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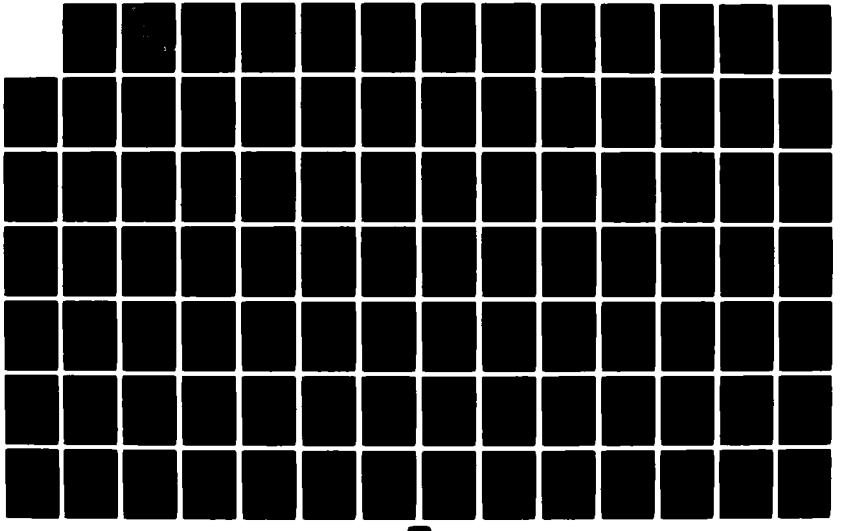

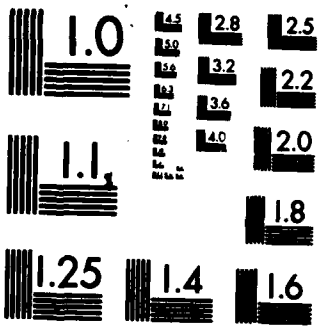

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(12)

A Statistical Survey of Vessel Performance and Configuration Characteristics on Inland Waterways

FEBRUARY 1983

RESEARCH REPORT 83R-1

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18. SUPPLEMENTARY NOTES

The source survey for this report was conducted before the Performance Monitoring System (PMS) was available system wide. More complete and recent statistics can now be retrieved through PMS for tow speeds and sizes but not for delays. Also PMS is only applicable to canalized waterways.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Statistical Survey	Transit Time
Vessel Performance	Annual Velocity
Study Design	Input Data
Tow Speeds	Navigation Improvement
Average Delays	Barge Rates

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report provides information about tow characteristics for the Mississippi River, its tributaries and the Gulf Intracoastal Waterway. It will allow for consistent input data to be used in the evaluation of navigation improvements. The performance and characteristics of tows on the waterways are important determinants of barge rates and inputs into waterway cost models.

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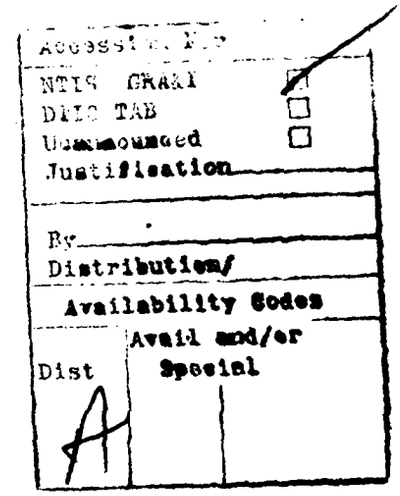
A STATISTICAL SURVEY OF VESSEL PERFORMANCE AND CONFIGURATION CHARACTERISTICS ON INLAND WATERWAYS

by
Brad Jolson and David F. Bastian



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LIST OF TABLES

LIST OF FIGURES

TABLE OF CONTENTS

I. INTRODUCTION

Background

1. An important aspect of the benefit-cost analysis performed by the Corps of Engineers in its evaluation of navigation improvements is the physical performance of tows throughout the inland navigation system. The performance and characteristics of tows on the waterways are important determinants of barge rates, and inputs into waterway cost models.

Purpose

2. The purpose of this report is to provide information about tow characteristics for the Mississippi River, its tributaries and the Gulf Intracoastal Waterway. This will allow for consistent input data for use in the evaluation of navigation improvements utilizing system-analytic techniques.

Data Collection Responsibility

3. The data collected in the survey was for calendar year 1978, and was obtained by St. Louis District personnel between July 1979 and January 1980.

II. STUDY DESIGN

Statistical Approach

4. To determine operating characteristics of the towing industry such as towboat and barge utilization and tow speeds a sampling procedure was necessary. Established statistical techniques and methods were used to obtain inputs and outputs. Specification error and other common statistical errors were investigated to insure reliable output.

Data Sources

5. Alternatives. At the time of this study there were three potential sources for input data:

- o Performance Monitoring System (PMS)
- o Carrier Survey
- o Vessel Master Logs

6. PMS. The Performance Monitoring System (PMS) data contains vessel and tow information as well as lock processing times. The most recent PMS data available (at the time of this study) was for the year 1976 which was the second year of data gathering under PMS. However, the data collected by the Corps at that time was incomplete. In addition to PMS not being system-wide in 1976, three other characteristics prevented its application.

7. The problem of computing underway speed by subtracting out locking times does not account for delays incurred other than at locks. Therefore, the resultant underway speed would be incorrect. Delays such as weather, fleeting, repairs, supply or other delays as expressed in this report are not identifiable when using PMS.

8. The absence of locks on the lower Mississippi River preclude using PMS to determine speeds or vessel characteristics for that region.

9. Carrier Survey. Carrier surveys are a source of input but are subject to bias and misinterpretation in responses from carriers surveyed. It may be in the interest of those interviewed to overestimate delays and underway speed and to under-estimate transit time.

10. The Vessel Logs. The source of data chosen was the vessel master logs maintained by the vessel captains. Vessels are required to report their position at least every six hours as well as to list the dock of origin and destination, fleeting stops, lockings and all delays by time and type. Barge numbers and tow configuration are also listed. The comprehensive nature of information at the time of this study allowed for the most complete and accurate reporting of the required information.

11. Accuracy of the Vessel Logs. The logs are kept by the firms which operate the vessels. Their accuracy is necessarily high because insurance procedures require log audits in order to pay off claims.

Sample Design

12. Sample Source. There are approximately 3,250 vessels which operate along the Mississippi River basin and its tributaries. Approximately one-half of these do not make through movements on the inland river system, being either harbor vessels, work vessels or passenger boats. The remainder of the vessels, slightly more than 1,500, are those which make through movements and, thus, comprise the universe for data collection. These vessels are described in the Inland River Record (Waterways Journal) which lists vessels, their characteristics, owners and operators.

13. Stratifying the Sample. The sample was stratified into ranges of horsepower based upon the tonnage moved by towboats of a given horsepower range. For example, if vessels in the 5000-6000 horsepower range carry ten percent of tonnage on the system during a certain period, then ten percent of the sample was composed of vesse.› from that range. 1976 PMS data was used to determine this stratification.

14. Sample Size. One hundred vessels were considered to be the minimum sample size.

15. Vessel Selection. The second part of the sample selection involved the choice of vessels. As mentioned above, the source used for the vessels was the Inland River Record. Vessels could have been chosen by owner, by name, or by assigning a random number to each vessel. The choice of vessel by random number avoided potential biases.

16. The Random Number Process. Each vessel was assigned a random number of five digits. The random numbers were then listed in order of horsepower from lowest to greatest. Vessels of equal horsepower could be distinguished only by their random number.

17. This list was then broken up into nine horsepower groups, according to the groups specified in the stratification data, and listed in Table 1. The number of vessels desired from each group was determined, based upon the stratification data. A vessel from each interval was selected by random number. The remaining vessels were selected from each interval at equidistant spacing. For example, suppose a given interval contained 25 vessels, and five vessels were needed from this interval. Each of these vessels would be numbered from 1 to 25 and a random number generated would be generated from this set of vessel numbers, say 17. The vessels selected from this interval then, would be numbers 17, 22, 2, 7 and 12. These numbers were decoded to determine the vessel name and owner.

TABLE 1
VESSEL STRATIFICATION
by
Horsepower and Number

Class	Horsepower	No. of Vessels
A	600-1600	24
B	1600-2200	19
C	2200-2800	17
D	2800-3800	34
E	3800-4800	25
F	4800-5400	18
G	5400-6200	4
H	6200-7500	4
I	7500-9000	1
J	9000-10500	1
TOTAL		150

18. Non-Operating Vessels. In a few instances, vessels did not operate during part or parts of the sampled period (January, April, July and October of 1978). When this occurred, no sample replacement was made.

19. Non-Replacement. When a vessel did not operate due to drydocking operations or was used as a harbor vessel, the timing of such operations was important and relevant to the study. For instance, needed repairs may have been held off until January in anticipation of ice delays which might detain the voyage anyway. Replacement of these vessels infers that the timing of these operations is arbitrary. Therefore replacement was not made.

20. The Four Month Data Scheme. A four-month period of information was obtained from each vessel log. A month was picked at random (so as not to

bias the sample) and that and each subsequent third month was selected to provide input data. January, April, July and October were chosen. This reduced the data collection effort while allowing for seasonal analysis.

21. The Data Collection Process. All data for any trip which occurred during any part of the sample period was recorded. For instance, if a trip began in December, but extended into January, it was recorded. Trips which extended beyond the end of the sample month were treated similarly.

Errors

22. Sampling and Non-Sampling Error. Generally, possible errors in estimates of universe parameters may be classified as being associated with the sampling process (sampling error) in a sample survey, and/or related to the data collection and processing (non-sampling error). In practice, sampling errors are more likely, while non-sampling errors are more readily controlled so that the total error is approximated by the measure of sampling error.

23. Exclusion Errors. The principle possibilities for non-sampling errors occur via exclusion of sampled items and in processing. Exclusion can occur by inability to locate the vessel logs, or from respondent noncooperation. There was no incidence of inability to locate the vessel logs, though there were two whose owners refused to cooperate. In these instances as explained previously, no replacement took place.

24. Processing Errors. Processing errors were primarily human errors in coding, transcribing, and key punching data. Close double checking and computer programs written for the purpose of checking errors reduced these errors with no discernable bias.

25. Sampling Errors. Sampling errors result from the fact that the statistics presented in this report are estimated from a sample. The particular sample that was selected is one of the large number of all possible samples of the same size that could have been selected using the sample design. Estimates derived from the different samples would differ from each other and from the results of a complete collection of the universe of data using the same procedures.

III. STUDY RESULTS

Tow Speeds

26. Introduction. Tow speeds determined from the vessel logs of the 150 chosen towboats for the months January, April, June and October 1978 are presented in Tables 2 through 4. These tables show speeds (in miles per hour) as a function of trip type, direction, season, waterway and horsepower.

27. Data Accuracy. Tow speeds were derived directly from the vessel logs. Interpolation was necessary for inter-system movements (trips traversing more than one river) whenever the logs did not specify the time at which the tow changed (entered or exited) rivers.

28. Definitions. Underway speed is, as the name implies, speed while moving. Weighted average speed is the sum of the mileage in a given aggregation divided by the amount of time taken to travel that mileage and places more weight on longer trips than shorter trips. This figure is probably more representative of the correct speeds because shorter trips tend to have extreme ranges in speed especially when they occur totally between constraints (i.e., locks).

29. Table 2. Table 2 presents average tow speeds on a given waterway by direction, with and without delays and as a function of inter or intra movements with respect to the subject waterway. This table does not allow for determination of tow size, configuration or draft. Nor does it provide towboat horsepower or the tonnage moved. All of these would influence speed. The variability of these parameters is greater in some rivers than others. However, a proper sample would reflect these parameters in a representative manner.

30. Inter and Intra-System Movements. The differences between the inter-system and intra-system figures imply various things about the usage of those waterways. The faster speeds, larger tows and greater occurrence of inter-system movements on a certain waterway would imply its use mostly as a feeder waterway and that most trips begin or end before a major constraint point. One example would be the termination of many trips entering the Upper Mississippi River at mile 0 (Cairo, Il) and ending at St. Louis, or beginning southbound at St. Louis and avoiding Locks and Dam No. 26.

31. Figures 1 - 4. Figures 1 through 4 show the average annual weighted tow velocities for each waterway by direction with and without delays. The highest downstream underway velocities are recorded in the lower Mississippi and Missouri Rivers, respectively. Because these two rivers are open channel, the current velocities are generally higher, which helps to account for the higher tow speeds in the downstream direction and also helps to account for the Missouri showing the lowest upstream underway velocity.

32. The large difference between upstream and downstream underway velocity (Figure 1) on these two rivers when compared to the canalized rivers is also reflective of their higher current velocities.

33. Figures 2 - 4 show the relative effect of delays on tow speeds. Delays are of three major types: weather, traffic and carrier (i.e., frequency of loading).

34. Table 3. Table 3 subdivides the data presented in Table 2 into seasonal values. The percentage usage is the ratio of miles traveled on that waterway for that season (sampled month) to the total miles traveled on that waterway for all seasons (sampled months).

35. As would be expected, ice and weather conditions lowered usage numbers on several rivers during the winter. The Missouri is closed to winter navigation explaining the absence of winter observations. In the case of the Black Warrior - Tombigbee River System, low winter usage was the result of a coal strike during the sample period.

36. Open Pass Conditions. The lower four locks (50, 51, 52 and 53) on the Ohio River were not used except during the fall of 1978 because river stages were sufficient to allow open pass operation. Tow speeds in the fall show the effects of having to lock through the additional four locks.

37. Standard Deviations. The statistics contained in Table 4 are the sample standard deviations by waterway and direction for speeds with and without delays.

38. Table 5. Table 5 lists median speeds for each river. Testing revealed no significant skewness in the speed distributions.

Average Number of Barges Per Tow

39. Introduction. Tables 6 and 7 present a breakdown of tow sizes in terms of the number of barges by waterway, direction, and season, for all barges, loaded or empty, regardless of commodity types. In some cases the average number of barges per tow presented is misleading. Based upon the vessel logs, the average number of barges is largest on the Monongahela and fourth largest on the lower Mississippi. Apparently the numbers presented for the Monongahela represents trips below the lowest pool on the river. There is a fleeting area just below the first lock at river mile 11.2. The number of barges obviously represent those tows that were just coming off or just going onto the Ohio River. There are a large number of intersystem movements between the mines and the power plants and these tows are much smaller. The same probably applies to the Allegheny River tow sizes presented. The relatively low average number of barges listed for the lower Mississippi results from the fact that about 50% of the tows sampled were carrying petroleum only. In general, liquid cargo (tank) barges are much larger than dry cargo barges and therefore it takes far fewer barges to achieve the same payload as tows containing dry cargo barges.

40. One cannot make a direct comparison of tow size between river systems based on average number of barges because of the range in dimensions of barges. This would also inhibit being able to correlate speeds as a function of tow size. Despite the above problems, the average number of barges per tow as presented represent the tows sampled from which tow speeds were derived.

Percent Backhaul Empty

41. Backhaul. One half of all the barges on a given trip are considered to be on the front haul, that is, the trip to which this movement is dedicated. The rest are, therefore, defined as returning or on the backhaul. Based upon

this, the percentage of empty backhaul barges was calculated considering only 50% of the number of barges per tow as the base number. All empty barges up to 50% of the total number of barges in the tow are assigned to the backhaul category and are ratioed to the number of barges defined numerically as backhaul. Due to the definition whenever there is a calculated 100% empty backhaul, one cannot determine whether or not the front hauls are all loaded.

42. Example. For example, if an aggregation has 10 barges, 8 of which are full then five of the loaded barges are on the front haul. The remaining three loaded barges are on the backhaul. This means that 60 percent of the backhaul is full, and the backhaul figure (percentage empty) reported would thus be 40%. See Tables 8 and 9.

Waterway Lock Transiting Times

43. Tables 10 and 11 present the annual and seasonal average lock transiting times for a given waterway. These times are composed of the waiting and processing times that tows incur at each lock. To determine these values all of the processing and waiting times for all locks traversed on a given waterway were summed. This value was then divided by the product of the lock density (locks per mile) and summation of miles traversed. Therefore these numbers apply to each waterway as a whole and are not indicative of the actual times at individual locks.

Average Delays, by Type

44. Introduction. Tables 12-15 report on delays by waterway and type. The probability of occurrence is the chance of the vessel stopping for that reason on a given trip. The mean delay is the average delay when that type of delay occurs. The mean delay per trip is then the product of these numbers.

45. Classifications.

The delays are classified as follows:

Weather - all weather related stops, except fog and ice
Fog - self explanatory
Locking - includes awaiting lockages
Repairs - self explanatory
Ice - self explanatory
Crew Change - awaiting new crew (while stopped)
Supplies - includes fueling stops, but not fueling while underway
Awaiting Orders - stops to await order change (during a voyage)
Vessel Assisting - assisting other vessels
Awaiting Berth - at fleet point with no dock space
Bridge Wait - self explanatory
Fleeting - dropping and adding barges to tow and associated shifts.

46. Method. Each reported delay is the sum of that type of delay per voyage. Mean Delays are expressed in hours.

47. Insufficient Data. In Tables 14 and 15, no statistics are reported for the Allegheny, Arkansas, Port Allen to Morgan City Route and Monongahela Rivers due to insufficient data.

IV. CONCLUSIONS

48. The tow speeds, average number of barges, lock transit times and delay types and times presented show the operational characteristics of the various waterways.

49. Based upon data presented the reader cannot correlate tow speeds with water currents, horsepower, or number, load, configuration and draft of barges.

50. The average number of barges for the Monongahela and Allegheny Rivers seem high and may reflect an insufficient sample size.

51. The average number of barges per tow per waterway does not allow for calculating tow dimensions or arrangement.

V. RECOMMENDATIONS

52. Now that PMS is well established it could be used to verify speeds presented (except for the Lower Mississippi and Missouri River) as well as allow for a more comprehensive analysis.

53. This study should be extended to include tow speeds as a function of load. This can be done through PMS.

54. The average tow size should be evaluated on a pool basis and should include average load, number of barges, dimension of tow and associated horsepower.

TABLE 2

AVERAGE ANNUAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Allegheny River				
Downriver	Average, Underway	7.58	SAMPLE SIZE TOO SMALL	
	Average, with Delays	4.69		
	Weighted Average, Underway	7.82		
	Weighted Average, with Delays	4.49		
Upriver	Average, Underway	5.66	SAMPLE SIZE TOO SMALL	
	Average, with Delays	3.67		
	Weighted Average, Underway	5.31		
	Weighted Average, with Delays	3.40		
Total	Average, Underway	6.62	SAMPLE SIZE TOO SMALL	
	Average, with Delays	4.18		
	Weighted Average, Underway	6.29		
	Weighted Average, with Delays	3.86		

Sample Size = 15 trips

TABLE 2 (continued)

AVERAGE ANNUAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Arkansas River				
Downriver	Average, Underway	6.76	SAMPLE SIZE TOO SMALL	
	Average, with Delays	4.37		
	Weighted Average, Underway	6.12		
	Weighted Average, with Delays	4.21		
Upriver	Average, Underway	7.04	SAMPLE SIZE TOO SMALL	
	Average, with Delays	4.79		
	Weighted Average, Underway	6.09		
	Weighted Average, with Delays	4.89		
Total	Average, Underway	6.35	SAMPLE SIZE TOO SMALL	
	Average, with Delays	4.62		
	Weighted Average, Underway	5.99		
	Weighted Average, with Delays	4.65		

Sample Size = 18 trips

TABLE 2 (continued)

AVERAGE ANNUAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Black Warrior-Tombigbee River System				
Downriver	Average, Underway	6.70	6.76	5.01
	Average, with Delays	5.54	5.75	4.10
	Weighted Average, Underway	6.59	6.62	4.99
	Weighted Average, with Delays	5.35	5.59	4.08
Upriver	Average, Underway	5.32	5.13	5.61
	Average, with Delays	4.38	4.39	4.34
	Weighted Average, Underway	5.24	5.06	5.56
	Weighted Average, with Delays	4.31	4.31	4.31
Total	Average, Underway	5.96	5.89	5.34
	Average, with Delays	4.92	5.02	4.23
	Weighted Average, Underway	5.74	5.63	5.25
	Weighted Average, with Delays	4.70	4.78	4.21

Sample Size = 69 trips

TABLE 2 (continued)

AVERAGE ANNUAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Cumberland River				
Downriver	Average, Underway	8.33	8.22	8.36
	Average, with Delays	6.58	6.95	6.47
	Weighted Average, Underway	8.01	7.28	9.31
	Weighted Average, with Delays	5.81	5.43	6.49
Upriver	Average, Underway	5.76	4.72	5.95
	Average, with Delays	4.67	4.39	4.72
	Weighted Average, Underway	4.29	4.76	4.25
	Weighted Average, with Delays	3.61	4.43	3.55
Total	Average, Underway	6.94	6.72	6.99
	Average, with Delays	5.55	5.85	5.48
	Weighted Average, Underway	5.57	6.23	4.58
	Weighted Average, with Delays	4.45	5.07	5.81

Sample Size = 37 trips

TABLE 2 (continued)

AVERAGE ANNUAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Gulf Intracoastal Waterway				
Eastern Portion (New Orleans to Pensacola)	Average, Underway	6.45	5.91	7.17
	Average, with Delays	5.01	5.01	5.01
	Weighted Average, Underway	6.04	5.67	6.90
	Weighted Average, w/Delays	4.32	4.33	4.30
Sample Size = 63				
Western Portion (Houston to New Orleans)	Average, Underway	7.02	6.27	7.74
	Average, with Delays	5.51	5.02	5.76
	Weighted Average, Underway	6.83	5.74	6.93
	Weighted Average, w/Delays	5.26	4.54	5.23
Sample Size = 72 trips				

TABLE 2 (continued)

AVERAGE ANNUAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
ILLINOIS RIVER				
Downriver	Average, Underway	5.45	4.88	6.29
	Average, with Delays	3.28	2.72	4.02
	Weighted Average, Underway	4.94	4.16	5.69
	Weighted Average, with Delays	2.74	2.34	3.16
Upriver	Average, Underway	4.17	4.52	5.35
	Average, with Delays	2.94	2.34	3.87
	Weighted Average, Underway	4.03	3.52	5.22
	Weighted Average, with Delays	2.51	2.06	3.41
Total	Average, Underway	5.06	4.69	5.75
	Average, with Delays	3.10	2.51	3.93
	Weighted Average, Underway	4.42	3.76	5.39
	Weighted Average, with Delays	2.61	2.17	3.31

Sample Size = 184 trips

TABLE 2 (continued)

AVERAGE ANNUAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION

(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Illinois Waterway System North of Lockport, IL (including Calumet-Saginaw, Chicago Sanitary and Ship Canal and Chicago River)				
Downriver	Average, Underway	5.76	SAMPLE SIZE TOO SMALL	
	Average, with Delays	2.45		
	Weighted Average, Underway	5.15		
	Weighted Average, with Delays	2.39		
Upriver	Average, Underway	4.17	SAMPLE SIZE TOO SMALL	
	Average, with Delays	2.07		
	Weighted Average, Underway	3.67		
	Weighted Average, with Delays	2.16		
Total	Average, Underway	4.94	SAMPLE SIZE TOO SMALL	
	Average, with Delays	2.25		
	Weighted Average, Underway	4.26		
	Weighted Average, with Delays	2.27		

SAMPLE SIZE = 89 trips

TABLE 2 (continued)

AVERAGE ANNUAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Lower Mississippi River				
Downriver	Average, Underway	11.68	11.91	10.53
	Average, with Delays	10.16	10.56	9.17
	Weighted Average, Underway	11.64	11.37	9.57
	Weighted Average, with Delays	9.59	9.37	8.34
Upriver	Average, Underway	5.61	5.53	5.81
	Average, with Delays	5.08	5.09	5.08
	Weighted Average, Underway	5.39	5.30	5.47
	Weighted Average, with Delays	4.77	4.76	4.78
Total	Average, Underway	8.63	8.54	7.95
	Average, with Delays	7.62	7.76	7.43
	Weighted Average, Underway	7.39	7.07	9.63
	Weighted Average, with Delays	6.38	6.19	6.64

Sample Size = 369 trips

TABLE 2 (continued)

AVERAGE ANNUAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Missouri River				
Downriver	Average, Underway	9.27	SAMPLE SIZE TOO SMALL	
	Average, with Delays	6.73		
	Weighted Average, Underway	9.34		
	Weighted Average, with Delays	6.09		
Upriver	Average, Underway	4.00	SAMPLE SIZE TOO SMALL	
	Average, with Delays	3.57		
	Weighted Average, Underway	3.98		
	Weighted Average, with Delays	3.53		
Total	Average, Underway	6.55	SAMPLE SIZE TOO SMALL	
	Average, with Delays	5.10		
	Weighted Average, Underway	5.42		
	Weighted Average, with Delays	4.38		

Sample Size = 31 trips

TABLE 2 (continued)

AVERAGE ANNUAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION

(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Monongahela River				
Downriver	Average, Underway	8.29	SAMPLE SIZE TOO SMALL	
	Average, with Delays	5.30		
	Weighted Average, Underway	8.07		
	Weighted Average, with Delays	5.23		
Upriver	Average, Underway	6.15	SAMPLE SIZE TOO SMALL	
	Average, with Delays	4.25		
	Weighted Average, Underway	5.74		
	Weighted Average, with Delays	4.10		
Total	Average, Underway	7.27	SAMPLE SIZE TOO SMALL	
	Average, with Delays	4.80		
	Weighted Average, Underway	6.88		
	Weighted Average, with Delays	4.68		

Sample Size = 47 trips

TABLE 2 (continued)

AVERAGE ANNUAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Morgan City to Port Allen Route				
Downriver	Average, Underway	6.68	SAMPLE SIZE TOO SMALL	
	Average, with Delays	4.72		
	Weighted Average, Underway	5.88		
	Weighted Average, with Delays	4.13		
Upriver	Average, Underway	5.45	SAMPLE SIZE TOO SMALL	
	Average, with Delays	4.64		
	Weighted Average, Underway	5.45		
	Weighted Average, with Delays	4.64		
Total	Average, Underway	6.61	SAMPLE SIZE TOO SMALL	
	Average, with Delays	4.72		
	Weighted Average, Underway	5.85		
	Weighted Average, with Delays	4.16		

Sample Size = 18 trips

TABLE 2 (continued)

AVERAGE ANNUAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Ohio River				
Downriver	Average, Underway	9.02	8.26	9.51
	Average, with Delays	6.04	5.56	6.98
	Weighted Average, Underway	8.78	7.51	9.78
	Weighted Average, with Delays	4.91	4.67	5.40
Upriver	Average, Underway	6.48	6.25	6.64
	Average, with Delays	4.39	4.22	4.87
	Weighted Average, Underway	6.14	5.59	6.84
	Weighted Average, with Delays	3.87	3.71	4.40
Total	Average, Underway	7.76	7.19	8.28
	Average, with Delays	5.22	4.84	6.07
	Weighted Average, Underway	7.27	6.35	8.30
	Weighted Average, with Delays	4.34	4.10	4.93

Sample Size = 401 trips

TABLE 2 (continued)

AVERAGE ANNUAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION

(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Tennessee River				
Downriver	**Average, Underway**	8.86	6.40	9.07
	Average, with Delays	5.36	4.42	5.44
	Weighted Average, Underway	7.99	6.40	8.29
	Weighted Average, with Delays	5.17	4.39	5.32
Upriver	Average, Underway	6.19	7.43	5.91
	Average, with Delays	3.74	4.83	3.49
	Weighted Average, Underway	6.53	7.46	6.17
	Weighted Average, with Delays	4.11	4.79	3.85
Total	Average, Underway	7.60	7.08	7.68
	Average, with Delays	4.60	4.70	4.58
	Weighted Average, Underway	7.27	7.05	7.31
	Weighted Average, with Delays	4.64	4.64	4.64

Sample Size = 68 trips

TABLE 2 (continued)

AVERAGE ANNUAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION

(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Upper Mississippi River				
Downriver	Average, Underway	8.49	7.34	9.06
	Average, with Delays	4.16	3.57	4.61
	Weighted Average, Underway	7.51	6.66	8.51
	Weighted Average, with Delays	3.15	3.31	2.74
Upriver	Average, Underway	6.04	6.19	5.82
	Average, with Delays	3.22	3.84	2.66
	Weighted Average, Underway	5.49	5.38	4.93
	Weighted Average, with Delays	2.90	3.23	2.18
Total	Average, Underway	7.24	6.82	7.45
	Average, with Delays	3.68	3.70	3.64
	Weighted Average, Underway	6.33	6.04	6.44
	Weighted Average, with Delays	3.01	3.27	2.46

Sample Size = 414 trips

TABLE 3

AVERAGE SEASONAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION

(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Black Warrior-Tombigbee River System				
Fall (Usage 16%)				
Downriver	Average, Underway	5.05	4.93	
	Average, with Delays	3.72	3.71	
	Weighted Average, Underway	5.12	5.00	
	Weighted Average, with Delays	3.64	3.60	
Upriver	Average, Underway	5.76	5.60	
	Average, with Delays	4.06	4.12	
	Weighted Average, Underway	5.67	5.55	
	Weighted Average, with Delays	3.96	4.00	
Total	Average, Underway	5.43	5.30	
	Average, with Delays	3.90	3.93	
	Weighted Average, Underway	5.46	5.36	
	Weighted Average, with Delays	3.84	3.80	

SAMPLE SIZE TOO SMALL

TABLE 3 (continued)

AVERAGE SEASONAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION

(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Black Warrior-Tombigbee River System				
Spring (Usage 37%)				
Downriver	Average, Underway	7.52	7.79	
	Average, with Delays	6.34	6.54	
	Weighted Average, Underway	7.32	7.66	
	Weighted Average, with Delays	6.19	6.53	
Upriver	Average, Underway	5.02	4.96	SAMPLE SIZE TOO SMALL
	Average, with Delays	4.27	4.24	
	Weighted Average, Underway	4.94	4.89	
	Weighted Average, with Delays	4.21	4.18	
Total	Average, Underway	6.17	6.25	
	Average, with Delays	5.22	5.28	
	Weighted Average, Underway	5.76	5.81	
	Weighted Average, with Delays	4.90	4.93	

TABLE 3 (continued)

AVERAGE SEASONAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION

(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
BLACK WARRIOR-TOMBIGBEE RIVER SYSTEM				
Summer (Usage 43%)				
Downriver	Average, Underway	6.67	6.98	
	Average, with Delays	5.61	5.86	
	Weighted Average, Underway	6.55	6.96	
	Weighted Average, with Delays	5.46	5.76	
Upriver	Average, Underway	5.39	5.43	SAMPLE SIZE TOO SMALL
	Average, with Delays	4.63	4.67	
	Weighted Average, Underway	5.34	5.38	
	Weighted Average, with Delays	4.59	4.62	
Total	Average, Underway	6.17	6.17	
	Average, with Delays	5.22	5.24	
	Weighted Average, Underway	5.81	5.99	
	Weighted Average, with Delays	4.94	5.07	

TABLE 3 (continued)

AVERAGE SEASONAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION

(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Black Warrior-Tombigbee River System				
Winter (Usage 4%)				
Downriver	Average, Underway	8.20		
	Average, with Delays	6.67		
	Weighted Average, Underway	8.20	SAMPLE SIZE TOO SMALL	SAMPLE SIZE TOO SMALL
	Weighted Average, with Delays	6.67		
Upriver	Average, Underway	5.03		
	Average, with Delays	4.18		
	Weighted Average, Underway	5.03		
	Weighted Average, with Delays	4.18		
Total	Average, Underway	6.61		
	Average, with Delays	5.42		
	Weighted Average, Underway	6.23		
	Weighted Average, with Delays	5.14		

TABLE 3 (continued)

AVERAGE SEASONAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Cumberland River				
Fall				
Downriver	Average, Underway	9.66	SAMPLE SIZE TOO SMALL	SAMPLE SIZE TOO SMALL
	Average, with Delays	5.82		
	Weighted Average, Underway	9.58		
	Weighted Average, with Delays	5.69		
Upriver	Average, Underway	5.86		
	Average, with Delays	5.86		
	Weighted Average, Underway	5.86		
	Weighted Average, with Delays	5.86		
Total	Average, Underway	7.76		
	Average, with Delays	5.84		
	Weighted Average, Underway	8.20		
	Weighted Average, with Delays	5.73		

TABLE 3 (continued)

AVERAGE SEASONAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION

(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Cumberland River				
Spring				
Downriver	Average, Underway	8.51		
	Average, with Delays	6.84		
	Weighted Average, Underway	8.04		
	Weighted Average, with Delays	6.06	SAMPLE SIZE TOO SMALL	SAMPLE SIZE TOO SMALL
Upriver	Average, Underway	5.45		
	Average, with Delays	4.82		
	Weighted Average, Underway	3.61		
	Weighted Average, with Delays	3.30		
Total	Average, Underway	6.76		
	Average, with Delays	5.68		
	Weighted Average, Underway	4.65		
	Weighted Average, with Delays	4.05		

TABLE 3 (continued)

AVERAGE SEASONAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION

(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Cumberland River				
Summer				
Downriver	Average, Underway	7.89		
	Average, with Delays	6.46		
	Weighted Average, Underway	7.48	SAMPLE SIZE TOO SMALL	SAMPLE SIZE TOO SMALL
	Weighted Average, with Delays	5.60		
Upriver	Average, Underway	6.51		
	Average, with Delays	4.19		
	Weighted Average, Underway	5.41		
	Weighted Average, with Delays	3.70		
Total	Average, Underway	7.25		
	Average, with Delays	5.40		
	Weighted Average, Underway	6.39		
	Weighted Average, with Delays	4.56		

TABLE 3 (continued)

AVERAGE SEASONAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION

(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Cumberland River				
Winter				
Downriver	Average, Underway	8.05		
	Average, with Delays	7.57		
	Weighted Average, Underway	8.05		
	Weighted Average, with Delays	7.57	SAMPLE SIZE TOO SMALL	SAMPLE SIZE TOO SMALL
Upriver	Average, Underway	4.81		
	Average, with Delays	4.61		
	Weighted Average, Underway	4.70		
	Weighted Average, with Delays	4.43		
Total	Average, Underway	5.62		
	Average, with Delays	5.35		
	Weighted Average, Underway	5.23		
	Weighted Average, with Delays	4.93		

TABLE 3 (continued)

AVERAGE SEASONAL TWO SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Gulf Intracoastal Waterway - Eastern Portion				
Fall (Usage 36%)				
Total	Average, Underway	6.85	6.44	7.31
	Average, with Delays	5.61	6.14	5.02
	Weighted Average, Underway	6.33	6.15	6.68
	Weighted Average, with Delays	5.35	5.73	4.76
Spring (Usage 17%)				
Total	Average, Underway	6.74	6.20	7.59
	Average, with Delays	4.95	5.40	4.42
	Weighted Average, Underway	6.29	5.69	8.72
	Weighted Average, with Delays	3.96	3.96	3.97
Summer (Usage 15%)				
Total	Average, Underway	6.83	6.74	6.87
	Average, with Delays	5.56	6.10	5.34
	Weighted Average, Underway	6.07	5.59	6.30
	Weighted Average, with Delays	4.36	4.56	4.27
Winter (Usage 32%)				
Total	Average, Underway	5.18	SAMPLE SIZE TOO SMALL	SAMPLE SIZE TOO SMALL
	Average, with Delays	3.67		
	Weighted Average, Underway	5.35		
	Weighted Average, with Delays	3.48		

TABLE 3 (continued)

AVERAGE SEASONAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Gulf Intracoastal Waterway - Western Portion				
Fall (Usage 24%)				
Total	Average, Underway	8.39	7.66	7.67
	Average, with Delays	6.69	6.10	6.25
	Weighted Average, Underway	7.35	6.78	7.03
	Weighted Average, with Delays	6.24	5.62	5.95
Spring (Usage 38%)				
Total	Average, Underway	7.58	6.82	8.13
	Average, with Delays	5.75	5.09	6.00
	Weighted Average, Underway	7.15	6.27	6.86
	Weighted Average, with Delays	5.16	4.61	5.01
Summer (Usage 14%)				
Total	Average, Underway	6.52	6.39	6.65
	Average, with Delays	5.82	5.47	5.70
	Weighted Average, Underway	5.95	6.41	5.73
	Weighted Average, with Delays	5.05	4.91	4.86
Winter (Usage 24%)				
Total	Average, Underway	5.92	4.89	8.16
	Average, with Delays	4.43	4.00	5.19
	Weighted Average, Underway	6.23	4.46	7.99
	Weighted Average, with Delays	4.57	3.59	5.15

TABLE 3 (continued)

AVERAGE SEASONAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION

(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Illinois River				
Fall (Usage 41%)				
Downriver	Average, Underway	5.59	5.40	6.41
	Average, with Delays	3.45	3.09	4.18
	Weighted Average, Underway	5.71	5.47	6.24
	Weighted Average, with Delays	3.48	3.10	4.08
Upriver	Average, Underway	5.09	4.87	5.71
	Average, with Delays	3.01	2.39	4.00
	Weighted Average, Underway	4.57	4.32	5.57
	Weighted Average, with Delays	2.70	2.32	3.50
Total	Average, Underway	5.31	5.10	5.98
	Average, with Delays	3.20	2.69	4.07
	Weighted Average, Underway	5.04	4.73	5.80
	Weighted Average, with Delays	3.02	2.59	3.70

TABLE 3 (continued)

AVERAGE SEASONAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
ILLINOIS RIVER				
Spring (usage 20%)				
Downriver	Average, Underway	5.78	4.71	6.97
	Average, with Delays	3.51	2.32	4.55
	Weighted Average, Underway	5.37	4.48	6.86
	Weighted Average, with Delays	3.35	2.34	4.47
Upriver	Average, Underway	4.24	4.29	4.20
	Average, with Delays	2.80	2.30	3.24
	Weighted Average, Underway	4.30	4.18	4.41
	Weighted Average, with Delays	2.76	2.29	3.17
Total	Average, Underway	5.03	4.29	5.68
	Average, with Delays	3.16	2.30	3.91
	Weighted Average, Underway	4.76	4.18	5.27
	Weighted Average, with Delays	3.02	2.29	3.66

TABLE 3 (continued)

AVERAGE SEASONAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Illinois River				
Summer (Usage 23%)				
Downriver	Average, Underway	6.18	5.79	7.01
	Average, with Delays	3.88	3.07	5.59
	Weighted Average, Underway	5.81	5.36	6.61
	Weighted Average, with Delays	3.14	2.61	4.45
Upriver	Average, Underway	5.09	4.51	5.84
	Average, with Delays	3.37	2.36	4.52
	Weighted Average, Underway	3.85	2.61	5.35
	Weighted Average, with Delays	2.55	1.66	3.68
Total	Average, Underway	5.64	5.22	6.29
	Average, with Delays	3.62	2.76	4.94
	Weighted Average, Underway	4.60	3.79	5.72
	Weighted Average, with Delays	2.80	2.13	3.91

TABLE 3 (continued)

AVERAGE SEASONAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Illinois River				
Winter (Usage 16%)				
Downriver	Average, Underway	4.09	2.37	5.09
	Average, with Delays	2.14	1.66	2.43
	Weighted Average, Underway	3.51	1.92	4.31
	Weighted Average, with Delays	1.70	1.10	1.94
Upriver	Average, Underway	4.29	4.81	4.57
	Average, with Delays	2.58	2.29	3.33
	Weighted Average, Underway	3.45	3.33	4.39
	Weighted Average, with Delays	2.12	1.73	2.95
Total	Average, Underway	4.21	3.91	4.78
	Average, with Delays	2.39	2.05	2.96
	Weighted Average, Underway	3.48	2.74	4.36
	Weighted Average, with Delays	1.91	1.48	2.45

TABLE 3 (continued)

AVERAGE SEASONAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Lower Mississippi River				
Fall (Usage 27%)				
Downriver	Average, Underway	10.80	10.69	10.74
	Average, with Delays	9.70	9.59	9.49
	Weighted Average, Underway	10.81	10.43	11.07
	Weighted Average, with Delays	9.40	9.04	9.59
Upriver	Average, Underway	5.71	5.29	6.05
	Average, with Delays	5.12	4.67	5.48
	Weighted Average, Underway	5.66	5.31	5.94
	Weighted Average, with Delays	4.84	4.53	5.09
Total	Average, Underway	8.23	7.57	8.76
	Average, with Delays	7.39	6.75	7.91
	Weighted Average, Underway	7.59	6.76	8.26
	Weighted Average, with Delays	6.54	5.80	7.14

TABLE 3 (continued)

AVERAGE SEASONAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Lower Mississippi River				
Spring (Usage 30%)				
Downriver	Average, Underway	12.62	13.17	11.01
	Average, with Delays	10.49	11.40	8.54
	Weighted Average, Underway	12.25	11.74	12.35
	Weighted Average, with Delays	9.85	9.48	9.84
Upriver	Average, Underway	5.92	5.93	5.91
	Average, with Delays	5.27	5.39	5.13
	Weighted Average, Underway	5.27	5.25	5.31
	Weighted Average, with Delays	4.74	4.78	4.74
Total	Average, Underway	9.27	9.61	8.62
	Average, with Delays	7.88	8.45	6.94
	Weighted Average, Underway	7.39	7.22	7.55
	Weighted Average, with Delays	6.41	6.29	6.48

TABLE 3 (continued)

AVERAGE SEASONAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Lower Mississippi River				
Summer (Usage 23%)				
Downriver	Average, Underway	11.37	12.12	10.26
	Average, with Delays	10.53	11.17	9.42
	Weighted Average, Underway	11.65	12.21	11.06
	Weighted Average, with Delays	10.57	11.03	10.02
Upriver	Average, Underway	5.43	5.68	5.30
	Average, with Delays	5.07	5.40	4.84
	Weighted Average, Underway	5.49	5.63	5.38
	Weighted Average, with Delays	5.00	5.24	4.82
Total	Average, Underway	8.55	8.96	8.10
	Average, with Delays	7.94	8.34	7.42
	Weighted Average, Underway	7.35	7.61	7.14
	Weighted Average, with Delays	6.69	7.02	6.42

TABLE 3 (continued)

AVERAGE SEASONAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Lower Mississippi River				
Winter (Usage 21%)				
Downriver	Average, Underway	12.03	12.11	11.97
	Average, with Delays	9.74	9.34	10.06
	Weighted Average, Underway	12.19	12.22	12.17
	Weighted Average, with Delays	8.52	8.19	8.79
Upriver	Average, Underway	5.28	5.41	5.13
	Average, with Delays	4.79	4.95	4.61
	Weighted Average, Underway	5.14	5.33	4.88
	Weighted Average, with Delays	4.45	4.67	4.17
Total	Average, Underway	8.40	8.37	7.83
	Average, with Delays	7.08	6.89	6.98
	Weighted Average, Underway	7.17	7.24	7.11
	Weighted Average, with Delays	5.81	5.84	5.75

TABLE 3 (continued)

AVERAGE SEASONAL TWO SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Missouri River				
Fall (Usage 41%)				
Downriver	Average, Underway	8.82		
	Average, with Delays	5.42		
	Weighted Average, Underway	8.94	SAMPLE SIZE TOO SMALL	SAMPLE SIZE TOO SMALL
	Weighted Average, with Delays	5.54		
Upriver	Average, Underway	4.34		
	Average, with Delays	3.91		
	Weighted Average, Underway	4.12		
	Weighted Average, with Delays	3.69		
Total	Average, Underway	6.58		
	Average, with Delays	4.66		
	Weighted Average, Underway	5.57		
	Weighted Average, with Delays	4.39		

TABLE 3 (continued)

AVERAGE SEASONAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Missouri River				
Spring (Usage 25%)				
Downriver	Average, Underway	10.01		
	Average, with Delays	7.33		
	Weighted Average, Underway	10.64		
	Weighted Average, with Delays	5.83		
Upriver	Average, Underway	3.90	SAMPLE SIZE TOO SMALL	SAMPLE SIZE TOO SMALL
	Average, with Delays	3.63		
	Weighted Average, Underway	3.88		
	Weighted Average, with Delays	3.55		
Total	Average, Underway	6.93		
	Average, with Delays	5.48		
	Weighted Average, Underway	5.13		
	Weighted Average, with Delays	4.18		

TABLE 3 (continued)

AVERAGE SEASONAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Missouri River				
Summer (Usage 35%)				
Downriver	Average, Underway	9.60	SAMPLE SIZE TOO SMALL	SAMPLE SIZE TOO SMALL
	Average, with Delays	7.40		
	Weighted Average, Underway	9.55		
	Weighted Average, with Delays	7.07		
Upriver	Average, Underway	3.88		
	Average, with Delays	3.30		
	Weighted Average, Underway	3.99		
	Weighted Average, with Delays	3.34		
Total	Average, Underway	6.93		
	Average, with Delays	5.48		
	Weighted Average, Underway	5.61		
	Weighted Average, with Delays	4.52		

Winter (There were no winter observations on the Missouri River)

TABLE 3 (continued)

AVERAGE SEASONAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION

(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Ohio River				
Fall (Usage 25%)				
Downriver	Average, Underway	7.96	7.35	8.51
	Average, with Delays	3.78	3.79	3.77
	Weighted Average, Underway	7.25	7.01	7.59
	Weighted Average, with Delays	3.23	3.42	3.02
Upriver	Average, Underway	6.71	6.78	6.52
	Average, with Delays	3.25	3.28	3.17
	Weighted Average, Underway	6.30	6.15	6.85
	Weighted Average, with Delays	2.89	2.89	2.88
Total	Average, Underway	7.32	6.99	7.84
	Average, with Delays	3.51	3.47	3.57
	Weighted Average, Underway	6.76	6.50	7.33
	Weighted Average, with Delays	3.06	3.10	2.97

TABLE 3 (continued)

AVERAGE SEASONAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Ohio River				
Spring (Usage 34%)				
Downriver	Average, Underway	9.63	9.23	10.92
	Average, with Delays	7.49	6.84	9.30
	Weighted Average, Underway	9.79	9.38	12.10
	Weighted Average, with Delays	7.39	6.81	9.92
Upriver	Average, Underway	6.43	6.12	7.39
	Average, with Delays	5.20	4.95	5.96
	Weighted Average, Underway	6.05	5.73	7.68
	Weighted Average, with Delays	4.69	4.40	6.22
Total	Average, Underway	8.06	7.62	9.42
	Average, with Delays	6.37	5.86	7.88
	Weighted Average, Underway	7.53	7.03	9.90
	Weighted Average, with Delays	5.77	5.29	8.07

TABLE 3 (continued)

AVERAGE SEASONAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Ohio River				
Summer (Usage 27%)				
Downriver	Average, Underway	9.38	8.80	10.15
	Average, with Delays	6.51	6.03	7.17
	Weighted Average, Underway	9.26	8.47	10.26
	Weighted Average, with Delays	5.95	5.42	6.61
Upriver	Average, Underway	6.48	6.92	5.81
	Average, with Delays	4.72	4.85	4.54
	Weighted Average, Underway	6.32	6.53	5.95
	Weighted Average, with Delays	4.43	4.59	4.14
Total	Average, Underway	7.94	7.85	8.07
	Average, with Delays	5.63	5.43	5.91
	Weighted Average, Underway	7.59	7.30	8.02
	Weighted Average, with Delays	5.12	4.94	5.37

TABLE 3 (continued)

AVERAGE SEASONAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Ohio River				
Winter (Usage 14%)				
Downriver	Average, Underway	8.97	7.97	9.57
	Average, with Delays	6.22	4.29	7.39
	Weighted Average, Underway	8.98	8.35	9.36
	Weighted Average, with Delays	4.04	3.32	4.47
Upriver	Average, Underway	6.14	6.62	5.85
	Average, with Delays	4.30	3.75	4.63
	Weighted Average, Underway	5.77	6.20	5.51
	Weighted Average, with Delays	3.63	3.14	3.93
Total	Average, Underway	7.65	6.62	8.27
	Average, with Delays	5.32	3.75	6.27
	Weighted Average, Underway	7.12	6.20	7.68
	Weighted Average, with Delays	3.89	3.14	4.34

TABLE 3 (continued)

AVERAGE SEASONAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Tennessee River				
Fall				
Downriver	Average, Underway	8.14	SAMPLE SIZE TOO SMALL	SAMPLE SIZE TOO SMALL
	Average, with Delays	5.56		
	Weighted Average, Underway	6.22		
	Weighted Average, with Delays	4.48		
Upriver	Average, Underway	5.41		
	Average, with Delays	3.63		
	Weighted Average, Underway	5.70		
	Weighted Average, with Delays	3.51		
Total	Average, Underway	7.09		
	Average, with Delays	4.81		
	Weighted Average, Underway	6.03		
	Weighted Average, with Delays	4.14		

TABLE 3 (continued)

AVERAGE SEASONAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Tennessee River				
Spring				
Downriver	Average, Underway	10.04	SAMPLE SIZE TOO SMALL	SAMPLE SIZE TOO SMALL
	Average, with Delays	5.49		
	Weighted Average, Underway	8.65		
	Weighted Average, with Delays	5.61		
Upriver	Average, Underway	7.56		
	Average, with Delays	4.86		
	Weighted Average, Underway	8.00		
	Weighted Average, with Delays	5.21		
Total	Average, Underway	8.74		
	Average, with Delays	5.16		
	Weighted Average, Underway	8.25		
	Weighted Average, with Delays	5.37		

TABLE 3 (continued)

AVERAGE SEASONAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Tennessee River				
Summer				
Downriver	Average, Underway	7.87		
	Average, with Delays	5.04		
	Weighted Average, Underway	7.87		
	Weighted Average, with Delays	5.29	SAMPLE SIZE TOO SMALL	SAMPLE SIZE TOO SMALL
Upriver	Average, Underway	5.39		
	Average, with Delays	2.61		
	Weighted Average, Underway	5.49		
	Weighted Average, with Delays	3.08		
Total	Average, Underway	6.74		
	Average, with Delays	3.94		
	Weighted Average, Underway	6.95		
	Weighted Average, with Delays	4.34		

TABLE 3 (continued)

AVERAGE SEASONAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Tennessee River				
Winter				
Downriver	Average, Underway	9.83		
	Average, with Delays	5.49		
	Weighted Average, Underway	9.27	SAMPLE SIZE TOO SMALL	SAMPLE SIZE TOO SMALL
	Weighted Average, with Delays	5.27		
Upriver	Average, Underway	5.95		
	Average, with Delays	3.83		
	Weighted Average, Underway	6.27		
	Weighted Average, with Delays	4.08		
Total	Average, Underway	7.89		
	Average, with Delays	4.66		
	Weighted Average, Underway	7.58		
	Weighted Average, with Delays	4.64		

TABLE 3 (continued)

AVERAGE SEASONAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Upper Mississippi River				
Fall (Usage 32%)				
Downriver	**Average, Underway**	7.95	7.64	8.34
	Average, with Delays	4.37	4.23	4.53
	Weighted Average, Underway	7.76	7.62	8.09
	Weighted Average, with Delays	4.24	4.20	4.31
Upriver	**Average, Underway**	6.61	6.74	6.38
	Average, with Delays	3.94	4.08	3.69
	Weighted Average, Underway	5.97	5.92	5.17
	Weighted Average, with Delays	3.48	3.49	3.42
Total	**Average, Underway**	7.26	7.14	7.42
	Average, with Delays	4.14	4.15	4.13
	Weighted Average, Underway	6.68	6.62	6.88
	Weighted Average, with Delays	3.84	3.80	3.99

TABLE 3 (continued)

AVERAGE SEASONAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Upper Mississippi River				
Spring (Usage 27%)				
Downriver	Average, Underway	7.95	7.64	8.34
	Average, with Delays	4.37	4.23	4.53
	Weighted Average, Underway	7.76	7.62	8.09
	Weighted Average, with Delays	4.24	4.20	4.31
Upriver	Average, Underway	6.61	6.74	6.38
	Average, with Delays	3.94	4.08	3.69
	Weighted Average, Underway	5.97	4.92	5.17
	Weighted Average, with Delays	3.48	3.49	3.42
Total	Average, Underway	7.26	7.14	7.42
	Average, with Delays	4.14	4.15	4.13
	Weighted Average, Underway	6.68	6.62	6.88
	Weighted Average, with Delays	3.84	3.80	3.99

TABLE 3 (continued)

AVERAGE SEASONAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Upper Mississippi River				
Summer (Usage 37%)				
Downriver	Average, Underway	9.00	8.33	10.08
	Average, with Delays	4.73	3.84	6.19
	Weighted Average, Underway	8.22	8.07	8.81
	Weighted Average, with Delays	3.78	3.68	4.18
Upriver	Average, Underway	5.83	6.04	5.33
	Average, with Delays	3.30	3.41	3.03
	Weighted Average, Underway	5.60	5.73	5.04
	Weighted Average, with Delays	3.11	3.14	2.95
Total	Average, Underway	7.30	7.04	7.82
	Average, with Delays	3.96	3.60	4.68
	Weighted Average, Underway	6.59	6.59	6.61
	Weighted Average, with Delays	3.40	3.37	3.53

TABLE 3 (continued)

AVERAGE SEASONAL TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Upper Mississippi River				
Winter (Usage 4%)				
Downriver	Average, Underway	6.32	5.62	6.25
	Average, with Delays	2.05	2.17	2.07
	Weighted Average, Underway	4.36	3.89	7.63
	Weighted Average, with Delays	0.94	1.03	0.88
Upriver	Average, Underway	5.39	5.42	5.38
	Average, with Delays	2.14	3.82	1.45
	Weighted Average, Underway	4.22	5.05	3.85
	Weighted Average, with Delays	1.29	2.18	1.04
Total	Average, Underway	5.91	5.57	5.76
	Average, with Delays	2.09	2.60	1.72
	Weighted Average, Underway	4.31	4.18	5.13
	Weighted Average, with Delays	1.06	1.22	0.95

TABLE 4

STANDARD DEVIATIONS OF TOW SPEEDS
(miles per hour)

WATERWAY	UNDERWAY		WITH DELAY	
	UP	DOWN	UP	DOWN
ARKANSAS RIVER	4.54	1.83	1.75	0.84
BLACK WARRIOR-TOMBIGBEE	0.78	1.60	0.66	1.47
CUMBERLAND RIVER	2.75	1.41	2.09	1.72
GULF INTRACOASTAL WATERWAY				
EASTERN PORTION	2.29		2.56	
WESTERN PORTION	3.28		2.55	
ILLINOIS RIVER	2.56	1.95	1.42	1.68
LOWER MISSISSIPPI RIVER	2.28	3.16	2.23	3.21
MISSOURI RIVER	0.77	1.59	0.83	2.63
OHIO RIVER	2.34	2.82	2.06	2.92
PORT ALLEN ROUTE	1.73		1.66	
TENNESSEE RIVER	1.98	3.37	1.56	2.32
UPPER MISSISSIPPI RIVER	2.71	3.39	1.59	3.02

TABLE 5

MEDIAN TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION
(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Arkansas River				
Downriver	Underway	5.93		
	With Delays	4.38	SAMPLE SIZE TOO SMALL	SAMPLE SIZE TOO SMALL
Upriver	Underway	6.62		
	With Delays	5.56		
Total	Underway	6.17		
	With Delays	4.98		
Black Warrior-Tombigbee River System				
Downriver	Underway	6.98	7.14	4.93
	With Delays	5.87	6.04	4.10
Upriver	Underway	5.40	5.39	5.69
	With Delays	4.52	4.54	4.41
Total	Underway	5.76	5.82	4.99
	With Delays	4.79	4.91	4.30

TABLE 5 (continued)

MEDIAN TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION

(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Cumberland River				
Downriver	Underway	8.39	7.60	8.42
	With Delays	6.67	6.80	6.80
Upriver	Underway	5.44	4.31	5.54
	With Delays	4.61	3.95	5.05
Total	Underway	6.74	6.85	6.53
	With Delays	5.57	6.03	5.56
Gulf Intracoastal Waterway - Eastern Portion				
	Underway	6.21	5.52	6.70
	With Delays	4.49	4.50	4.46
Gulf Intracoastal Waterway - Western Portion				
	Underway	6.73	6.29	7.47
	With Delays	5.26	4.85	5.27

TABLE 5 (continued)

MEDIAN TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION

(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Illinois River				
Downriver	Underway	5.58	5.32	6.30
	With Delays	3.23	2.34	3.74
Upriver	Underway	4.19	3.87	4.99
	With Delays	2.59	2.24	3.58
Total	Underway	4.87	4.18	5.52
	With Delays	2.76	2.25	3.67
Lower Mississippi River				
Downriver	Underway	11.87	12.35	10.86
	With Delays	10.43	10.68	9.71
Upriver	Underway	5.50	5.60	5.12
	With Delays	4.70	5.11	4.60
Total	Underway	7.05	6.54	7.55
	With Delays	6.18	6.14	6.18

TABLE 5 (continued)

MEDIAN TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION

(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Missouri River				
Downriver	Underway	9.68	SAMPLE SIZE TOO SMALL	SAMPLE SIZE TOO SMALL
	With Delays	6.49		
Upriver	Underway	3.89		
	With Delays	3.54		
Total	Underway	5.78		
	With Delays	4.29		
Ohio River				
Downriver	Underway	8.97	12.08	10.03
	With Delays	5.91	8.42	6.52
Upriver	Underway	6.38	6.14	6.84
	With Delays	5.63	4.17	5.76
Total	Underway	7.48	7.26	8.11
	With Delays	4.93	4.65	5.76

TABLE 5 (continued)

MEDIAN TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION

(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Port Allen Route				
Downriver	Underway	6.50		
	With Delays	4.48		
Upriver	Underway	5.45		
	With Delays	4.64		
Total	Underway	6.45		
	With Delays	4.56		
Tennessee River				
Downriver	Underway	7.99		
	With Delays	5.15		
Upriver	Underway	5.92		
	With Delays	3.89		
Total	Underway	7.09		
	With Delays	4.74		

SAMPLE SIZE TOO SMALL

SAMPLE SIZE TOO SMALL

TABLE 5 (continued)

MEDIAN TOW SPEEDS BY WATERWAY, TYPE AND DIRECTION

(Miles per Hour)

		TOTAL	INTRA SYSTEM	INTER SYSTEM
Upper Mississippi River				
Downriver	Underway	8.49	7.89	9.31
	With Delays	3.81	3.84	6.84
Upriver	Underway	5.72	5.92	5.29
	With Delays	3.31	3.56	2.38
Total	Underway	6.65	6.65	6.55
	With Delays	3.48	3.64	2.74

TABLE 6

AVERAGE NUMBER OF BARGES PER TOW

	TOTAL	INTRA SYSTEM	INTER SYSTEM
Allegheny River			
Downriver	8.31	SAMPLE SIZE TOO SMALL	SAMPLE SIZE TOO SMALL
Upriver	9.92		
Total	9.14		
Arkansas River			
Downriver	3.78		
Upriver	3.56		
Total	3.60		
Black Warrior-Tombigbee River System			
Downriver	4.31	4.07	6.00
Upriver	4.27	4.00	6.00
Total	4.29	4.03	6.00
Cumberland River			
Downriver	9.06	7.75	8.93
Upriver	8.75	7.00	9.06
Total	8.89	7.43	9.00

TABLE 6 (continued)

AVERAGE NUMBER OF BARGES PER TOW

	TOTAL	INTRA SYSTEM	INTER SYSTEM
Gulf Intracoastal Waterway - Eastern Portion (New Orleans to Pensacola)	2.84	2.19	3.70
Gulf Intracoastal Waterway - Western Portion (Houston to New Orleans)	2.99	2.53	3.90
Illinois River			
Downriver	10.71	11.09	10.29
Upriver	11.03	11.30	9.77
Total	10.88	11.20	9.99
Illinois Waterway System North of Lockport, IL (including Calumet-Saginaw, Chicago Sanitary and Ship Canal and Chicago River)			
Downriver	8.31	SAMPLE SIZE TOO SMALL	
Upriver	9.92		
Total	9.14		

TABLE 6 (continued)

AVERAGE NUMBER OF BARGES PER TOW

	TOTAL	INTRA SYSTEM	INTER SYSTEM
Lower Mississippi River			
Downriver	10.15	10.08	9.12
Upriver	11.48	10.37	12.50
Total	10.82	10.23	10.56
Missouri River			
Downriver	4.67	SAMPLE SIZE TOO SMALL	
Upriver	4.88		
Total	4.77		
Monongahela River			
Downriver	12.25	SAMPLE SIZE TOO SMALL	
Upriver	11.32		
Total	11.80		
Morgan City to Port Allen Route			
Downriver	4.18	SAMPLE SIZE TOO SMALL	
Upriver	4.00		
Total	4.17		

TABLE 6 (continued)

AVERAGE NUMBER OF BARGES PER TOW

	TOTAL	INTRA SYSTEM	INTER SYSTEM
Ohio River			
Downriver	9.90	11.52	7.78
Upriver	11.07	12.04	9.06
Total	10.48	11.80	8.29
Tennessee River			
Downriver	9.64	12.67	9.36
Upriver	11.84	10.33	12.19
Total	11.90	11.11	10.61
Upper Mississippi River			
Downriver	10.93	10.30	11.32
Upriver	11.62	11.16	12.20
Total	11.28	10.69	11.75

TABLE 7

AVERAGE NUMBER OF BARGES PER TOW
(by seasons of the year)

	TOTAL	INTRA SYSTEM	INTER SYSTEM
Black Warrior-Tombigbee River System			
Fall (Usage 16%)			
Downriver	3.38	3.40	
Upriver	4.00	3.67	
Total	3.92	3.55	
Spring (Usage 37%)			SAMPLE SIZE TOO SMALL
Downriver	4.18	4.00	
Upriver	4.31	4.17	
Total	4.25	4.09	
Summer (Usage 43%)			
Downriver	4.64	4.42	
Upriver	4.44	4.08	
Total	4.25	4.24	
Winter (Usage 4%)			
Downriver	4.00	SAMPLE SIZE TOO SMALL	
Upriver	3.00		
Total	3.50		

TABLE 7 (continued)

AVERAGE NUMBER OF BARGES PER TOW
(by seasons of the year)

	TOTAL	INTRA SYSTEM	INTER SYSTEM
Cumberland River			
Fall			
Downriver	2.50		
Upriver	10.50		
Total	6.50		
Spring			
Downriver	7.33	SAMPLE SIZE TOO SMALL	SAMPLE SIZE TOO SMALL
Upriver	6.25		
Total	6.71		
Summer			
Downriver	11.88		
Upriver	10.86		
Total	11.40		
Winter			
Downriver	10.00		
Upriver	9.33		
Total	9.50		

TABLE 7 (continued)

AVERAGE NUMBER OF BARGES PER TOW
(by seasons of the year)

	TOTAL	INTRA SYSTEM	INTER SYSTEM
Gulf Intracoastal Waterway - Eastern Portion			
Fall (Usage 36%)			
Total	2.94	2.00	4.00
Spring (Usage 17%)			
Total	3.33	2.00	4.86
Summer (Usage 15%)			
Total	3.06	3.60	2.83
Winter (Usage 32%)			
Total	1.93	SAMPLE SIZE TOO SMALL	
Gulf Intracoastal Waterway - Western Portion			
Fall (Usage 24%)			
Total	3.07	2.57	3.83
Spring (Usage 38%)			
Total	3.04	2.63	4.33
Summer (Usage 14%)			
Total	2.54	2.09	3.33
Winter (Usage 24%)			
Total	3.08	2.59	3.88

TABLE 7 (continued)

AVERAGE NUMBER OF BARGES PER TOW
(by seasons of the year)

	TOTAL	INTRA SYSTEM	INTER SYSTEM
Illinois River			
Fall (Usage 41%)			
Downriver	10.76	11.80	9.20
Upriver	11.35	11.55	10.25
Total	11.09	11.66	9.85
Spring (Usage 20%)			
Downriver	11.40	12.50	12.33
Upriver	12.68	11.39	10.92
Total	12.02	11.39	11.63
Summer (Usage 23%)			
Downriver	13.59	13.80	13.14
Upriver	12.04	12.84	11.00
Total	12.82	13.37	11.83
Winter (Usage 16%)			
Downriver	6.58	5.00	7.50
Upriver	8.58	8.33	7.71
Total	7.73	7.10	7.62

TABLE 7 (continued)

AVERAGE NUMBER OF BARGES PER TOW
(by seasons of the year)

	TOTAL	INTRA SYSTEM	INTER SYSTEM
Lower Mississippi River			
Fall (Usage 27%)			
Downriver	11.43	10.82	11.00
Upriver	11.68	10.27	13.27
Total	11.56	10.50	11.94
Spring (Usage 30%)			
Downriver	11.98	12.00	10.89
Upriver	12.29	12.78	11.75
Total	12.14	12.38	11.29
Summer (Usage 23%)			
Downriver	8.34	6.77	9.00
Upriver	8.34	7.72	14.79
Total	9.78	7.24	11.53
Winter (Usage 21%)			
Downriver	8.22	11.13	5.14
Upriver	10.17	10.89	9 .35
Total	9.27	11.00	7.02

TABLE 7 (continued)

AVERAGE NUMBER OF BARGES PER TOW
(by seasons of the year)

	TOTAL	INTRA SYSTEM	INTER SYSTEM
Missouri River			
Fall (Usage 41%)			
Downriver	5.60		
Upriver	5.40		
Total	5.50		
Spring (Usage 25%)		SAMPLE SIZE TOO SMALL	SAMPLE SIZE TOO SMALL
Downriver	2.00		
Upriver	4.25		
Total	3.50		
Summer (Usage 35%)			
Downriver	4.75		
Upriver	4.86		
Total	4.80		
Winter (There were no winter observations on the Missouri River)			

TABLE 7 (continued)

AVERAGE NUMBER OF BARGES PER TOW
(by season of the year)

	TOTAL	INTRA SYSTEM	INTER SYSTEM
Ohio River			
Fall (Usage 25%)			
Downriver	10.55	12.92	8.43
Upriver	11.20	11.63	9.93
Total	10.88	12.12	8.93
Spring (Usage 34%)			
Downriver	11.69	13.25	10.92
Upriver	11.82	12.28	10.43
Total	11.76	12.75	9.27
Summer (Usage 27%)			
Downriver	8.66	9.47	7.56
Upriver	10.64	12.43	7.91
Total	9.64	10.97	7.73
Winter (Usage 14%)			
Downriver	7.81	9.61	5.57
Upriver	10.18	10.63	7.82
Total	8.92	10.63	6.56

TABLE 7 (continued)

AVERAGE NUMBER OF BARGES PER TOW
(by season of the year)

	TOTAL	INTRA SYSTEM	INTER SYSTEM
Tennessee River			
Fall			
Downriver	8.12		
Upriver	11.60		
Total	9.46		
Spring			
Downriver	10.44	SAMPLE SIZE TOO SMALL	SAMPLE SIZE TOO SMALL
Upriver	11.80		
Total	11.16		
Summer			
Downriver	10.08		
Upriver	12.70		
Total	11.27		
Winter			
Downriver	9.57		
Upriver	10.86		
Total	10.21		

TABLE 7 (continued)

AVERAGE NUMBER OF BARGES PER TOW
(by season of the year)

	TOTAL	INTRA SYSTEM	INTER SYSTEM
Upper Mississippi River			
Fall (Usage 32%)			
Downriver	12.57	12.32	12.88
Upriver	11.57	9.87	14.50
Total	12.05	10.97	13.64
Spring (Usage 27%)			
Downriver	10.71	9.61	12.32
Upriver	11.51	11.50	11.52
Total	11.13	10.62	11.93
Summer (Usage 37%)			
Downriver	11.22	10.64	12.18
Upriver	12.46	11.81	14.00
Total	11.89	11.30	13.05
Winter (Usage 4%)			
Downriver	8.48	8.76	7.65
Upriver	10.10	12.67	9.04
Total	9.18	9.79	8.44

TABLE 7

PERCENT BACKHAUL EMPTY

	TOTAL	INTRA SYSTEM	INTER SYSTEM
Allegheny River			
Downriver	92		
Upriver	90		
Total	91	SAMPLE SIZE TOO SMALL	SAMPLE SIZE TOO SMALL
Arkansas River			
Downriver	67		
Upriver	100		
Total	89		
Black Warrior-Tombigbee River System			
Downriver	55	67	0
Upriver	43	6	100
Total	49	35	100
Cumberland River			
Downriver	100	100	100
Upriver	17	10	18
Total	89	100	87

TABLE 7 (continued)

PERCENT BACKHAUL EMPTY

	TOTAL	INTRA SYSTEM	INTER SYSTEM
Gulf Intracoastal Waterway - Eastern Portion (New Orleans to Pensacola)	100	100	98
Gulf Intracoastal Waterway - Western Portion (Houston to New Orleans)	100	87	100
Illinois River			
Downriver	87	100	29
Upriver	53	35	71
Total	69	81	53
Illinois Waterway System North of Lockport, IL (including Calumet-Saginaw, Chicago Sanitary and Ship Canal and Chicago River)			
Downriver	100	SAMPLE SIZE TOO SMALL	
Upriver	28		
Total	68		

TABLE 7 (continued)

PERCENT BACKHAUL EMPTY

	TOTAL	INTRA SYSTEM	INTER SYSTEM
Lower Mississippi River			
Downriver	66	75	66
Upriver	73	54	94
Total	70	64	80
Missouri River			
Downriver	23		
Upriver	72		
Total	49		
Monongahela River		SAMPLE SIZE TOO SMALL	SAMPLE SIZE TOO SMALL
Downriver	100		
Upriver	18		
Total	77		
Morgan City to Port Allen Route			
Downriver	100		
Upriver	100		
Total	100		

TABLE 7 (continued)

PERCENT BACKHAUL EMPTY

	TOTAL	INTRA SYSTEM	INTER SYSTEM
Ohio River			
Downriver	82	77	93
Upriver	69	66	72
Total	75	71	83
Tennessee River			
Downriver	100	100	100
Upriver	23	32	21
Total	81	67	84
Upper Mississippi River			
Downriver	28	18	41
Upriver	100	84	100
Total	65	49	72

TABLE 8

PERCENT BACKHAUL EMPTY BY SEASON

	TOTAL	INTRA SYSTEM	INTER SYSTEM
Black Warrior-Tombigbee River System			
Fall (Usage 16%)			
Downriver	17	24	
Upriver	64	27	
Total	43	26	
Spring (Usage 37%)			
Downriver	70	80	
Upriver	21	0	
Total	43	36	
Summer (Usage 43%)			
Downriver	62	75	
Upriver	54	4	
Total	62	40	
Winter (Usage [illegible])			
Downriver	0	SAMPLE SIZE TOO SMALL	
Upriver	0		
Total	0		

SAMPLE SIZE TOO SMALL

TABLE 8 (continued)

PERCENT BACKHAUL EMPTY BY SEASON

	TOTAL	INTRA SYSTEM	INTER SYSTEM
Cumberland River			
Fall			
Downriver	0		
Upriver	0		
Total	0		
Spring			
Downriver	100	SAMPLE SIZE TOO SMALL	SAMPLE SIZE TOO SMALL
Upriver	36		
Total	96		
Summer			
Downriver	100		
Upriver	8		
Total	99		
Winter			
Downriver	100		
Upriver	21		
Total	63		

TABLE 8 (continued)

PERCENT BACKHAUL EMPTY BY SEASON

	TOTAL	INTRA SYSTEM	INTER SYSTEM
Gulf Intracoastal Waterway - Eastern Portion			
Fall (Usage 36%)	100	100	100
Spring (Usage 17%)	100	100	88
Summer (Usage 15%)	100	100	94
Winter (Usage 32%)	100	SAMPLE SIZE TOO SMALL	

TABLE 8 (continued)

PERCENT BACKHAUL EMPTY BY SEASON

	TOTAL	INTRA SYSTEM	INTER SYSTEM
Gulf Intracoastal Waterway - Western Portion			
Fall (Usage 24%)	100	56	100
Spring (Usage 38%)	100	100	100
Summer (Usage 14%)	100	100	100
Winter (Usage 24%)	100	77	100

TABLE 8 (continued)

PERCENT BACKHAUL EMPTY BY SEASON

	TOTAL	INTRA SYSTEM	INTER SYSTEM
Illinois River			
Fall (Usage 41%)			
Downriver	100	100	33
Upriver	39	19	68
Total	78	88	55
Spring (Usage 20%)			
Downriver	56	22	23
Upriver	32	60	37
Total	43	60	29
Summer (23%)			
Downriver	95	100	24
Upriver	72	51	94
Total	84	94	64
Winter (Usage 6%)			
Downriver	37	29	40
Upriver	75	56	78
Total	61	56	62

TABLE 8 (continued)

PERCENT BACKHAUL EMPTY BY SEASON

	TOTAL	INTRA SYSTEM	INTER SYSTEM
Lower Mississippi River			
Fall (Usage 27%)			
Downriver	57	49	65
Upriver	83	68	100
Total	70	60	84
Spring (Usage 30%)			
Downriver	70	85	44
Upriver	75	48	100
Total	69	66	75
Summer (Usage 23%)			
Downriver	73	93	64
Upriver	79	34	100
Total	76	62	85
Winter (Usage 21%)			
Downriver	82	63	100
Upriver	46	61	28
Total	61	39	61

TABLE 8 (continued)

PERCENT BACKHAUL EMPTY BY SEASON

	TOTAL	INTRA SYSTEM	INTER SYSTEM
Ohio River			
Fall (Usage 25%)			
Downriver	75	76	74
Upriver	72	57	100
Total	73	65	91
Spring (Usage 34%)			
Downriver	90	88	100
Upriver	77	75	88
Total	84	81	94
Summer (Usage 27%)			
Downriver	76	61	100
Upriver	70	75	57
Total	73	69	80
Winter (Usage 14%)			
Downriver	88	74	100
Upriver	43	61	28
Total	64	61	68

TABLE 8 (continued)

PERCENT BACKHAUL EMPTY BY SEASON

	TOTAL	INTRA SYSTEM	INTER SYSTEM
Tennessee River			
Fall			
Downriver	100		
Upriver	14		
Total	93		
Spring			
Downriver	100		
Upriver	17		
Total	66		
Summer			
Downriver	100		
Upriver	14		
Total	86		
Winter			
Downriver	100		
Upriver	53		
Total	85		

TABLE 8 (continued)

PERCENT BACKHAUL EMPTY BY SEASON

	TOTAL	INTRA SYSTEM	INTER SYSTEM
Upper Mississippi River			
Fall (Usage 32%)			
Downriver	32	22	43
Upriver	94	85	100
Total	63	53	73
Spring (Usage 27%)			
Downriver	21	16	25
Upriver	100	100	98
Total	65	69	59
Summer (Usage 37%)			
Downriver	31	14	55
Upriver	100	100	100
Total	78	72	88
Winter (Usage 4%)			
Downriver	25	21	45
Upriver	61	40	73
Total	42	28	62

TABLE 9

AVERAGE TRANSIT TIME FOR EACH LOCK TRAVERSED BY WATERWAY

WATERWAY	TRANSIT TIME (HOURS)
ARKANSAS RIVER	.68
BLACK WARRIOR-TOMBIGBEE	.75
CUMBERLAND	.75
GULF INTRACOASTAL WATERWAY, EASTERN PORTION	7.58
GULF INTRACOASTAL WATERWAY, WESTERN PORTION	1.60
ILLINOIS RIVER	4.86
OHIO RIVER	2.81
PORT ALLEN ROUTE	1.02
TENNESSEE RIVER	3.36
UPPER MISSISSIPPI RIVER	3.20

TABLE 10

AVERAGE TRANSIT TIME FOR EACH LOCK TRAVERSED BY WATERWAY AND SEASON

WATERWAY	TRANSIT TIME (HOURS)
BLACK WARRIOR-TOMBIGBEE RIVER SYSTEM	
FALL	1.17
SPRING	0.65
SUMMER	0.68
WINTER	0.31
GULF INTRACOASTAL WATERWAY/WESTERN PORTION	
FALL	1.15
SPRING	1.23
SUMMER	0.86
WINTER	2.21
ILLINOIS RIVER	
FALL	4.90
SPRING	4.75
SUMMER	5.51
WINTER	2.38
OHIO RIVER	
FALL	6.32
SPRING	1.14
SUMMER	2.27
WINTER	2.56
UPPER MISSISSIPPI RIVER	
FALL	2.13
SPRING	2.72
SUMMER	2.80
WINTER	9.37

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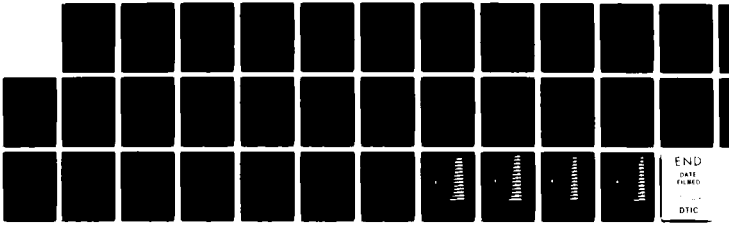


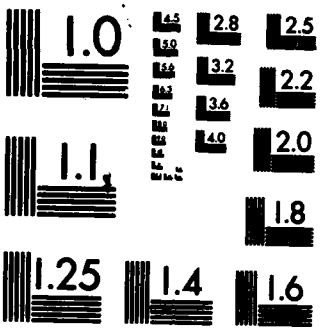


TABLE 11

AVERAGE DELAYS BY WATERWAY - ALL MOVEMENTS

	DOWNRIVER		UPRIVER		BOTH	
	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)
ARKANSAS RIVER						
WEATHER	.22	3.12	.22	7.25	.22	5.19
FOG	.33	12.36	.33	2.36	.33	7.36
LOCKING	1.00	12.34	1.00	6.91	1.00	9.62
REPAIRS	.11	2.00	.33	0.61	.22	0.96
ICE	.33	6.50	.11	12.75	.22	8.06
CREW CHANGE	----	----	----	----	----	----
SUPPLIES	----	----	.11	0.75	.11	0.75
CHANNEL DELAY	.56	8.40	.78	1.14	.67	4.16
AWAITING ORDERS	----	----	----	----	----	----
VESSEL ASSISTING	----	----	.11	0.92	.11	0.92
AWAITING BERTH	----	----	----	----	----	----
BRIDGE WAIT	.56	1.55	.33	0.69	.44	1.23
FLEETING	.11	1.67	.56	2.05	.33	1.99
BLACK WARRIOR-TOMBIGBEE RIVER SYSTEM						
WEATHER	.03	0.50	.03	3.25	.03	1.88
FOG	.42	5.62	.38	8.84	.39	7.29
LOCKING	.97	5.83	1.00	6.15	.99	6.00
REPAIRS	.25	6.86	.27	7.24	.27	7.07
ICE	----	----	----	----	----	----
CREW CHANGE	----	----	.03	0.42	.01	0.42
SUPPLIES	----	----	----	----	----	----
CHANNEL DELAY	.16	1.78	.14	1.52	.14	1.65
AWAITING ORDERS	----	----	----	----	----	----
VESSEL ASSISTING	----	----	----	----	----	----
AWAITING BERTH	----	----	----	----	----	----
BRIDGE WAIT	.03	8.50	----	----	.01	8.50
FLEETING	.59	1.85	.81	4.28	.71	3.34

TABLE 11 (continued)

AVERAGE DELAYS BY WATERWAY - ALL MOVEMENTS

	DOWNRIVER		UPRIVER		BOTH	
	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)
CUMBERLAND RIVER						
WEATHER	----	----	----	----	----	----
FOG	.35	6.71	.20	2.56	.27	4.72
LOCKING	.94	1.93	.75	2.68	.84	2.29
REPAIRS	.06	0.50	.10	0.29	.08	0.36
ICE	----	----	----	----	----	----
CREW CHANGE	.06	0.25	.10	0.66	.08	0.53
SUPPLIES	.06	2.00	.15	1.78	.11	1.84
CHANNEL DELAY	----	----	.05	0.33	.03	0.33
AWAITING ORDERS	.06	0.25	----	----	.03	0.25
VESSEL ASSISTING	----	----	.15	0.86	.08	0.86
AWAITING BERTH	----	----	----	----	----	----
BRIDGE WAIT	----	----	----	----	----	----
FLEETING	.53	2.71	.55	2.56	.54	2.63

TABLE 11 (continued)

AVERAGE DELAYS BY WATERWAY - ALL MOVEMENTS

	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)
GULF INTRACOASTAL WATERWAY, EASTERN PORTION		
WEATHER	.14	12.05
FOG	.08	12.06
LOCKING	.42	7.58
REPAIRS	.08	2.22
ICE	----	----
CREW CHANGE	.03	0.50
SUPPLIES	.03	0.67
CHANNEL DELAY	.06	1.66
AWAITING ORDERS	----	----
VESSEL ASSISTING	.08	11.11
AWAITING BERTH	.06	1.96
BRIDGE WAIT	----	----
FLEETING	.28	3.21
GULF INTRACOASTAL WATERWAY, WESTERN PORTION		
WEATHER	.09	7.21
FOG	.22	5.84
LOCKING	.69	7.63
REPAIRS	.12	5.01
ICE	----	----
CREW CHANGE	.03	1.50
SUPPLIES	.15	2.06
CHANNEL DELAY	.27	3.44
AWAITING ORDERS	.03	1.12
VESSEL ASSISTING	.09	1.60
AWAITING BERTH	.07	12.16
BRIDGE WAIT	.11	4.69
FLEETING	.26	2.49

TABLE 11 (continued)

AVERAGE DELAYS BY WATERWAY - ALL MOVEMENTS

	DOWNRIVER		UPRIVER		BOTH	
	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)
ILLINOIS RIVER						
WEATHER	.15	5.76	.04	7.42	.09	6.15
FOG	.14	4.46	.13	4.10	.14	4.28
LOCKING	.80	13.45	.81	16.94	.81	15.33
REPAIRS	.15	2.49	.11	5.96	.13	4.08
ICE	.13	25.51	.10	14.10	.11	20.08
CREW CHANGE	.03	0.89	.02	1.46	.03	1.12
SUPPLIES	.02	6.25	.12	1.62	.08	2.28
CHANNEL DELAY	.29	2.92	.70	3.03	.51	3.00
AWAITING ORDERS	.03	43.92	.01	2.00	.02	33.44
VESSEL ASSISTING	.23	6.34	.20	5.89	.22	6.11
AWAITING BERTH	.01	0.67	----	----	.01	0.67
BRIDGE WAIT	.19	1.29	.07	2.58	.13	1.68
FLEETING	.74	8.22	.56	6.25	.65	7.31
LOWER MISSISSIPPI RIVER						
WEATHER	.07	4.53	.04	5.95	.05	5.06
FOG	.26	9.22	.22	7.53	.24	8.44
LOCKING	----	----	----	----	----	----
REPAIRS	.08	5.96	.16	6.59	.12	6.38
ICE	----	----	----	----	----	----
CREW CHANGE	.04	1.08	.04	1.55	.04	1.33
SUPPLIES	.16	2.38	.18	2.27	.17	2.32
CHANNEL DELAY	.11	1.54	.62	4.52	.37	4.08
AWAITING ORDERS	.01	0.25	.01	4.09	.01	2.17
VESSEL ASSISTING	.20	2.28	.20	3.55	.20	2.93
AWAITING BERTH	.02	3.84	.01	1.00	.01	3.27
BRIDGE WAIT	.02	11.00	.03	0.79	.03	4.88
FLEETING	.43	8.44	.42	7.79	.43	8.12

TABLE 11 (continued)

AVERAGE DELAYS BY WATERWAY - ALL MOVEMENTS

	DOWNRIVER		UPRIVER		BOTH	
	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)
MISSOURI RIVER						
WEATHER	.20	17.72	----	----	.10	17.72
FOG	.40	6.83	.38	5.11	.39	5.97
LOCKING	----	----	----	----	----	----
REPAIRS	.13	2.88	.13	3.95	.13	3.41
ICE	----	----	----	----	----	----
CREW CHANGE	.13	0.50	.13	0.58	.13	0.54
SUPPLIES	.27	1.58	.31	2.07	.29	1.85
CHANNEL DELAY	----	----	.44	3.94	.23	3.94
AWAITING ORDERS	----	----	.06	0.58	.03	0.58
VESSEL ASSISTING	----	----	----	----	----	----
AWAITING BERTH	----	----	----	----	----	----
BRIDGE WAIT	.20	5.89	.19	4.75	.19	5.32
FLEETING	.67	9.18	.81	4.09	.74	6.31
OHIO RIVER						
WEATHER	.03	9.32	.03	14.04	.03	11.68
FOG	.24	7.29	.18	8.98	.21	8.00
LOCKING	.89	24.50	.88	24.60	.89	24.55
REPAIRS	.10	3.02	.11	10.04	.10	6.53
ICE	.04	67.85	.04	41.73	.04	55.66
CREW CHANGE	.06	0.66	.07	1.19	.06	0.93
SUPPLIES	.18	1.89	.22	2.06	.20	1.98
CHANNEL DELAY	.07	1.49	.26	2.12	.16	1.98
AWAITING ORDERS	.01	1.88	.01	58.25	.01	30.06
VESSEL ASSISTING	.09	3.45	.11	2.91	.10	3.16
AWAITING BERTH	.01	1.00	----	----	----	----
BRIDGE WAIT	.01	5.66	.01	0.50	.01	3.94
FLEETING	.61	8.89	.66	8.93	.64	8.91

TABLE 11 - (continued)

AVERAGE DELAYS BY WATERWAY - ALL MOVEMENTS

	DOWNRIVER		UPRIVER		BOTH	
	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)
PORT ALLEN ROUTE						
WEATHER	----	----	----	----	----	----
FOG	.12	3.78	----	----	.11	3.76
LOCKING	1.00	3.12	1.00	1.50	1.00	3.03
REPAIRS	----	----	1.00	0.58	.06	0.58
ICE	----	----	----	----	----	----
CREW CHANGE	----	----	----	----	----	----
SUPPLIES	----	----	----	----	----	----
CHANNEL DELAY	.12	1.38	----	----	.11	1.38
AWAITING ORDERS	----	----	----	----	----	----
VESSEL ASSISTING	----	----	----	----	----	----
AWAITING BERTH	----	----	----	----	----	----
BRIDGE WAIT	.29	1.80	----	----	.28	1.80
FLEETING	.18	2.33	----	----	.17	2.33
TENNESSEE RIVER						
WEATHER	.08	13.17	.03	8.08	.06	11.90
FOG	.17	2.18	.31	8.44	.24	6.09
LOCKING	.94	9.22	.97	10.03	.96	9.61
REPAIRS	.11	3.36	.06	1.75	.09	2.82
ICE	----	----	----	----	----	----
CREW CHANGE	----	----	----	----	----	----
SUPPLIES	.08	1.19	.06	1.38	.07	1.27
CHANNEL DELAY	.06	1.62	.13	0.88	.09	1.12
AWAITING ORDERS	.03	0.50	----	----	.01	0.50
VESSEL ASSISTING	.14	4.77	.09	3.97	.12	4.47
AWAITING BERTH	----	----	----	----	----	----
BRIDGE WAIT	.08	0.94	.03	0.25	.06	0.77
FLEETING	.67	5.04	.63	7.44	.65	6.13

TABLE 11 (continued)

AVERAGE DELAYS BY WATERWAY - ALL MOVEMENTS

	DOWNRIVER		UPRIVER		BOTH	
	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)
UPPER MISSISSIPPI RIVER						
WEATHER	.11	7.40	.07	5.74	.09	6.73
FOG	.22	7.55	.17	5.98	.19	6.86
LOCKING	.82	43.02	.79	40.48	.81	41.75
REPAIRS	.11	9.08	.06	4.30	.08	7.39
ICE	.05	41.92	.02	39.38	.04	41.24
CREW CHANGE	.01	0.56	.06	1.76	.04	1.52
SUPPLIES	.06	2.10	.09	2.22	.08	2.17
CHANNEL DELAY	.18	4.25	.53	2.89	.36	3.22
AWAITING ORDERS	.01	5.33	.02	12.00	.02	9.50
VESSEL ASSISTING	.19	3.59	.17	2.91	.18	3.26
AWAITING BERTH	----	----	.01	3.08	.01	2.50
BRIDGE WAIT	.14	1.88	.14	1.09	.14	1.48
FLEETING	.60	6.86	.59	6.31	.60	6.59

TABLE 12

AVERAGE DELAYS BY WATERWAY FOR WITHIN SYSTEM MOVEMENTS

	DOWNRIVER		UPRIVER		BOTH	
	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)
BLACK WARRIOR-TOMBIGBEE RIVER SYSTEM						
WEATHER	.04	.50	----	----	.02	0.50
FOG	.37	6.21	.38	9.30	.37	7.89
LOCKING	1.00	5.33	1.00	5.28	1.00	5.30
REPAIRS	.26	7.77	.28	7.69	.27	7.73
ICE	----	----	----	----	----	----
CREW CHANGE	----	----	.03	0.42	.02	0.42
SUPPLIES	----	----	----	----	----	----
CHANNEL DELAY	.07	1.38	.09	2.25	.08	1.90
AWAITING ORDERS	----	----	----	----	----	----
VESSEL ASSISTING	----	----	----	----	----	----
AWAITING BERTH	----	----	----	----	----	----
BRIDGE WAIT	.04	8.50	----	----	.02	8.50
FLEETING	.67	1.90	.88	4.53	.78	3.50

TABLE 12 (continued)

AVERAGE DELAYS BY WATERWAY FOR WITHIN SYSTEM MOVEMENTS

	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)
GULF INTRACOASTAL WATERWAY - EASTERN PORTION		
WEATHER	.14	11.62
FOG	.06	10.29
LOCKING	.49	8.02
REPAIRS	.10	13.38
ICE	----	----
CREW CHANGE	.03	1.00
SUPPLIES	.08	1.33
CHANNEL DELAY	.08	1.70
AWAITING ORDERS	----	----
VESSEL ASSISTING	.06	8.84
AWAITING BERTH	.03	1.96
BRIDGE WAIT	.01	0.83
FLEETING	.25	3.56
GULF INTRACOASTAL WATERWAY - WESTERN PORTION		
WEATHER	.18	8.78
FOG	.14	6.01
LOCKING	.68	4.49
REPAIRS	.13	3.32
ICE	.01	3.00
CREW CHANGE	.03	1.34
SUPPLIES	.07	2.10
CHANNEL DELAY	.26	2.61
AWAITING ORDERS	.01	0.25
VESSEL ASSISTING	.10	4.05
AWAITING BERTH	.04	9.08
BRIDGE WAIT	.18	5.97
FLEETING	.29	3.48

TABLE 12 (continued)

AVERAGE DELAYS BY WATERWAY FOR WITHIN SYSTEM MOVEMENTS

	DOWNRIVER		UPRIVER		BOTH	
	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)
ILLINOIS RIVER						
WEATHER	.16	4.15	.06	7.56	.10	5.17
FOG	.09	5.23	.17	3.41	.13	3.97
LOCKING	.93	14.56	.96	19.54	.95	17.31
REPAIRS	.11	2.45	.07	8.10	.09	4.96
ICE	.07	18.33	.06	18.86	.06	18.60
CREW CHANGE	----	----	.02	2.00	.01	2.00
SUPPLIES	----	----	.09	1.87	.05	1.87
CHANNEL DELAY	.20	1.96	.65	2.44	.44	2.35
AWAITING ORDERS	.04	3.50	.02	2.00	.03	2.17
VESSEL ASSISTING	.18	10.13	.28	5.96	.23	4.71
AWAITING BERTH	----	----	----	----	----	----
BRIDGE WAIT	.07	1.50	.07	0.64	.07	1.01
FLEETING	.69	6.51	.48	6.98	.55	6.73
LOWER MISSISSIPPI RIVER						
WEATHER	.03	1.81	.04	6.42	.04	4.44
FOG	.26	9.36	.25	6.68	.26	7.99
LOCKING	.05	5.12	.03	22.66	.04	11.70
REPAIRS	.10	7.55	.21	5.10	.16	5.84
ICE	----	----	----	----	----	----
CREW CHANGE	.01	3.75	.03	0.94	.02	1.64
SUPPLIES	.11	3.31	.17	2.66	.14	2.96
CHANNEL DELAY	.08	2.59	.64	4.02	.37	3.88
AWAITING ORDERS	.01	0.25	.01	4.09	.01	2.17
VESSEL ASSISTING	.26	2.70	.21	3.94	.23	3.28
AWAITING BERTH	.03	4.06	.01	1.00	.02	3.29
BRIDGE WAIT	.03	14.08	.04	0.67	.04	6.42
FLEETING	.44	9.14	.43	8.33	.43	8.72

TABLE 12 (continued)

AVERAGE DELAYS BY WATERWAY FOR WITHIN SYSTEM MOVEMENTS

	DOWNRIVER		UPRIVER		BOTH	
	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOUR
MISSOURI RIVER						
WEATHER	.20	17.72	----	----	.10	17.72
FOG	.40	6.83	.38	5.11	.39	5.97
LOCKING	----	----	----	----	----	----
REPAIRS	.13	2.88	.12	3.95	.13	3.41
ICE	----	----	----	----	----	----
CREW CHANGE	.13	0.50	.12	0.58	.13	0.54
SUPPLIES	.27	1.58	.31	2.07	.29	1.85
CHANNEL DELAY	----	----	.44	3.94	.23	3.94
AWAITING ORDERS	----	----	.06	0.58	.03	0.58
VESSEL ASSISTING	----	----	----	----	----	----
AWAITING BERTH	----	----	----	----	----	----
BRIDGE WAIT	.20	5.89	.19	4.75	.19	5.32
FLEETING	.67	9.18	.81	4.09	.74	6.31
OHIO RIVER						
WEATHER	.03	6.47	.04	16.45	.03	12.71
FOG	.26	6.12	.18	8.22	.22	7.07
LOCKING	1.00	21.15	.99	23.24	1.00	22.27
REPAIRS	.14	3.13	.13	11.96	.13	7.68
ICE	.06	77.26	.04	47.56	.05	63.55
CREW CHANGE	.08	0.69	.08	1.31	.08	1.03
SUPPLIES	.18	1.01	.24	2.42	.21	1.86
CHANNEL DELAY	.05	0.80	.26	1.69	.17	1.57
AWAITING ORDERS	.01	0.50	.01	58.25	.01	39.00
VESSEL ASSISTING	.11	2.83	.10	3.67	.11	3.27
AWAITING BERTH	.01	1.00	----	----	----	----
BRIDGE WAIT	----	----	.01	0.50	----	----
FLEETING	.75	9.65	.72	8.90	.74	9.25

TABLE 12 (continued)

AVERAGE DELAYS BY WATERWAY FOR WITHIN SYSTEM MOVEMENTS

	DOWNRIVER		UPRIVER		BOTH	
	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)
UPPER MISSISSIPPI RIVER						
WEATHER	.12	6.31	.08	7.79	.10	6.93
FOG	.28	6.38	.21	6.06	.24	6.24
LOCKING	.91	41.86	.87	41.74	.89	41.80
REPAIRS	.13	11.29	.07	5.50	.10	9.20
ICE	.08	38.66	----	----	.04	38.66
CREW CHANGE	.03	0.56	.08	1.07	.05	0.95
SUPPLIES	.07	2.03	.10	1.44	.09	1.66
CHANNEL DELAY	.21	4.43	.55	2.66	.38	3.13
AWAITING ORDERS	.03	5.33	.02	16.61	.02	10.97
VESSEL ASSISTING	.23	3.28	.20	3.20	.21	3.24
AWAITING BERTH	.01	0.75	.02	3.08	.02	2.50
BRIDGE WAIT	.27	1.72	.24	1.09	.23	1.39
FLEETING	.75	6.89	.71	7.62	.73	7.25

TABLE 13

AVERAGE DELAY BY WATERWAY FOR INTERSYSTEM MOVEMENTS

	DOWNRIVER		UPRIVER		BOTH	
	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)
BLACK WARRIOR-TOMBIGBEE RIVER SYSTEM						
WEATHER	----	----	.20	3.25	.11	3.25
FOG	.75	3.67	.40	6.08	.56	4.63
LOCKING	1.00	9.25	1.00	11.72	1.00	10.62
REPAIRS	.25	0.50	.20	3.17	.22	1.84
ICE	----	----	----	----	----	----
CREW CHANGE	----	----	----	----	----	----
SUPPLIES	----	----	----	----	----	----
CHANNEL DELAY	.75	2.06	.40	0.42	.56	1.40
AWAITING ORDERS	----	----	----	----	----	----
VESSEL ASSISTING	----	----	----	----	----	----
AWAITING BERTH	----	----	----	----	----	----
BRIDGE WAIT	----	----	----	----	----	----
FLEETING	.25	0.92	.40	0.75	.33	0.81
CUMBERLAND RIVER						
WEATHER	----	----	----	----	----	----
FOG	.46	7.00	.24	7.56	.33	5.23
LOCKING	1.00	2.18	.71	3.74	.83	2.69
REPAIRS	.08	0.50	.12	0.58	.10	0.36
ICE	----	----	----	----	----	----
CREW CHANGE	----	----	.12	0.66	.07	0.66
SUPPLIES	----	----	.18	1.78	.10	1.78
CHANNEL DELAY	----	----	.06	0.33	.03	0.33
AWAITING ORDERS	----	----	----	----	----	----
VESSEL ASSISTING	----	----	.18	0.86	.10	0.86
AWAITING BERTH	----	----	----	----	----	----
BRIDGE WAIT	----	----	----	----	----	----
FLEETING	.54	2.01	.47	3.33	.50	2.72

TABLE 13 (continued)

AVERAGE DELAY BY WATERWAY FOR INTERSYSTEM MOVEMENTS

	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)
GULF INTRACOASTAL WATERWAY - EASTERN PORTION		
WEATHER	.15	11.08
FOG	.04	5.00
LOCKING	.56	7.73
REPAIRS	.11	24.53
ICE	----	----
CREW CHANGE	.04	1.50
SUPPLIES	.15	1.50
CHANNEL DELAY	.11	1.72
AWAITING ORDERS	----	----
VESSEL ASSISTING	.04	2.00
AWAITING BERTH	----	----
BRIDGE WAIT	.04	0.83
FLEETING	.22	4.15
GULF INTRACOASTAL WATERWAY - WESTERN PORTION		
WEATHER	.31	9.27
FOG	.14	5.75
LOCKING	.97	4.95
REPAIRS	.17	2.72
ICE	----	----
CREW CHANGE	.03	0.50
SUPPLIES	.07	0.92
CHANNEL DELAY	.28	1.86
AWAITING ORDERS	----	----
VESSEL ASSISTING	.14	5.36
AWAITING BERTH	----	----
BRIDGE WAIT	.34	5.22
FLEETING	.38	3.80

THERE IS NO CURRENT ON THE GULF INTRACOASTAL WATERWAYS

TABLE 13 (continued)

AVERAGE DELAY BY WATERWAY FOR INTERSYSTEM MOVEMENTS

	DOWNRIVER		UPRIVER		BOTH	
	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)
ILLINOIS RIVER						
WEATHER	.15	7.62	.02	7.00	.07	7.54
FOG	.20	4.08	.11	5.17	.14	4.55
LOCKING	.66	11.74	.72	18.23	.69	15.65
REPAIRS	.20	2.51	.14	4.27	.16	3.39
ICE	.20	28.21	.16	10.65	.17	18.91
CREW CHANGE	.07	0.89	.04	1.84	.05	1.27
SUPPLIES	.05	6.25	.19	1.12	.13	1.91
CHANNEL DELAY	.39	3.46	.77	3.34	.61	3.37
AWAITING ORDERS	.02	124.75	----	----	.01	124.75
VESSEL ASSISTING	.29	3.81	.16	11.28	.21	7.01
AWAITING BERTH	.02	0.67	----	----	.01	0.67
BRIDGE WAIT	.32	1.24	.11	3.12	.19	1.83
FLEETING	.80	9.82	.63	5.00	.70	7.30

TABLE 13 (continued)

AVERAGE DELAY BY WATERWAY FOR INTERSYSTEM MOVEMENTS

	DOWNRIVER		UPRIVER		BOTH	
	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)
LOWER MISSISSIPPI RIVER						
WEATHER	.08	5.71	.03	5.33	.06	5.61
FOG	.22	8.83	.18	8.86	.21	8.84
LOCKING	----	----	----	----	----	----
REPAIRS	.06	120.94	.11	9.12	.08	55.17
ICE	----	----	----	----	.01	43.00
CREW CHANGE	.05	0.64	.06	1.92	.05	1.22
SUPPLIES	.17	1.81	.21	2.15	.19	1.97
CHANNEL DELAY	.15	0.94	.60	6.15	.34	4.87
AWAITING ORDERS	.01	6.67	----	----	.01	6.67
VESSEL ASSISTING	.13	10.08	.18	3.05	.15	6.45
AWAITING BERTH	.01	3.17	----	----	.01	3.17
BRIDGE WAIT	.04	1.80	.02	1.04	.03	1.58
FLEETING	.38	7.10	.43	6.94	.40	7.02
OHIO RIVER						
WEATHER	.02	10.42	.02	2.00	.02	7.61
FOG	.23	7.78	.17	10.73	.21	8.83
LOCKING	.72	30.99	.65	28.59	.68	30.02
REPAIRS	.06	2.65	.08	1.58	.07	2.12
ICE	.01	2.00	.03	4.62	.02	3.75
CREW CHANGE	.03	0.56	.03	0.50	.03	0.53
SUPPLIES	.16	2.88	.17	1.00	.17	2.05
CHANNEL DELAY	.10	1.94	.25	3.05	.17	2.65
AWAITING ORDERS	.01	3.25	----	----	.01	3.25
VESSEL ASSISTING	.08	4.25	.14	1.45	.11	2.68
AWAITING BERTH	.01	1.00	----	----	.01	1.00
BRIDGE WAIT	.02	5.66	----	----	.02	5.66
FLEETING	.42	6.69	.52	8.87	.46	7.75

TABLE 13 (continued)

AVERAGE DELAY BY WATERWAY FOR INTERSYSTEM MOVEMENTS

	DOWNRIVER		UPRIVER		BOTH	
	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)
TENNESSEE RIVER						
WEATHER	.06	18.38	.04	8.08	.05	14.94
FOG	.12	2.56	.23	9.67	.17	6.82
LOCKING	.94	8.60	.96	9.10	.95	8.83
REPAIRS	.09	2.56	.08	1.75	.08	2.83
ICE	----	----	----	----	----	----
CREW CHANGE	----	----	----	----	----	----
SUPPLIES	.06	1.54	.08	1.38	.07	1.46
CHANNEL DELAY	.03	0.25	.08	1.38	.05	1.00
AWAITING ORDERS	.03	0.50	----	----	.01	0.50
VESSEL ASSISTING	.15	4.77	.08	4.96	.12	4.82
AWAITING BERTH	----	----	----	----	----	----
BRIDGE WAIT	.09	0.94	.04	0.25	.07	0.77
FLEETING	.67	4.51	.58	7.31	.63	5.64
UPPER MISSISSIPPI RIVER						
WEATHER	.09	9.30	.06	1.65	.07	6.36
FOG	.15	10.17	.09	5.68	.12	8.46
LOCKING	.70	46.15	.68	39.00	.69	42.66
REPAIRS	.07	3.21	.03	0.69	.05	2.37
ICE	.01	74.50	.05	39.38	.03	46.40
CREW CHANGE	----	----	.02	5.25	.01	5.25
SUPPLIES	.06	2.20	.08	3.69	.07	3.07
CHANNEL DELAY	.14	3.84	.49	3.21	.31	3.35
AWAITING ORDERS	----	----	.02	5.08	.01	5.08
VESSEL ASSISTING	.13	4.36	.13	2.24	.13	3.30
AWAITING BERTH	----	----	----	----	----	----
BRIDGE WAIT	.03	2.78	----	----	.02	2.78
FLEETING	.39	6.60	.43	3.21	.41	4.83

TABLE 14

AVERAGE DELAY BY WATERWAY AND SEASON

	DOWNRIVER		UPRIVER		BOTH	
	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)
BLACK WARRIOR-TOMBIGBEE RIVER SYSTEM						
FALL						
WEATHER	----	----	----	----	----	----
FOG	.80	8.21	.50	21.25	.64	13.80
LOCKING	1.00	7.35	1.00	7.47	1.00	7.42
REPAIRS	.20	13.00	.50	9.06	.36	10.04
ICE	----	----	----	----	----	----
CREW CHANGE	----	----	----	----	----	----
SUPPLIES	----	----	----	----	----	----
CHANNEL DELAY	----	----	.17	2.00	.18	2.00
AWAITING ORDERS	----	----	----	----	----	----
VESSEL ASSISTING	----	----	----	----	----	----
AWAITING BERTH	----	----	----	----	----	----
BRIDGE WAIT	----	----	----	----	----	----
FLEETING	.80	1.58	1.00	5.00	.82	3.48
SPRING						
WEATHER	.10	0.50	----	----	.05	0.50
FOG	.30	3.81	.58	6.12	.45	5.43
LOCKING	1.00	4.89	1.00	4.36	1.00	4.60
REPAIRS	.40	4.81	.25	8.08	.32	6.21
ICE	----	----	----	----	----	----
CREW CHANGE	----	----	----	----	----	----
SUPPLIES	----	----	----	----	----	----
CHANNEL DELAY	----	----	----	----	----	----
AWAITING ORDERS	----	----	----	----	----	----
VESSEL ASSISTING	----	----	----	----	----	----
AWAITING BERTH	----	----	----	----	----	----
BRIDGE WAIT	----	----	----	----	----	----
FLEETING	.60	0.77	.83	3.21	.73	2.29

TABLE 14 (continued)

AVERAGE DELAY BY WATERWAY AND SEASON

	DOWNRIVER		UPRIVER		BOTH	
	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)
BLACK WARRIOR-TOMBIGBEE RIVER SYSTEM						
SUMMER						
WEATHER	----	----	----	----	----	----
FOG	.25	5.94	.15	2.50	.20	4.57
LOCKING	.92	5.06	1.00	5.33	.96	5.21
REPAIRS	.17	11.09	.15	7.29	.16	9.18
ICE	----	----	----	----	----	----
CREW CHANGE	----	----	.08	0.42	.04	0.42
SUPPLIES	----	----	----	----	----	----
CHANNEL DELAY	.17	1.38	.15	2.38	.16	1.88
AWAITING ORDERS	----	----	----	----	----	----
VESSEL ASSISTING	----	----	----	----	----	----
AWAITING BERTH	----	----	----	----	----	----
BRIDGE WAIT	----	----	----	----	----	----
FLEETING	.67	2.92	.92	4.96	.80	4.14
WINTER						
WEATHER	----	----	----	----	----	----
FOG	----	----	----	----	----	----
LOCKING	1.00	2.50	1.00	2.42	1.00	2.46
REPAIRS	----	----	1.00	3.25	.50	3.25
ICE	----	----	----	----	----	----
CREW CHANGE	----	----	----	----	----	----
SUPPLIES	----	----	----	----	----	----
CHANNEL DELAY	----	----	----	----	----	----
AWAITING ORDERS	----	----	----	----	----	----
VESSEL ASSISTING	----	----	----	----	----	----
AWAITING BERTH	----	----	----	----	----	----
BRIDGE WAIT	1.00	8.50	----	----	.50	8.50
FLEETING	----	----	1.-0	10.33	.50	10.33

TABLE 14 (continued)

AVERAGE DELAY BY WATERWAY AND SEASON

	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)
GULF INTRACOASTAL WATERWAY - EASTERN PORTION		
FALL		
WEATHER	----	----
FOG	----	----
LOCKING	.33	4.50
REPAIRS	.22	2.92
ICE	----	----
CREW CHANGE	----	----
SUPPLIES	.11	0.67
CHANNEL DELAY	.11	0.33
AWAITING ORDERS	----	----
VESSEL ASSISTING	----	----
AWAITING BERTH	----	----
BRIDGE WAIT	----	----
FLEETING	.22	1.21
SPRING		
WEATHER	.12	11.75
FOG	.12	5.00
LOCKING	.38	16.39
REPAIRS	.12	0.83
ICE	----	----
CREW CHANGE	----	----
SUPPLIES	----	----
CHANNEL DELAY	----	----
AWAITING ORDERS	----	----
VESSEL ASSISTING	.12	0.50
AWAITING BERTH	----	----
BRIDGE WAIT	----	----
FLEETING	.38	0.56

TABLE 14 (continued)

AVERAGE DELAY BY WATERWAY AND SEASON

	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)
GULF INTRACOASTAL WATERWAY - EASTERN PORTION		
SUMMER		
WEATHER	.20	5.25
FOG	----	----
LOCKING	.20	11.58
REPAIRS	----	----
ICE	----	----
CREW CHANGE	----	----
SUPPLIES	----	----
CHANNEL DELAY	.20	3.00
AWAITING ORDERS	----	----
VESSEL ASSISTING	.20	0.67
AWAITING BERTH	----	----
BRIDGE WAIT	----	----
FLEETING	.40	5.62
WINTER		
WEATHER	.21	14.42
FOG	.14	15.58
LOCKING	.57	4.94
REPAIRS	----	----
ICE	----	----
CREW CHANGE	.07	0.50
SUPPLIES	----	----
CHANNEL DELAY	----	----
AWAITING ORDERS	----	----
VESSEL ASSISTING	.07	32.17
AWAITING BERTH	.14	1.96
BRIDGE WAIT	----	----
FLEETING	.21	5.58

TABLE 14 (continued)

AVERAGE DELAY BY WATERWAY AND SEASON

	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)
GULF INTRACOASTAL WATERWAY - WESTERN PORTION		
FALL		
WEATHER	----	----
FOG	.36	3.73
LOCKING	.79	7.48
REPAIRS	.07	1.84
ICE	----	----
CREW CHANGE	.07	0.83
SUPPLIES	.21	1.89
CHANNEL DELAY	.07	1.32
AWAITING ORDERS	.07	0.25
VESSEL ASSISTING	.07	5.25
AWAITING BERTH	----	----
BRIDGE WAIT	.14	4.29
FLEETING	----	----
SPRING		
WEATHER	.11	13.33
FOG	.26	4.18
LOCKING	.78	7.85
REPAIRS	.15	1.96
ICE	----	----
CREW CHANGE	----	----
SUPPLIES	.15	1.14
CHANNEL DELAY	.48	2.45
AWAITING ORDERS	.04	2.00
VESSEL ASSISTING	.15	1.08
AWAITING BERTH	.04	29.83
BRIDGE WAIT	.15	6.46
FLEETING	.44	2.98

TABLE 14 (continued)

AVERAGE DELAY BY WATERWAY AND SEASON

	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)
GULF INTRACOASTAL WATERWAY - WESTERN PORTION		
SUMMER		
WEATHER	.18	0.29
FOG	----	----
LOCKING	.55	10.82
REPAIRS	.18	6.08
ICE	----	----
CREW CHANGE	----	----
SUPPLIES	----	----
CHANNEL DELAY	.09	24.00
AWAITING ORDERS	----	----
VESSEL ASSISTING	.18	0.80
AWAITING BERTH	.09	6.00
BRIDGE WAIT	----	----
FLEETING	.18	1.42
WINTER		
WEATHER	.09	4.96
FOG	.18	11.38
LOCKING	.59	5.93
REPAIRS	.09	11.62
ICE	----	----
CREW CHANGE	.04	2.17
SUPPLIES	.18	3.09
CHANNEL DELAY	.23	2.30
AWAITING ORDERS	----	----
VESSEL ASSISTING	----	----
AWAITING BERTH	.14	8.33
BRIDGE WAIT	.09	1.54
FLEETING	.23	1.73

TABLE 14 (continued)

AVERAGE DELAY BY WATERWAY AND SEASON

	DOWNRIVER		UPRIVER		BOTH	
	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)
ILLINOIS RIVER						
FALL						
WEATHER	.20	4.55	----	----	.09	4.55
FOG	.20	6.19	.25	4.57	.23	5.17
LOCKING	1.00	14.97	1.00	24.59	1.00	20.47
REPAIRS	.07	0.50	.05	9.50	.06	5.00
ICE	----	----	----	----	----	----
CREW CHANGE	----	----	----	----	----	----
SUPPLIES	----	----	.05	5.75	.03	5.75
CHANNEL DELAY	.20	1.22	.65	1.58	.46	1.51
AWAITING ORDERS	.07	2.50	----	----	.03	2.50
VESSEL ASSISTING	.07	3.83	.20	8.88	.14	7.87
AWAITING BERTH	----	----	----	----	----	----
BRIDGE WAIT	----	----	.15	0.61	.09	0.61
FLEETING	.47	4.15	.40	2.06	.43	3.04
SPRING						
WEATHER	.13	4.08	.10	6.50	.11	5.29
FOG	.13	2.33	----	----	.06	2.33
LOCKING	1.00	13.98	1.00	21.93	1.00	18.39
REPAIRS	.25	5.00	.10	2.67	.17	4.22
ICE	----	----	----	----	----	----
CREW CHANGE	----	----	----	----	----	----
SUPPLIES	----	----	.10	0.42	.06	0.42
CHANNEL DELAY	.25	0.88	.80	2.16	.56	1.90
AWAITING ORDERS	----	----	----	----	----	----
VESSEL ASSISTING	.25	2.42	.20	5.63	.22	4.02
AWAITING BERTH	----	----	----	----	----	----
BRIDGE WAIT	.13	0.17	----	----	.06	0.17
FLEETING	.63	10.37	.90	4.17	.78	6.38

TABLE 14 (continued)

AVERAGE DELAY BY WATERWAY AND SEASON

	DOWNRIVER		UPRIVER		BOTH	
	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)
ILLINOIS RIVER						
SUMMER						
WEATHER	.07	2.33	.08	2.00	.07	2.16
FOG	----	----	----	----	----	----
LOCKING	.87	19.38	.83	19.59	.85	19.47
REPAIRS	.13	0.88	.08	4.33	.11	2.03
ICE	----	----	----	----	----	----
CREW CHANGE	----	----	.08	2.00	.04	2.00
SUPPLIES	----	----	.08	0.42	.04	0.42
CHANNEL DELAY	.13	1.00	.75	1.12	.41	1.10
AWAITING ORDERS	.07	4.50	----	----	.04	4.50
VESSEL ASSISTING	.07	0.67	.17	1.88	.11	1.57
AWAITING BERTH	----	----	----	----	----	----
BRIDGE WAIT	.13	2.17	----	----	.07	2.17
FLEETING	.93	5.24	.25	7.23	.67	5.68
WINTER						
WEATHER	.29	4.50	.08	14.17	.16	7.72
FOG	----	----	.33	1.96	.21	1.96
LOCKING	.86	3.85	1.00	9.09	.95	7.34
REPAIRS	----	----	.08	15.92	.05	15.92
ICE	.43	18.33	.25	18.86	.32	18.60
CREW CHANGE	----	----	----	----	----	----
SUPPLIES	----	----	.17	1.38	.11	1.38
CHANNEL DELAY	.29	5.13	.42	7.55	.37	6.86
AWAITING ORDERS	----	----	.08	2.00	.05	2.00
VESSEL ASSISTING	.57	17.93	.58	5.55	.58	10.05
AWAITING BERTH	----	----	----	----	----	----
BRIDGE WAIT	----	----	.08	0.75	.05	0.75
FLEETING	.71	9.52	.42	19.73	.53	14.62

TABLE 14 (continued)

AVERAGE DELAY BY WATERWAY AND SEASON

	DOWNRIVER		UPRIVER		BOTH	
	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)
LOWER MISSISSIPPI RIVER						
FALL						
WEATHER	.05	1.50	----	----	.02	1.50
FOG	.32	5.43	.43	4.08	.38	4.55
LOCKING	----	----	----	----	----	----
REPAIRS	.05	1.75	.23	7.74	.15	6.99
ICE	----	----	----	----	----	----
CREW CHANGE	.05	3.75	.03	1.00	.04	2.38
SUPPLIES	.14	1.77	.17	1.72	.15	1.74
CHANNEL DELAY	.23	2.52	.83	5.96	.58	5.38
AWAITING ORDERS	.05	0.25	----	----	.02	0.25
VESSEL ASSISTING	.27	2.83	.20	2.38	.23	2.60
AWAITING BERTH	----	----	----	----	----	----
BRIDGE WAIT	----	----	----	----	----	----
FLEETING	.50	5.56	.47	5.60	.48	6.11
SPRING						
WEATHER	.04	2.50	----	----	.02	2.50
FOG	.29	4.98	.19	4.03	.24	4.62
LOCKING	----	----	----	----	----	----
REPAIRS	.11	12.64	.11	2.83	.11	7.74
ICE	----	----	----	----	----	----
CREW CHANGE	----	----	.04	0.83	.02	0.83
SUPPLIES	.07	0.46	.04	5.19	.11	3.61
CHANNEL DELAY	.04	3.25	.48	2.56	.25	2.61
AWAITING ORDERS	----	----	.04	4.09	.02	4.09
VESSEL ASSISTING	.18	1.73	.37	4.92	.27	3.86
AWAITING BERTH	----	----	----	----	----	----
BRIDGE WAIT	.11	14.08	.07	0.38	.09	8.60
FLEETING	.43	9.67	.48	10.61	.45	10.16

TABLE 14 (continued)

AVERAGE DELAY BY WATERWAY AND SEASON

	DOWNRIVER		UPRIVER		BOTH	
	PROBABILITY OF OCCURENCE	MEAN DELAY (HOURS)	PROBABLITIY OF OCCURENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURENCE	MEAN DELAY (HOURS)
LOWER MISSISSIPPI RIVER						
SUMMER						
WEATHER	----	----	.04	0.50	.02	0.50
FOG	.04	3.00	----	----	.02	3.00
LOCKING	----	----	----	----	----	----
REPAIRS	.04	0.75	.32	4.03	.18	3.66
ICE	----	----	----	----	----	----
CREW CHANGE	----	----	.04	1.00	.02	1.00
SUPPLIES	.12	2.92	.16	1.69	.14	2.21
CHANNEL DELAY	----	----	.60	3.21	.29	3.21
AWAITING ORDERS	----	----	----	----	----	----
VESSEL ASSISTING	.27	2.25	.08	1.75	.18	2.14
AWAITING BERTH	.12	4.06	----	----	.06	4.06
BRIDGE WAIT	----	----	----	----	----	----
FLEETING	.35	5.21	.28	7.14	.31	6.06
WINTER						
WEATHER	.07	1.42	.16	8.39	.12	6.65
FOG	.53	17.97	.37	13.39	.44	15.83
LOCKING	----	----	----	----	----	----
REPAIRS	.27	6.89	.16	4.08	.21	5.69
ICE	----	----	----	----	----	----
CREW CHANGE	----	----	----	----	----	----
SUPPLIES	.13	9.04	.16	0.81	.14	4.10
CHANNEL DELAY	.07	2.33	.58	2.42	.35	2.42
AWAITING ORDERS	----	----	----	----	----	----
VESSEL ASSISTING	.40	3.89	.16	5.25	.26	4.34
AWAITING BERTH	----	----	.05	1.00	.03	1.00
BRIDGE WAIT	----	----	.11	0.96	.06	0.96
FLEETING	.53	16.02	.42	10.61	.47	13.32

TABLE 14 (continued)

AVERAGE DELAY BY WATERWAY AND SEASON

	DOWNRIVER		UPRIVER		BOTH	
	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURANCE	MEAN DELAY (HOURS)
MISSOURI RIVER						
FALL						
WEATHER	.20	37.67	----	----	.10	37.67
FOG	.80	9.33	.60	7.50	.70	8.55
LOCKING	----	----	----	----	----	----
REPAIRS	.40	2.88	.20	3.32	.30	3.02
ICE	----	----	----	----	----	----
CREW CHANGE	.20	0.50	.20	0.92	.20	0.71
SUPPLIES	.40	1.83	.40	1.66	.40	1.75
CHANNEL DELAY	----	----	.60	1.31	.30	1.31
AWAITING ORDERS	----	----	----	----	----	----
VESSEL ASSISTING	----	----	----	----	----	----
AWAITING BERTH	----	----	----	----	----	----
BRIDGE WAIT	.20	1.17	----	----	.10	1.17
FLEETING	.40	10.84	.80	3.67	.60	6.06
SPRING						
WEATHER	.50	8.75	----	----	.17	8.75
FOG	----	----	.25	2.25	.17	2.25
LOCKING	----	----	----	----	----	----
REPAIRS	----	----	.25	4.58	.17	4.58
ICE	----	----	----	----	----	----
CREW CHANGE	----	----	.25	0.25	.17	0.25
SUPPLIES	.50	0.83	.50	2.58	.50	2.00
CHANNEL DELAY	----	----	.50	0.42	.33	0.42
AWAITING ORDERS	----	----	----	----	----	----
VESSEL ASSISTING	----	----	----	----	----	----
AWAITING BERTH	----	----	----	----	----	----
BRIDGE WAIT	----	----	----	----	----	----
FLEETING	1.00	24.79	.75	4.29	.83	12.87

TABLE 14 (continued)

AVERAGE DELAY BY WATERWAY AND SEASON

	DOWNRIVER		UPRIVER		BOTH	
	PROBABILITY OF OCCURENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURENCE	MEAN DELAY (HOURS)
MISSOURI RIVER						
SUMMER						
WEATHER	.12	6.75	----	----	.07	6.75
FOG	.25	1.83	.29	2.96	.27	2.40
LOCKING	----	----	----	----	----	----
REPAIRS	----	----	----	----	----	----
ICE	----	----	----	----	.07	0.50
CREW CHANGE	.12	0.50	----	----	.13	1.83
SUPPLIES	.12	1.83	.14	1.83	.13	11.42
CHANNEL DELAY	----	----	.29	0.58	.07	0.58
AWAITING ORDERS	----	----	----	----	----	----
VESSEL ASSISTING	----	----	----	----	----	----
AWAITING BERTH	----	----	----	----	----	----
BRIDGE WAIT	.25	8.25	.43	4.75	.33	6.15
FLEETING	.75	3.43	.86	3.96	.80	3.70

THERE WERE NO SAMPLE OBSERVATIONS FOR WINTER TRIPS ON THE MISSOURI RIVER AS THE WATERWAY WAS CLOSED.

TABLE 14 (continued)

AVERAGE DELAY BY WATERWAY AND SEASON

	DOWNRIVER		UPRIVER		BOTH	
	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)
OHIO RIVER						
FALL						
WEATHER	----	----	.05	1.62	.03	1.62
FOG	.40	7.98	.34	11.80	.36	10.21
LOCKING	1.00	48.70	1.00	46.21	1.00	47.15
REPAIRS	.08	4.00	.15	13.22	.12	10.92
ICE	----	----	----	----	----	----
CREW CHANGE	.20	0.67	.10	1.60	.14	1.08
SUPPLIES	.12	0.75	.15	4.72	.14	3.40
CHANNEL DELAY	.08	0.46	.27	3.63	.20	3.14
AWAITING ORDERS	----	----	----	----	----	----
VESSEL ASSISTING	.04	1.00	.02	0.92	.03	0.96
AWAITING BERTH	----	----	----	----	----	----
BRIDGE WAIT	----	----	----	----	----	----
FLEETING	.80	11.75	.61	8.10	.68	9.72
SPRING						
WEATHER	----	----	----	----	----	----
FOG	.08	4.06	.09	1.81	.08	2.77
LOCKING	1.00	8.40	.98	8.84	.99	8.62
REPAIRS	.20	2.56	.14	15.39	.17	8.06
ICE	----	----	----	----	----	----
CREW CHANGE	----	----	.09	0.54	.05	0.54
SUPPLIES	.15	1.15	.19	2.09	.17	1.69
CHANNEL DELAY	.05	0.46	.26	0.98	.16	0.90
AWAITING ORDERS	----	----	.02	115.75	.01	115.75
VESSEL ASSISTING	.10	1.56	.07	1.14	.08	1.38
AWAITING BERTH	.03	1.00	----	----	.01	1.00
BRIDGE WAIT	----	----	----	----	----	----
FLEETING	.78	7.69	.79	8.24	.78	7.98

TABLE 14 (continued)

AVERAGE DELAY BY WATERWAY AND SEASON

	DOWNRIVER		UPRIVER		BOTH	
	PROBABILITY OF OCCURENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURENCE	MEAN DELAY (HOURS)
OHIO RIVER						
SUMMER						
WEATHER	----	----	----	----	----	----
FOG	.26	4.65	.14	2.73	.20	3.90
LOCKING	1.00	15.89	1.00	16.85	1.00	16.37
REPAIRS	.06	0.88	.09	3.83	.07	2.65
ICE	----	----	----	----	----	----
CREW CHANGE	.09	0.39	.06	2.83	.07	1.36
SUPPLIES	.21	0.99	.40	1.27	.30	1.17
CHANNEL DELAY	.03	2.50	.29	0.83	.16	0.98
AWAITING ORDERS	.03	0.50	----	----	.01	0.50
VESSEL ASSISTING	.09	0.70	.14	2.42	.12	1.77
AWAITING BERTH	----	----	----	----	----	----
BRIDGE WAIT	----	----	.03	0.50	.01	0.50
FLEETING	.68	8.87	.74	9.52	.71	9.21
WINTER						
WEATHER	.17	6.47	.18	26.33	.17	16.40
FOG	.44	6.23	.12	9.62	.29	6.91
LOCKING	1.00	21.16	1.00	16.56	1.00	18.93
REPAIRS	.22	4.96	.12	10.04	.17	6.65
ICE	.39	77.26	.35	47.56	.37	62.55
CREW CHANGE	.06	1.75	.06	0.17	.06	0.96
SUPPLIES	.28	1.02	.24	3.64	.26	2.18
CHANNEL DELAY	.06	0.50	.24	0.50	.14	0.50
AWAITING ORDERS	----	----	.06	0.75	.03	0.75
VESSEL ASSISTING	.28	5.50	.24	6.98	.29	6.24
AWAITING BERTH	----	----	----	----	----	----
BRIDGE WAIT	----	----	----	----	----	----
FLEETING	.77	12.27	.78	10.88	.77	11.60

TABLE 14 (continued)

AVERAGE DELAY BY WATERWAY AND SEASON

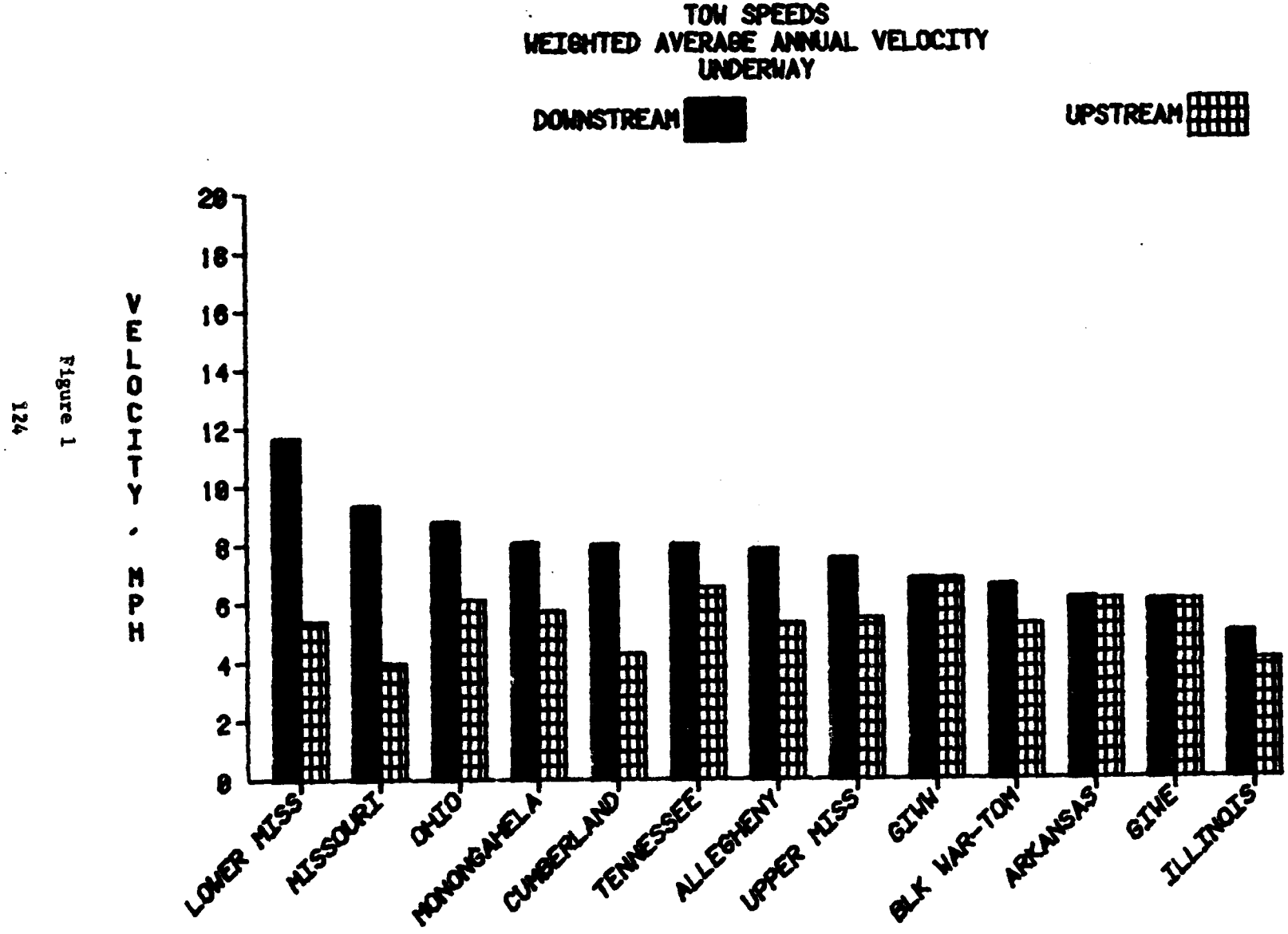
	DOWNRIVER		UPRIVER		BOTH	
	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)
UPPER MISSISSIPPI RIVER						
FALL						
WEATHER	.03	2.50	----	----	.01	2.50
FOG	.48	6.63	.26	7.73	.36	7.07
LOCKING	.97	32.93	.95	34.25	.96	33.65
REPAIRS	.03	1.75	.03	13.00	.03	7.38
ICE	----	----	----	----	----	----
CREW CHANGE	.06	0.46	.b1	1.33	.09	1.04
SUPPLIES	.13	1.73	.16	1.52	.14	1.60
CHANNEL DELAY	.29	2.69	.50	1.92	.41	2.17
AWAITING ORDERS	----	----	.05	1.79	.03	1.79
VESSEL ASSISTING	.19	5.30	.21	2.44	.20	3.67
AWAITING BERTH	----	----	----	----	----	----
BRIDGE WAIT	.26	0.68	.29	0.78	.28	0.74
FLEETING	.90	6.12	.76	7.17	.83	6.65
SPRING						
WEATHER	.18	9.68	.12	16.15	.15	12.56
FOG	.11	4.58	.09	4.14	.10	4.36
LOCKING	.89	37.15	.91	48.04	.90	43.00
REPAIRS	.21	4.90	.09	10.84	.15	6.90
ICE	----	----	----	----	----	----
CREW CHANGE	----	----	.06	1.34	.03	1.34
SUPPLIES	.04	3.00	.06	0.62	.04	1.42
CHANNEL DELAY	.07	3.38	.44	4.26	.27	4.15
AWAITING ORDERS	.04	1.50	----	----	.01	1.50
VESSEL ASSISTING	.25	2.00	.19	2.94	.22	2.44
AWAITING BERTH	----	----	----	----	----	----
BRIDGE WAIT	.32	0.77	.19	0.90	.25	0.82
FLEETING	.89	8.20	.81	5.41	.85	6.78

TABLE 14 (continued)

AVERAGE DELAY BY WATERWAY AND SEASON

	DOWNRIVER		UPRIVER		BOTH	
	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)	PROBABILITY OF OCCURRENCE	MEAN DELAY (HOURS)
UPPER MISSISSIPPI RIVER						
SUMMER						
WEATHER	.14	0.87	.13	2.22	.13	1.61
FOG	.28	3.87	.28	3.79	.28	3.82
LOCKING	1.90	43.35	.91	40.68	.95	41.90
REPAIRS	.19	19.31	.09	0.83	.13	12.59
ICE	----	----	----	----	----	---
CREW CHANGE	.03	0.75	.06	0.67	.05	0.69
SUPPLIES	.06	2.16	.09	1.71	.07	1.86
CHANNEL DELAY	.28	2.84	.66	2.48	.49	2.57
AWAITING ORDERS	----	----	.02	46.25	.01	46.25
VESSEL ASSISTING	.28	2.50	.21	3.67	.24	3.08
AWAITING BERTH	.03	0.75	----	----	.01	0.75
BRIDGE WAIT	.25	3.46	.28	1.44	.27	2.26
FLEETING	.69	6.54	.70	9.79	.70	8.39
WINTER						
WEATHER	.12	11.03	----	----	.09	11.03
FOG	.20	11.77	.11	24.75	.18	13.93
LOCKING	.72	60.28	.22	107.92	.59	65.04
REPAIRS	.08	7.12	.11	0.50	.09	4.92
ICE	.40	38.66	----	----	.29	38.66
CREW CHANGE	----	----	.11	0.67	.03	0.67
SUPPLIES	.04	2.00	.11	1.50	.06	1.75
CHANNEL DELAY	.16	12.83	.55	2.12	.26	6.88
AWAITING ORDERS	.08	7.25	----	----	.06	7.25
VESSEL ASSISTING	.16	4.44	.11	6.25	.15	4.80
AWAITING BERTH	----	----	.11	6.00	.03	6.00
BRIDGE WAIT	.04	3.00	----	----	.03	3.00
FLEETING	.48	6.68	.11	6.67	.38	6.68

Figure 1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WEIGHTED AVERAGE ANNUAL VELOCITY
UNDERWAY
DOWNSTREAM
UPSTREAM
VELOCITY - MPH
20
18
16
14
12
10
8
6
4
2
0
LOWER MISS
MISSOURI
OHIO
MONONGAHELA
CUMBERLAND
TENNESSEE
ALLEGHENY
UPPER MISS
GIWW
BLK WAR-TOM
ARKANSAS
GIWW
ILLINOIS

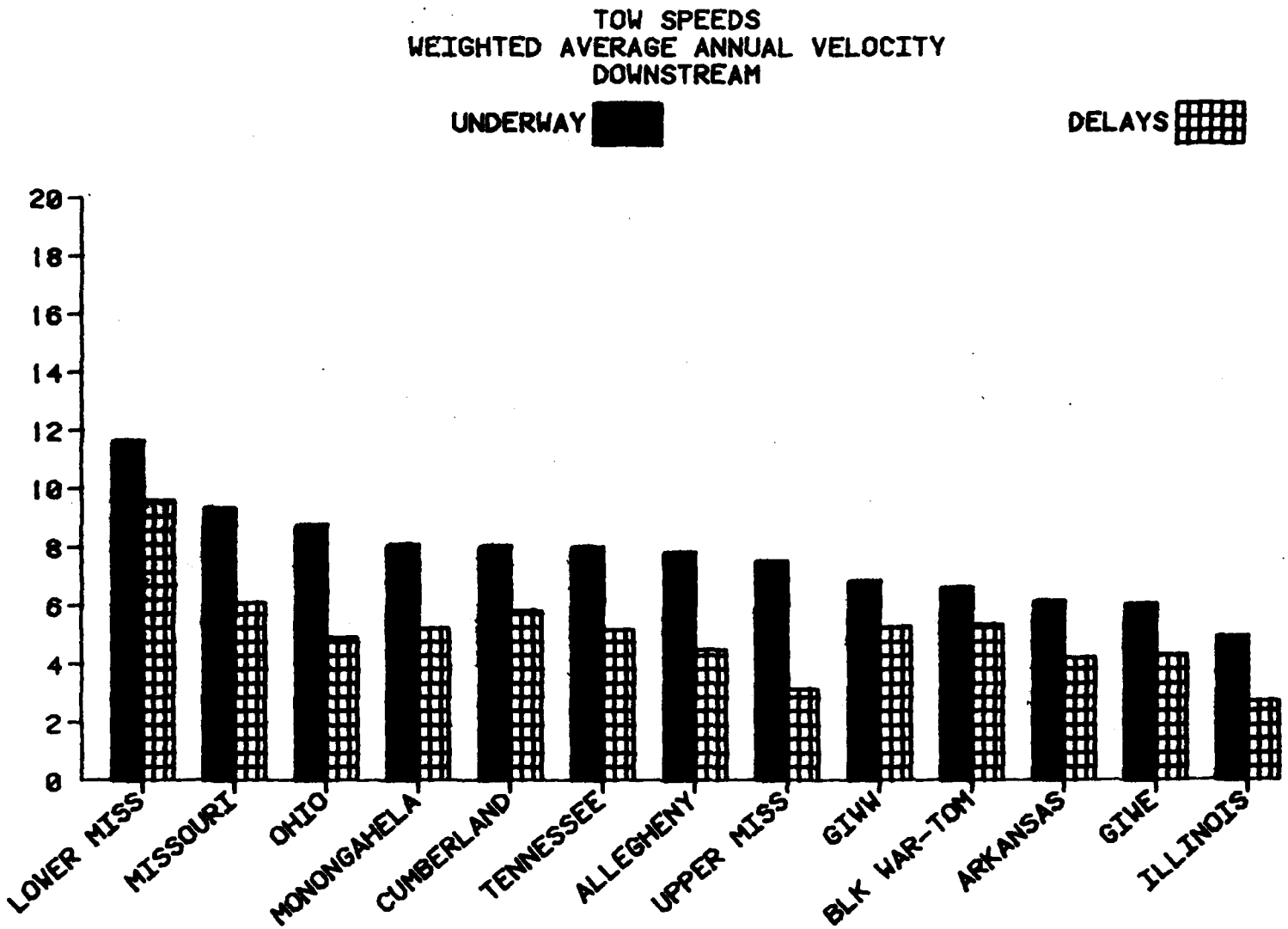

TOW SPEEDS
WEIGHTED AVERAGE ANNUAL VELOCITY
DOWNSTREAM
UNDERWAY
DELAYS
VELOCITY - MPH
20
18
16
14
12
10
8
6
4
2
0
LOWER MISS
MISSOURI
OHIO
MONONGAHELA
CUMBERLAND
TENNESSEE
ALLEGHENY
UPPER MISS
GIWW
BLK WAR-TOM
ARKANSAS
GIWE
ILLINOIS

Figure 2

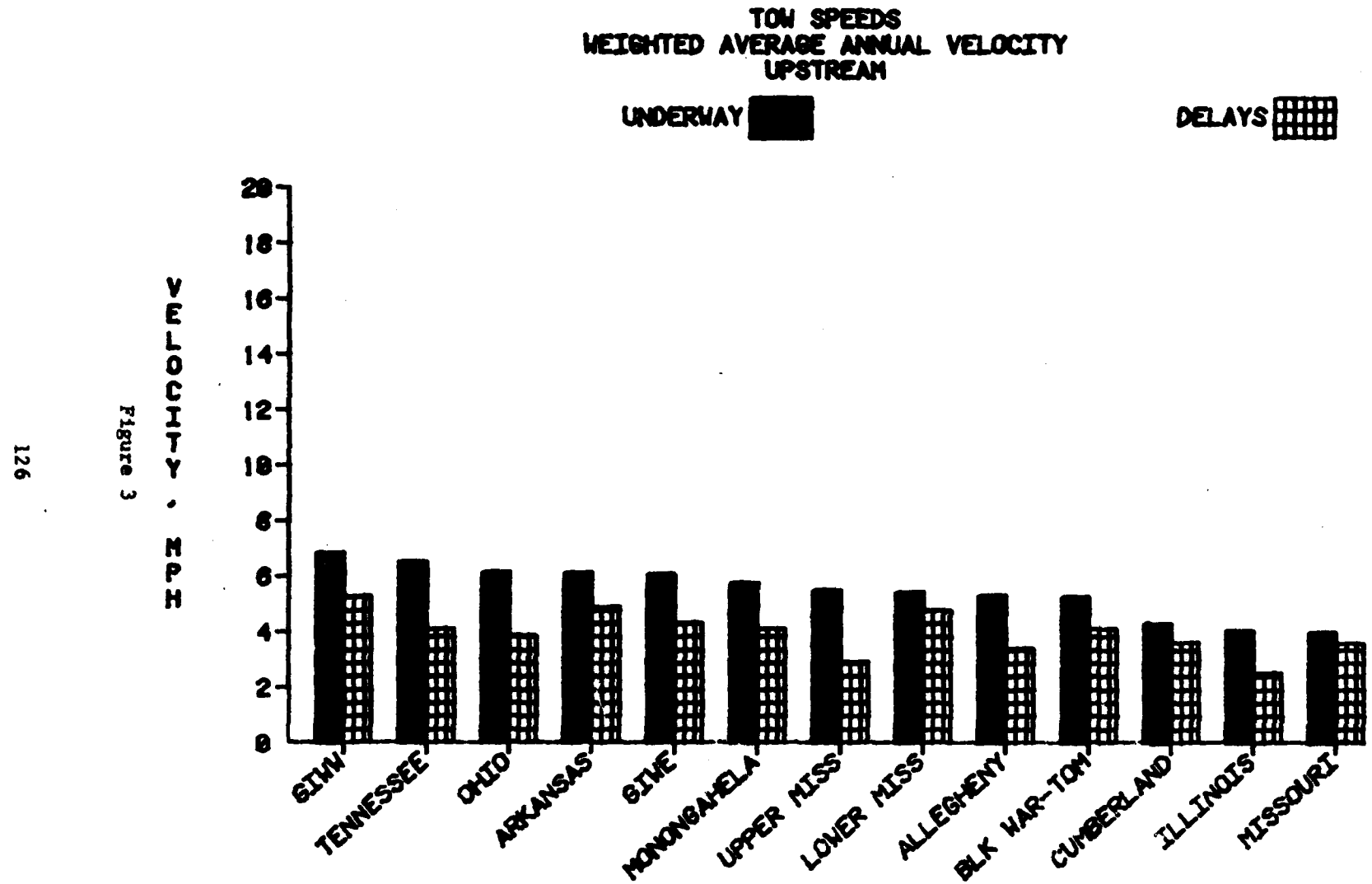
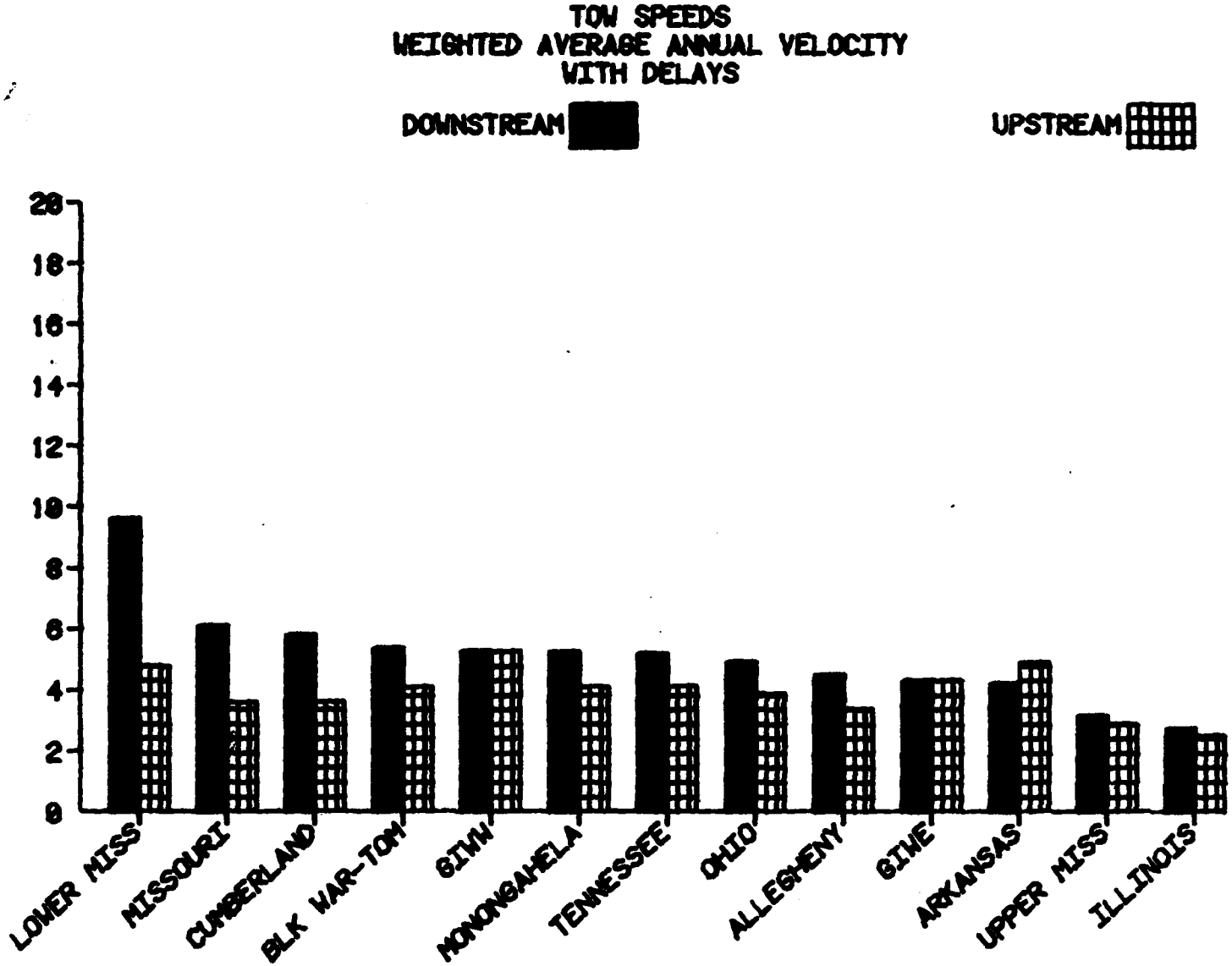

TOW SPEEDS
WEIGHTED AVERAGE ANNUAL VELOCITY
UPSTREAM
UNDERWAY
DELAYS
VELOCITY - MPH
20
18
16
14
12
10
8
6
4
2
0
GIWW
TENNESSEE
OHIO
ARKANSAS
GIWW
MONONGAHELA
UPPER MISS
LOWER MISS
ALLEGHENY
BLK WAR-TOM
CUMBERLAND
ILLINOIS
MISSOURI

Figure 3

Figure 4


TOW SPEEDS
WEIGHTED AVERAGE ANNUAL VELOCITY
WITH DELAYS
DOWNSTREAM
UPSTREAM
VELOCITY - MPH
20
18
16
14
12
10
8
6
4
2
0
LOWER MISS
MISSOURI
CUMBERLAND
BLK WAR-TOM
GIWW
MONONGAHELA
TENNESSEE
OHIO
ALLEGHENY
GIWW
ARKANSAS
UPPER MISS
ILLINOIS