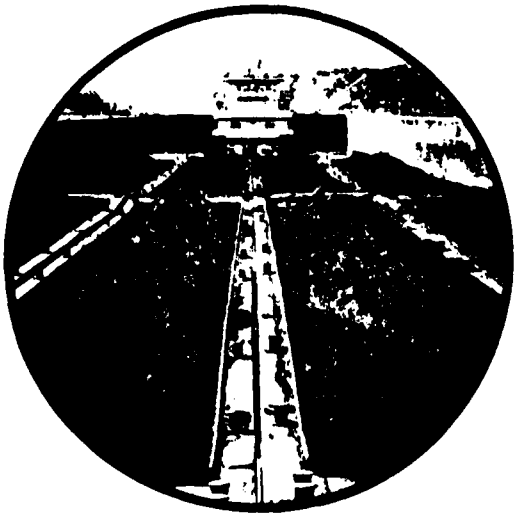
Forecast Of Future Ohio River Basin Waterway Traffic Based On Shippers' Surveys



SEPT. 1979

Ohio River Division
Cincinnati, Ohio
U. S. Army
Corps of Engineers

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The three study projections, in conjuction with other analytical tools and system information, will be used to evaluate specific waterway improvements to meet short and long-term navigation needs. The output from these studies will serve as input to Corps' Inland Navigation Simulation Models to help analyze the performance and opportunities for improvement of the Ohio River Basin Navigation System. These data will be used in current studies relating to improvement of Gallipolis Locks, the Monongahela River, the Upper Ohio River, the Kanawha River, the Lower Ohio River, the Cumberland River and the Tennessee River, as well as other improvements.

The study and the 1975-1990 traffic projections discussed in this report were developed by surveying all waterway users in the Ohio River Basin through a combined mail survey and personal interview approach. The purpose of the survey was to obtain an estimate from each individual shipper of his future commodity movements by specified origins and destinations, as well as other associated traffic information. All identifiable waterway users were contacted and requested to provide the survey information. In addition, personal interviews were held with the major shippers. The responses were then aggregated to yield projected traffic demands for the Ohio River Navigation System.

SUMMARY REPORT

FORECAST OF FUTURE OHIO RIVER BASIN WATERWAY TRAFFIC BASED ON SHIPPERS' SURVEYS

OHIO RIVER DIVISION
Prepared for the
U.S. Army Corps of Engineers

Huntington District Engineer
P.O. Box 2127
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BY:
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September 1979

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PREFACE

This Corps of Engineers report describes one of three independent but complementary studies of future freight traffic on the Ohio River Basin Navigation System. Each of the studies considers existing waterborne commerce and develops a consistent set of projections of future traffic demands for all of the navigable waterways of the Basin. Each report contains information on past and present waterborne commerce in the Basin and projections by commodity group and origin-destination areas from 1975 to at least 1990.

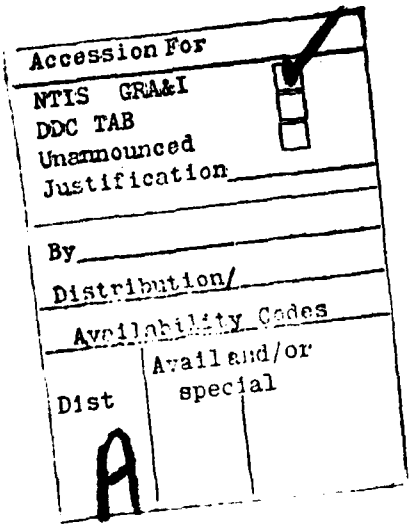
The three projections, in conjunction with other analytical tools and system information, will be used to evaluate specific waterway improvements to meet short- and long-term navigation needs. The output from these studies will serve as input to Corps' Inland Navigation Simulation Models to help analyze the performance and opportunities for improvement of the Ohio River Basin Navigation System. These data will be used in current studies relating to improvement of Gallipolis Locks, the Monongahela River, the Upper Ohio River, the Kanawha River, the Lower Ohio River, the Cumberland River, and the Tennessee River, as well as other improvements.

This report, completed in June 1979, was prepared for the Corps by Battelle Columbus Laboratories, Columbus, Ohio. The study and the 1975-1990 traffic projections discussed in this report were developed by surveying all waterway users in the Ohio River Basin through a combined mail survey and personal interview approach. The purpose of the survey was to obtain an estimate from each individual shipper of his future commodity movements by specified origins and destinations, as well as other associated traffic information. All identifiable waterway users were contacted and requested to provide the survey information. In addition, personal interviews were held with the major shippers. The responses were then aggregated to yield projected traffic demands for the Ohio River Navigation System.

A second report, completed in January 1979, was prepared for the Corps by CONSAD Research Corporation of Pittsburgh, Pennsylvania. The study and the 1975-1990 projected traffic demands discussed in that report were developed by correlating the historic waterborne commodity flows on the Ohio River Navigation System with various indicators of regional and national demands for the commodities. The demand variable(s) which appeared to best describe the historic traffic pattern for each of the commodity groups was selected for projection purposes. The historic and projected values for the demand variables are based upon the 1972 OBERS Series E Projections of National and Regional Economic Activity. The OBERS projections were developed by the Bureau of Economic Analysis of the U.S. Department of Commerce in conjunction with the Economic Research Service of the Department of Agriculture.

PREFACE
(Continued)

A third report, to be completed in September 1979 is being prepared for the Corps by Robert R. Nathan Associates, Inc. of Washington, D.C. The study and the 1975-2040 projections to be discussed in that report are much more comprehensive in scope, and focus on a much longer time frame. The basic study approach involves placing the historic production, consumption, and net shipments (by transportation mode) of commodities which move by water in the Ohio River Basin into perspective with total national output. The production, consumption, and shipment estimates are being prepared for all geographic areas within the Basin which are either directly or indirectly (through modal transfers) served by the Ohio River Navigation System. Economic, environmental and institutional factors which have historically affected output, consumption and modal shipments are being identified and analyzed. These same variables will then be projected through the year 2040 under alternative scenarios. Detailed waterway flow projections by commodity group and origin-destination areas will then be presented for the most probable future condition.



SUMMARY REPORT

FORECAST OF FUTURE OHIO RIVER BASIN WATERWAY TRAFFIC BASED ON SHIPPERS' SURVEYS

to

HUNTINGTON DISTRICT
U.S. ARMY CORPS OF ENGINEERS

Battelle
Columbus Laboratories

ACKNOWLEDGEMENT

We would like to extend our gratitude to the many organizations which participated in this study and particularly to the individuals who were interviewed by us for the survey. We also extend our gratitude to those firms who responded to our survey by mail. This report would not have been possible without their willing cooperation.

This study was conducted under the direction of Charles Kimm. Harry Collis served as principal researcher. He was assisted by Loren Rosenthal and Cathy Neuberger who lent valuable assistance in preparing the final report. In addition, Homer Ball, Norman Fischer, David Nippert, and Janice Warmke also participated in this study.

Our special gratitude is extended to the U.S. Army Corps of Engineers, especially the Huntington District staff, for their support and unfailing assistance throughout this study.

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SUMMARY REPORT

The Ohio River Basin is a nine state region covering an area of 204,000 square miles. Much of this region's basic industry is situated on the nine navigable rivers which constitute the Ohio River System. These industries, and others further inland, use the rivers to transport bulk commodities such as coal, aggregates, and petroleum fuels. In 1976, 196 million tons of these and other commodities were moved in tows of one to fifteen barges on the main stem Ohio and its tributaries. The Basin is depicted in the figure on the following page.

The U.S. Army Corps of Engineers (COE) is responsible for constructing and maintaining the 71 lock and dam projects* which make the Ohio River System navigable. Other navigation related COE maintenance duties include dredging, construction of revetments and channel straightening. COE responsibilities also encompass certain regulatory functions regarding development activities in navigable waters and their tributaries.

Purpose

COE needs reliable barge traffic projections to help guide the waterway improvement planning and management process. Such projections indicate which river segments, tributaries, and lock and dam projects are likely to experience the most future congestion. COE can then make necessary waterway improvements in anticipation of traffic problems.

COE is also interested in determining which operational and economic matters, relating to barge transportation, are of greatest concern to waterway users. And, COE needs to know user intentions regarding changes in size and configuration of barge tows, diversion of barge traffic in response to the waterway user charges, and reductions in empty or "light" barge traffic in the Basin.

This study was designed to generate barge traffic flow projections through the year 1990 for input to COE's waterway improvements plans. It was also meant to solicit user views regarding the matters mentioned above. This information was to be obtained by surveying waterway users through questionnaires and field interviews.

Areas of Analysis

This study focused on the movements of each of nine major commodity groups. The traffic growth of each river and lock was projected for each of the commodity groups. Outbound and inbound traffic volumes were also projected for each BEA within the region. (BEA is an abbreviation for "Bureau of Economic Analysis". This Bureau, which is part of the Commerce Department, has subdivided the United States into 173 geographical areas; these areas, known as BEA's, are used by many federal agencies for planning purposes.)

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* Currently there are 72 locks and dams including Locks & Dams 50 and 51 but Smithland will replace Locks & Dams 50 & 51.

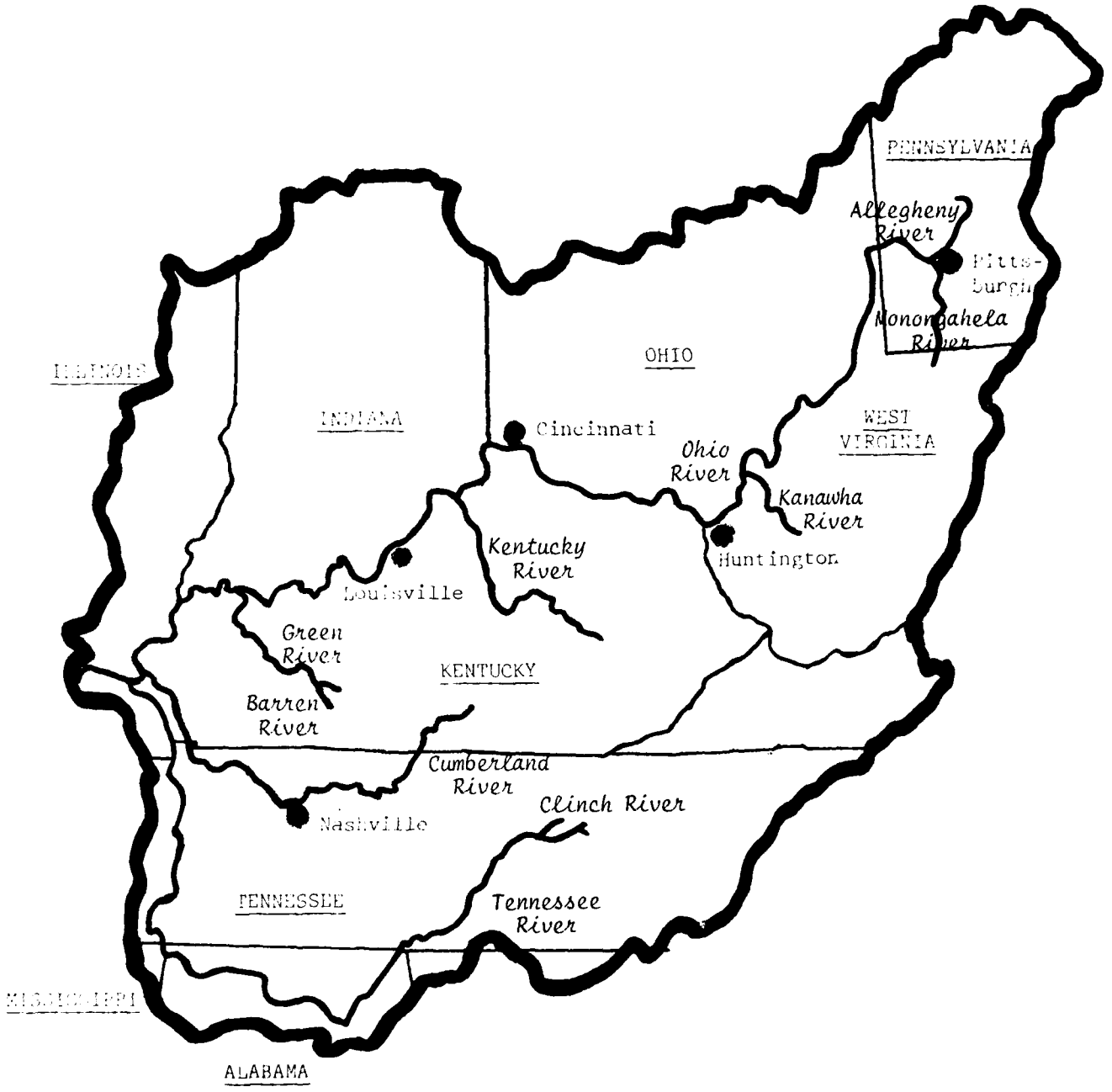


FIGURE 1. THE OHIO RIVER BASIN

Rivers and Locks

The nine navigable rivers of the Ohio System are listed below. The figure in parentheses following each river indicates the number of active lock and dam projects on that river.

- Ohio (main stem) (20)
- Allegheny (8)
- Monongahela (9)
- Kanawha (3)
- Kentucky (14)
- Green-Barren (3)
- Cumberland (4)
- Tennessee (9)
- Clinch (1)

BEA's and States

Portions of nine states are found in the Basin's navigable waterway hinterland:

- Pennsylvania
- West Virginia
- Ohio
- Kentucky
- Indiana
- Illinois
- Tennessee
- Alabama
- Mississippi

Counties of the various states have been recombined into BEA areas. BEA's are labeled as the cities which are their focal points. A river segment may be included within a BEA or it may be used as its boundary. There are 15 waterside BEA's in the study area:

- Pittsburgh, PA
- Cleveland, OH
- Huntington, WV
- Columbus, OH
- Cincinnati, OH
- Louisville, KY
- Evansville, IN
- Paducah, KY
- Huntsville, AL
- Chattanooga, TN
- Knoxville, KY
- Nashville, TN
- Clarksburg, WV
- Lexington, KY
- Memphis, TN

BEA's rather than states are used as a unit of analysis in this report. They are smaller and more homogenous in terms of industrial activities than states. The BEA boundaries are depicted in the figure on the following page.

Major Commodity Groupings

The nine major commodity groups used in this study are:

- Coal & Coke
- Petroleum Fuels
- Crude Petroleum
- Aggregates
- Grains
- Chemicals & Chemical Fertilizers
- Ores & Minerals
- Iron Ore, Iron & Steel
- Miscellaneous Commodities

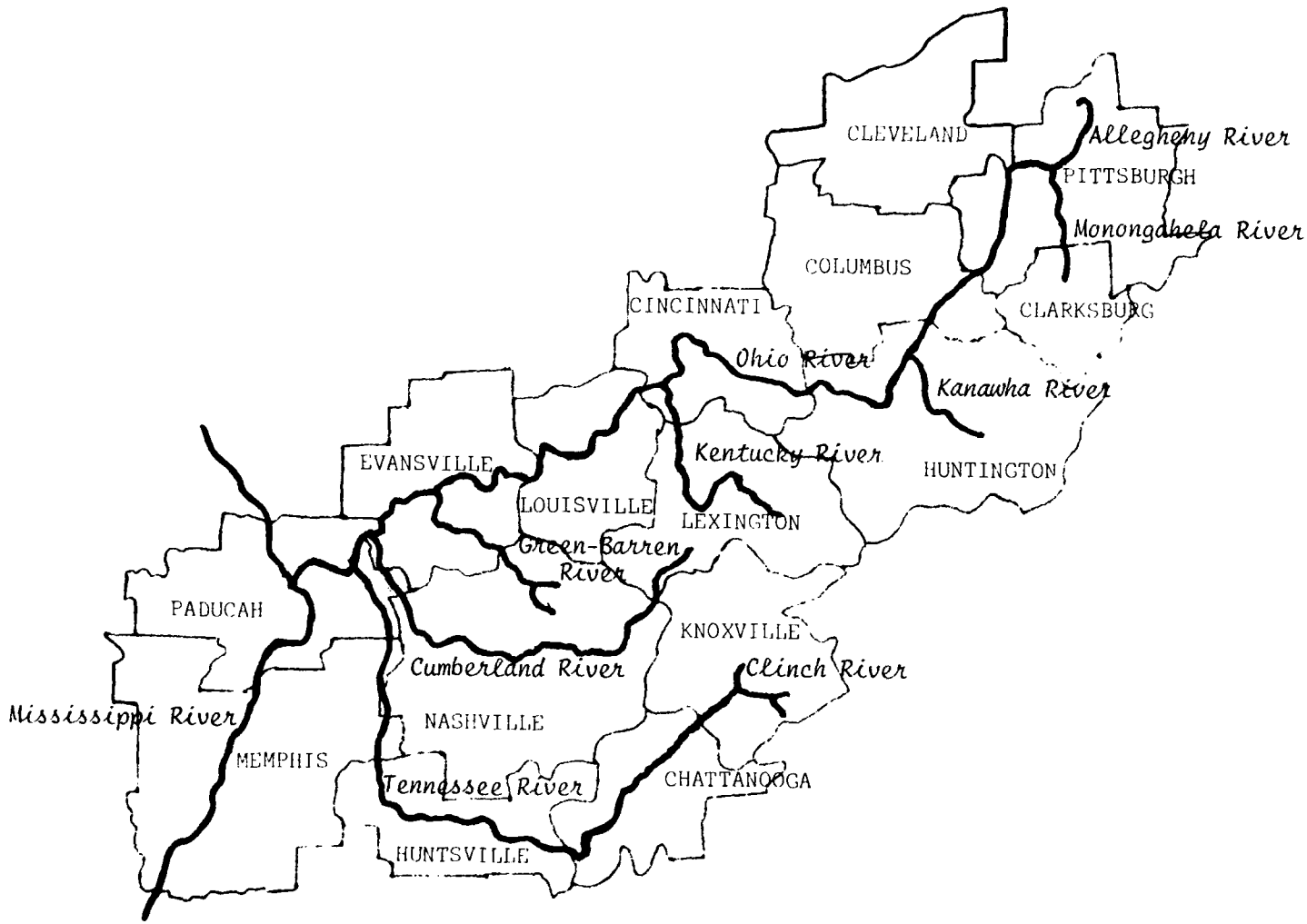


FIGURE 2. OHIO RIVER BASIN BY BEA'S

Brief Description of Barge Traffic Activities in the Basin

Each commodity group represents a specific kind of industrial activity. Barge transportation in the Basin is best understood in terms of these commodity groups.

Coal & Coke. Coal clearly dominates activities on the waterway. It is mined in nearly every state in the region. A large portion of that coal is consumed by power plants, steel firms, and other heavy industry within the Basin.

Petroleum Fuels and Crude Petroleum. Petroleum fuels are transported to various distribution points along the river. In some cases the supply source is a refinery; in other cases barges act as extensions of petroleum pipelines. A relatively small quantity of crude is imported to the region by barge.

Aggregates. Aggregates are quarried or dredged from the river, classified and taken to metropolitan areas and distributed principally by land modes. Or, aggregates may be barged directly from source to construction sites.

Grains. Grains are collected by rail and truck from throughout the region. Most barge shipments of grain are foreign export movements which are transloaded to oceangoing vessels at Gulf Coast ports.

Chemicals & Chemical Fertilizers. A wide array of basic chemicals and chemical fertilizers are moved on the river. Very little is exported from the region. About half of the tonnage is imported from Gulf ports; the other half is originated and terminated within the Basin.

Ores & Minerals. The bulk of the metallic ores are used in steel alloy making. Most of the metallic ores are imported from outside the Basin. Salt is an important nonmetallic mineral imported from the Western Gulf Coast.

Iron Ore, Iron & Steel. Only a limited amount of iron ore is handled by barge. Mainly this group represents steel products such as sheet, plate, tubes, pipes, angles, etc. Two-thirds of this traffic originates from the headwaters of the Basin; the rest is imported from outside the region. There are also substantial exports of steel products from the Basin.

Miscellaneous Commodities. The principal 4-digit commodities in this category are asphalt and waterway improvement materials. Because of the diversity of commodities in this group no particular pattern of movement can be sketched.

Study Approach

All Ohio River Basin Waterway Users were surveyed by questionnaire and/or field interviews. They were asked to describe their traffic flows in the base year 1976 and to project their traffic flows for the years 1980, 1985, and 1990. They were also asked to discuss operational and economic matters relating to barge movements which were of particular concern to them. Major waterway users were identified through the use of preexisting traffic data (the Waterborne Commerce Statistics and docking listing compiled by COE). Field interviews were conducted with personnel from these firms to clarify the responses from the questionnaire.

The survey responses were tabulated and traffic flow projections were made for each of 2,488 distinct commodity movements reported. These detailed projections were summed, yielding aggregate projections for rivers, BEA's, Port Equivalents (PE's), and individual locks and dams. The 1976 data collected from survey respondents was compared with pre-existing data. Finally, waterway user concerns and views were ranked and analyzed.

Findings

Growth Overview

The survey responses indicate that barge traffic will grow 74.0 percent from 1976 to 1990 in the Ohio River Basin. Projected traffic volumes for each major commodity group are shown in the table on the following page.

The numbers indicate that traffic will grow by 36.5 percent from 1976 to 1980, a moderate 17.5 percent growth from 1980 to 1985, and a modest 8.5 percent from 1985 to 1990. The shape of this growth curve is readily explainable.

Traffic, particularly coal traffic, will grow strongly throughout the next decade. But, an anticipated coal strike in 1981 will produce heavy coal stockpiling in 1980. Coal traffic will surge in that year (with a probable subsidance in 1981). Growth will then resume at a moderate rate with coal traffic once again being the major growth influence. Once one gets beyond the 1985 period, business people become increasingly

TABLE 1. OHIO RIVER BASIN WATERBORNE TRAFFIC PROJECTIONS BY COMMODITY GROUP, TO 1990 (IN THOUSAND TONS)

Commodity Group	1976*	1980	1985	1990	Projected Growth 1976-1990 (%)
Coal & Coke	111,631	166,270	201,095	217,335	94.7
Petroleum Fuels	20,922	21,527	22,640	23,764	13.6
Crude Petroleums	664	0	0	0	-100.0
Aggregates	25,169	31,194	34,671	38,339	52.3
Grains	5,583	6,921	7,918	9,004	61.3
Chemicals & Chemical Fertilizers	11,290	12,504	13,802	15,701	39.1
Ores & Minerals	4,435	4,668	5,151	5,627	26.9
Iron Ore, Iron & Steel	5,167	5,779	6,341	6,676	29.2
Miscellaneous Commodities	10,915	18,327	22,385	24,124	121.0
Total	195,776	267,190	314,003	340,570	74.0
Increase Over Previous Period (%)		36.5	17.5	8.5	
Overall Growth (1976-1990, %)				74.0	

* Based on readjusted volumes from Battelle's survey.

reluctant to make positive growth projections. Citing various uncertainties, many respondents projected zero or marginal growth for those final five years.

Many respondents qualified their projections. There was an almost universal expression of anxiety about environmental, regulatory, and zoning laws. Collectively these restrictions could significantly dampen barge traffic growth. Many traffic people also felt that substantial lock improvements might be necessary to accommodate the volume of future barge traffic. Otherwise, bottlenecks might physically limit barge activities in the Basin.

A final important consideration is the role of the railroads as competitive movers of bulk commodities within the region. Several respondents were very critical of rail carriers as bulk commodity movers. Most respondents totally discounted the potential of railroads to divert traffic from barges during the projection period.

Traffic Growth Projections by Commodity Groups

Coal dominates traffic in the Ohio River Basin. Coal volumes are expected to increase by 95 percent from 1976 to 1990. Power plants and to a lesser degree steel firms will be the major coal users. Expanding coal consumption will be the single biggest factor influencing traffic growth.

Petroleum fuel traffic volumes are not expected to grow appreciably over the projection period. Substantial modal shifts to pipeline, market swapping arrangements, and slow industry growth will all contribute to this outcome. Crude petroleum movements will virtually disappear.

Home and power plant construction and road resurfacing will moderately increase the demand for aggregates, but traffic in this commodity could be impeded by environmental and zoning restrictions.

Grain exports to Gulf Coast ports will increase by 61 percent from 1976 to 1990. Growth in this area is limited by the production potential of the region's agricultural lands and stiff competition from unit-trains moving grain to East Coast ports.

The movement of chemicals on the waterway will increase by only 39 percent from 1976 to 1990. This relative stagnancy is attributable to environmental regulation.

Steel movements are the least predictable element of the traffic mix. Depending on factors such as currency exchange rates, the domestic steel industry may fare well or poorly. Both the domestic steel industry

and the ore, mineral, and ferroalloy firms which serve it have a bearish outlook on the future, expecting less than 30 percent traffic growth from 1976 to 1990.

Of the miscellaneous commodities, only lime movements are expected to increase significantly. This material would be used largely for coal desulphurization.

Traffic Growth Projections by Rivers

Barge traffic on the main stem Ohio is expected to grow by 80.9 percent from 1976 to 1990. Since 85 percent of the traffic which moves in the Basin either originates from, terminates on, or transits the main stem Ohio, its traffic mix and growth characteristics are very similar to the Basin as a whole. (See table below.)

TABLE 2. OHIO RIVER BASIN TRAFFIC BY YEAR BY RIVER*
(IN THOUSAND TONS)

River	1976	1980	1985	1990	Projected Growth 1976-1990 (%)
Main Stem Ohio	164,351	228,717	273,021	297,241	80.9
Allegheny	6,058	6,943	7,099	7,403	22.2
Monongahela	39,099	49,680	57,242	61,399	57.0
Kanawha	14,437	17,973	21,725	22,675	57.1
Kentucky	541	628	758	914	68.9
Green-Barren	12,782	16,173	13,361	14,186	11.0
Cumberland	11,556	15,538	15,949	17,221	49.0
Tennessee	25,090	43,382	45,057	46,788	86.5
Clinch	50	82	100	108	116.0
Basin**	195,776	267,190	314,003	340,570	74.0

*Includes tonnage which originates from, terminates on, or transits each river.
**Because of double-counts, this number is different from the sum of the individual river volumes.

The average lock in the Basin will experience a 68 percent traffic increase. There are 71 operating locks in the Basin, of which 57 are used for commercial barge transportation.

Traffic Growth Projections by BEA's

BEA's are used by many federal agencies for economic analysis. They are smaller and economically more homogeneous than states. Analysis of BEA traffic indicates which stretches of the Basin's rivers will experience the most traffic growth and whether that growth will be largely outbound or inbound.

It is something of an oversimplication, but BEA's can be roughly divided into three classes. The first class includes BEA's with heavy amounts of extractive industries (coal and ore mines, oil production, etc.); these BEA's tend to have heavy outbound traffic. The second class of BEA's has a manufacturing orientation; its commodity movements are typically weighted towards inbound traffic. When a BEA shows high volumes of both outbound and inbound traffic, there is usually a large amount of waterborne traffic internal to the BEA. This third class of BEA's typically have manufacturing industry situated near mineral deposits in order to minimize transportation costs.

A cautionary note is in order at this point. The traffic which is listed and analyzed for each BEA includes only that traffic which originates or terminates on a river in the Ohio Basin. If a BEA includes a stretch of river not in the Basin, its traffic is excluded from the analysis unless it is inbound or outbound from the Basin. Outbound and inbound traffic growth projections for BEA's in the study area are shown in the table on the following page.

Waterway User Views and Concerns

Questions concerning user views on operational and economic aspects of barge transportation in the Ohio Basin brought forth the following responses:

Barge Rate Sensitivity. Most Waterway Users have loading/unloading facilities which are water oriented. And, they are convinced that any real increase in barge rates will be matched by an increase in rail rates. Real price increases for barge transportation up to 15 percent are unlikely to deter significant quantities of traffic from the river.

Lock Transit Times. Waterway Users are quite concerned about lock transit delays. (The delay of a 15-barge tow on the Ohio River may

TABLE 3. PROJECTED 1990 TRAFFIC GROWTH BY BEA FOR THE OHIO RIVER BASIN

BEA's	Estimated Outbound Tonnage (in 000's) 1976	1990	Projected Growth 1976-1990 (%)	Estimated Inbound Tonnage (in 000's) 1976	1990	Projected Growth 1976-1990 (%)
Pittsburgh	47,157	75,316	+60	53,056	78,406	+48
Cleveland	1,004	1,233	+23	6,695	13,692	+105
Columbus	2,482	3,702	+49	4,306	8,022	+86
Huntington	36,200	78,156	+116	26,665	43,226	+62
Clarksburg	4,199	7,040	+68	2,724	3,449	+27
Cincinnati	8,909	21,516	+142	23,027	58,846	+156
Louisville	5,760	10,513	+82	14,471	16,931	+17
Evansville	37,403	51,017	+36	6,916	18,693	+170
Paducah	15,356	43,672	+184	7,143	14,187	+99
Lexington	3	3	+0	538	911	+69
Nashville	1,782	3,075	+73	13,188	17,213	+31
Huntsville	4,264	2,876	-33	6,404	16,377	+155
Chattanooga	3,174	4,875	+54	4,509	7,513	+67
Knoxville	186	315	+69	321	553	+72
Memphis	774	885	+14	3,384	5,907	+76

cost as much as $200 per hour.) Currently, carriers experience significant transit delays at Locks 50, 51 and Gallipolis Lock, all on the main stem Ohio. Locks 50 and 51 will soon be replaced by the Smithland Lock and Dam Project. So, Waterway Users focus on Gallipolis as a problem lock.

Equipment. The majority of Waterway Users expressed concern about equipment shortages, particularly empty barges. This problem was partially blamed on shippers/receivers, many of whom are said to be tardy in loading/unloading barges. But some users also felt that equipment shortages were intimately tied to the lock transit time problem. Delay of transit at locks sometimes creates problems in the full utilization of towboats and barges.

Almost all users indicated that jumbo barges (35' x 195') will remain the norm in the Basin. "Stumbo" barges (26' x 195') will be used on the Monongahela and some other tributaries.

Planned Modal Shifts. Some traffic may be shifted from rail-to-barge because of continuing poor service provided by some rail carriers. Petroleum products will experience some shift to pipeline.

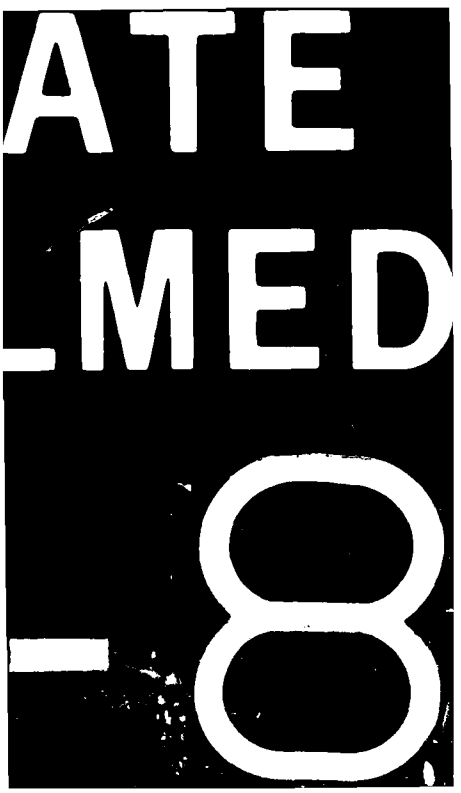
Tennessee-Tombigbee Waterway. Although a limited number of firms indicate intentions to use this connecting waterway, the result is not expected to represent major changes in Ohio Basin Waterway Traffic patterns or volumes shipped over the forecast period.

Additional Concerns of Waterway Users. Some users suggested that there is a shortage of port service vessels for barge placement, etc. They expressed a need for greater communication between themselves and the Corps of Engineers on matters such as river operating conditions, weather, lockage times, and scheduling of lock repairs.

Deficiencies in Data

The newly collected data displayed an estimated 10 percent increase in net tonnage over the Waterborne Commerce Statistics. In addition, a number of errors regarding commodity classification and origin/destination identification were detected. In some cases carriers simply failed to report movements; in other cases reports were erroneous. The latter can be attributed to carrier confusion resulting from:

- Traffic interchange between carriers
- Market swapping arrangements between firms who transport their own goods
- Reconsignments enroute
- Unrecorded shifts in dock or facility ownership
- Commodity classes not clearly defined in the minds of carriers
- Inconsistencies between COE commodity classifications and those used by other federal agencies.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