Waterway Traffic Forecasts for the Upper Mississippi River Basin

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I. Introduction

At the request of Jack Faucett Associates, Inc., Criton Corporation has undertaken an analysis to evaluate past, present and prospective coal supply and demand relationships in geographic regions served by the upper Mississippi River Basin waterway transportation network. These analyses were undertaken to develop insight into the major determinants of riverborne coal volumes along the targeted waterways. These analyses were then used to derive relevant coal demand estimates, which in turn were used to generate riverborne coal traffic forecasts through 2050 for the Upper Mississippi River Basin waterways. Specifically, traffic levels were forecast for the Upper Mississippi River between Minneapolis/St. Paul and the mouth of the Missouri River and the entire length of the Illinois Waterway. The analysis was performed on behalf of Jack Faucett Associates under prime contract DACW72-90-D-0003 , Delivery Order No. 0010 " Waterway Traffic Forecasts for the Upper Mississippi River Basin," issued by the U.S. Department of the Army, Ft. Belvoir District.

This report is divided into six sections including this introduction. The following section identifies relevant coal supply regions feeding traffic into the targeted waterway systems. Section III identifies and evaluates the relevant coal demand regions which generate traffic on the targeted waterways. This section also identifies coal demand by individual industrial sectors, such as electric utility, steelmaking, etc. Section IV discusses changing market and transportation dynamics that have resulted in shifts in coal demand and along the affected waterways. Section V outlines Criton's major assumptions in generating its waterway traffic projections, while Section VI presents and summarizes waterborne coal traffic forecasts for each of the targeted waterway segments through 2050.

II. Upper Mississippi River Basin Coal Supply Geography.

After farm products, coal represents the second largest major commodity group which moves by barge on both the upper Mississippi River and the Illinois Waterway. In 1994, the upper Mississippi River between the Twin Cities handled approximately 10.6 million tons of coal traffic (see Table 1). During this same period, the Illinois Waterway handled 9.1 million tons of coal. Coal traffic moving on the upper Mississippi and Illinois Waterways generally falls into two distinct categories: steam coal (or thermal coal) and metallurgical coal. Thermal coal generally consists of coal which is used primarily as fuel for the production of steam, heat or electricity. Metallurgical coal, becuase of its unique chemical properties, is used to produce blast furnace coke for the integrated steelmaking industry. While metallurgical grade coal can also be used for thermal purposes, the coal's superior chemical properties and higher selling prices generally prevent its sale for thermal uses. For the purposes of this report, thermal coal will be divided into two separate subcategories for evaluation purposes: Utility steam coal used for the generation of electricity and industrial steam coal used as fuel in industrial manufacturing operations.

Table 1.

Coal/Coke Traffic on Target Upper Mississippi Basin Waterways: 1990-1994 (000s of Short Tons)

Upper Mississippi Between Twin Cities and Mouth of Missouri River

	Inbound	Outbound	Intra	Through	Total
1990	4,322	501	1,787	4,629	11,239
1991	4,185	104	1,383	4,242	9,914
1992	4,432	215	1,144	4,039	9,830
1993	2,729	220	1,428	2,766	7,143
1994	4,105	295	1,359	4,798	10,557

Illinois Waterway

	Inbound	Outbound	Intra	Through	Total
1990	2,102	1,178	1,653	1,733	6,666
1991	2,121	1,236	2,251	1,390	6,998
1992	1,811	1,261	2,591	1,525	7,187
1993	1,950	1,405	3,359	1,735	8,449
1994	4,478	1,505	1,224	1,922	9,129

Source: Waterborne Commerce of the United States: 1990-1994

A. Primary Upper Mississippi River Basin Coal Supply Regions

In general, coal moving into, from, or through the three targeted upper Mississippi waterway segments originate in one of four major U.S. coal producing regions: The Illinois Basin, which encompasses large portions of south/central Illinois, western Indiana, and western Kentucky; the Powder River Basin, which encompasses several counties in northeastern Wyoming and southern Montana; central Appalachia, which covers most of eastern Kentucky and southern West Virginia; and "Other West" which includes coal mined in Colorado, Utah, and southern Wyoming. In addition, four oil refineries located along the targeted waterways also ship petroleum coke on these waterway segments. Specific coal quality, marketing and transportation considerations for each of these major coal producing regions is discussed in greater detail below.

1. Illinois Basin

The Illinois Basin coalfield encompasses portions of three midwestern states: Southern Illinois, southwestern Indiana and western Kentucky. Coal from the Illinois Basin is geographically closest to the upper Mississippi and Illinois waterways. Thus it historically has enjoyed a transportation cost advantage into the upper Mississippi study area. The coal, while relatively high in heat content, also has a relatively high sulfur content. As a result, its use has been shrinking, especially in the wake of the more stringent sulfur dioxide emission standards established under the Clean Air Act Amendments of 1990.

In 1992, coal producers in the Illinois Basin shipped approximately 132 million tons of coal to domestic destinations, according to U.S. Department of Energy figures. Illinois accounted for the largest share of this total, shipping 58.9 million tons of coal. Western Kentucky shipped 41.7 million tons of coal, while Indiana shipped 31.4 million tons of coal.

2. Powder River Basin

The Powder River Basin coal producing region is concentrated in north central Wyoming and southern Montana. Coal from the Powder River Basin has been enjoying strong demand growth in the upper Mississippi River basin due to two critical factors. First, the coal is extremely low in sulfur content, easily meeting the more stringent 1.2 lbs of SO_2/MMBtu emission limit mandated under Phase II of the Clean Air Act Amendments of 1990. Phase II emission limits become effective in January 2000. The other major advantage enjoyed by coal from the Powder River Basin is its extremely low cost. This coal sits relatively close to the surface in seams more than 70-feet thick. As a result, this coal is inexpensive to mine. Hence, Powder River Basin coal generally sells for $5.50/ton or less at the mine site. The major drawback of Powder River Basin coal, however, is its relatively high moisture content and relatively low heat content. While coal from the Illinois Basin typically has a heat content which ranges from 11,000 to 12,500 Btus/lb., the heat content of Powder River Basin coal generally ranges from 8,100 to 8,900 Btus/lb. Consequently, it cannot be burned efficiently in many older boilers which were designed to burn hotter bituminous coals.

In 1992, Criton estimates that the Powder River basin was the source of over 227 million tons of U.S. Coal. Approximately 188 million tons were produced in Wyoming while 38.9 million tons were produced in Montana.

3. Central Appalachia

The central Appalachian coalfields are located primarily in eastern Kentucky, southern West Virginia, and the extreme western portion of Virginia. Most Central Appalachian coals have the dual advantage of having the higher heat content of Illinois Basin coals with sulfur contents often rivaling low-cost Powder River Basin coals. Central Appalachian coals, however, are considerably more expensive than either Illinois Basin or Powder River Basin coals. In addition, central Appalachia also produces abundant quantities of coal with good coke-making characteristics. As a result, a significant proportion of the central Appalachian coal moving on the targeted waterways is used by area steelmakers to produce coke. Most of the remaining central Appalachian coal moving on the targeted waterways are used by utilities with power plants having strict sulfur dioxide emission standards but whose boiler designs preclude the use of Powder River Basin coals.

In 1992, central Appalachia was the source of approximately 279 million tons of U.S. coal. Eastern Kentucky generated approximately 120.2 million tons, while southern West Virginia accounted for approximately 113.1 million tons. The remaining 45.7 million tons was produced in south eastern Virginia.

4. Other West

The primary sources of western coals not mined in the Powder River Basin are located in Colorado and Utah. Western coal produced in these states are similar to central Appalachian coals with respect to sulfur and heat content. Several utilities along the upper Mississippi and Illinois Waterway have been substituting increased volumes of western bituminous coal for central Appalachian coals.

In 1992, western coal operators in Colorado and Utah shipped approximately 40 million tons of coal. Colorado was the source of 18.9 million tons of the total, while Utah accounted for the remainder.

B. Distribution of Upper Mississippi and Illinois Water Coal Traffic By Origin Region

Coal origination patterns for the two Upper Mississippi River basin waterway segments which have been studied for this analysis have markedly different coal sourcing patterns. Tables 2 and 3 highlight 1992 coal origination patterns for the upper Mississippi River and the Illinois Waterway.

The upper Mississippi River between the Twin Cities and the mouth of the Missouri River handled 9.8 million tons of coal traffic in 1992. Four million tons of this total represents "through" traffic moving primarily to the Illinois Waterway. Coal identified by Criton as originating in the Illinois Basin accounted for approximately 40 percent of the coal moving on this river segment. Coal originating in central Appalachia accounted for 23 percent of the total coal traffic while coal identified as originating in the Powder River Basin accounted for approximately eleven percent of the total. Petroleum Coke represented 14 percent of coal/coke traffic. Most of this traffic represents petroleum coke originating on the Illinois Waterway and the Chicago area moving through the targeted waterway on its way to points south.

Table 2.

Origin Distribution of Coal Moving on the Upper Mississippi on Segment Between the Twin Cities and the Mouth of the Missouri River: 1992 (Millions of Tons)

Coal Origin	Inbound	Outbound	Intra	Through	Total*
Illinois Basin	3.3	-	-	0.6	4.0
PRB	-	-	1.1	-	1.1
Central App.	0.5	-	-	1.7	2.3
Other West	0.1	-	-	0.2	0.3
Local Petcoke	0.2	0.2	*	1.0	1.4
Unknown	0.2	*	*	0.4	0.7
Total**	**4.4**	**0.2**	**1.1**	**4.0**	**9.8**

Table 3.
Origin Distribution of Coal Moving on the Illinois Waterway: 1992 (Millions of Tons)

Coal Origin	Inbound	Outbound	Intra	Through	Total*
Illinois Basin	0.6	-	-	-	0.6
PRB	-	-	1.2	-	1.2
Central App.	0.5	-	-	1.2	1.8
Other West	0.2	0	1.1	-	1.3
Local Petcoke	0.3	1.3	0.3	0.3	2.2
Unknown	0.1	-	-	-	0.1
Total**	**1.8**	**1.3**	**2.6**	**1.5**	**7.2**

*** Less than 50,000 tons.**
****Totals may not add due to rounding.**
Source: Criton Corporation

The Illinois Waterway handling a total of 7.2 million tons of coal in 1992. Unlike the Upper Mississippi River, coal originating in the Illinois Basin was a very small fraction of total Illinois Waterway coal traffic, accounting for less than ten percent of the total. Coal originating in the Powder River Basin, as well as coal mined in Colorado, Utah, and Southern Wyoming together accounted for 2.5 million tons of Illinois Waterway coal traffic. Central Appalachian coal, representing 25 percent of the total, also was strong, primarily because of the need for high quality metallurgical coal at two integrated steel mills in the Chicago area. With three major oil refineries capable of producing petroleum coke on or near the Illinois Waterway, it is not surprising that petroleum coke represented over 30 percent of the coal/coke traffic on the Illinois Waterway. These refineries are operated by Mobil Corp. in Joliet, IL; Unocal in Lemont, IL; and Amoco in Whiting, IN.

III. Geographic Coal Demand Regions

With only a few exceptions, the vast majority of the coal traveling along the targeted waterways is consumed in states immediately bordering the waterway. Estimated total and riverborne coal demand in these states is summarized in Table 4.

Table 4.
Estimated Coal Demand and Riverborne Receipts in States Bordering Targeted Waterways: 1992*
(000s of Tons)

State	Riverborne Receipts	Total Receipts
Minnesota	142	17,224
Wisconsin	1,158	20,477
Iowa	2,426	16,988
Illinois	3,088**	31,186
Missouri	3,850	24,207
Total	10,664	110,082

Source: U.S. Dept. of Energy, Energy Information Administration

* Data represents results of survey of producers and not census. Historically, Criton has found these figures to understate actual shipment levels by 10 to 20 percent.

** A Portion of this tonnage was received at points of the Ohio River outside of the target study zone.

In addition to the states listed in Table 4, Criton has identified three major non-local geographic markets for coal moving on the targeted waterways: Louisiana, Florida, and overseas export markets. Criton estimates that approximately 5.3 million tons of coal moving along the targeted waterways was shipped to Cajun Electric Power Coop's Big Cajun plant near Baton Rouge, LA in 1992. This coal originated in the Powder River Basin and was transloaded from rail to barge in St. Louis. In addition, approximately one million tons of coal was shipped to Davant, LA, where it was transloaded to cross-Gulf barges for final delivery to Tampa Electric's Big Bend generating station in Florida. Finally, Criton estimates that an additional 1.2 million tons of coal was moved by barge from Cora, IL to Davant, LA where it was shipped overseas to Spain. This coal also originated in the Powder River Basin.

A. Segment-Specific Demand: Upper Miss (Twin Cities to MO River)

Based on the Waterborne Commerce data for 1992, total riverborne coal demand that year on the upper Mississippi between the Twin Cities and the mouth of the Missouri river totaled approximately 5.6 million tons (the sum of "inbound" and "intra" tonnage from Table 1.) Criton estimates that nearly 80 percent of this total represents demand for steam coal by several coal-fired generating stations located along the targeted waterway. Approximately ten percent was used to fire local cement kilns, while the remainder was used in other major industrial applications, especially corn processing. Major demand centers and their associated 1992 barge receipts are summarized in Table 5.

Table 5.
Major Consumers of Riverborne Coal on the Upper Mississippi
Between the Twin Cities and the Missouri River: 1992
(000s of Tons)

Sector/ Company	Plant or Location	Tonnage
Electric Utility		
Central Iowa Power Coop	Fair Plant	148
Dairyland Power Coop	Alma Plant	315
	Genoa Plant	773
	Stoneman Plant	24
IES Utilities	Burlington Plant	476
Illinois Power	Wood River	464
Interstate Power	Dubuque Plant	90
	Kapp Plant	501
	Lansing Plant	590
Muscatine Water & Power	Muscatine Plant	559
Wisconsin Power & Light	Dewey Plant	447
Subtotal		**4,387**
Cement Manufacturing		
Continental	Hannibal, MO	w
Holnam	Clarksville, MO	w
Lafarge	Davenport, IA	w
Subtotal		**515**
Food and Corn Processing		
Archer Daniels Midland	Clinton, IA	w
Roquette	Keukuk, IA	w
Others/Balance Item		w
Subtotal		**674**
Grand Total		**5,576**
w-withheld		

B. Segment-Specific Demand: Illinois Waterway

Based on the Waterborne Commerce data for 1992, total riverborne coal demand that year on the Illinois Waterway totaled approximately 5.6 million tons (the sum of "inbound" and "intra" tonnage from Table 1 as well as approximately 1.2 million tons of upbound "through" traffic destined for coal users in the Chicago area.) Criton estimates that approximately 62 percent of this total represents demand for steam coal from several utility plants located on the Illinois Waterway. Approximately 20 percent of the total represents metallurgical coal moving to Chicago-area steel mills, while the remainder is coal used at other local industrial facilities, most of whom process corn. The major demand centers for this waterway and their associated 1992 barge receipts are summarized in Table 6.

Table 6.
Major Consumers of Riverborne Coal on the Illinois Waterway: 1992
(000s of Tons)

Sector/ Company	Plant or Location	Tonnage
Electric Utility		
Central Illinois Public Service	Meredosia	53
Central Illinois Light Co.	Edwards	318
Commonwealth Edison	Crawford	303
	Fisk	321
	Will County	1,682
Illinois Power	Havana	386
	Hennepin	442
Subtotal		**3,505**
Steel		
LTV Steel	South Chicago	w
Acme Steel	Chicago	w
Subtotal		**1,100**
Other Industrial		
Archer Daniels Midland	Peoria	w
CPC International	Argo	w
Midwest Grain Products	Pekin	w
Caterpillar, Inc.	Peoria	w
Marblehead Lime	South Chicago	w
Other/Balancing Item		w
Subtotal		**1,016**
Grand Total		**5,621**

w- withheld

Source: Criton Corporation

C. Segment Specific Demand, Regions Outside of the Study Area.

Criton estimates that approximately 10.7 million tons of coal and petcoke which moved along the waterways of the Upper Mississippi River Basin were delivered by barge to points outside of this basin. Ninety-one percent of this total represents steam coal, while the remainder represents petroleum coke moving to export markets via the lower Mississippi and to various domestic users on the Ohio and lower Mississippi rivers. Criton estimates that overseas exports accounted for approximately 11 percent of all coal shipped out of the upper Mississippi River Basin. Most of the petroleum coke leaving the region originates at the three refineries located on or near the Illinois waterway, while the remainder originates at Koch Industries' Rosemont, MN refinery. The major demand centers for coal and coke moving to regions outside of the Upper Mississippi Basin are shown in Table 7.

Table 7.
Major Consumers of Riverborne Coal Outside of the Upper Mississippi River Basin: 1992
(000s of Tons)

Sector/ Company	Plant or Location	Tonnage
Domestic Electric Utility		
Associated Electric Coop	New Madrid, MO	2,121
Cajun Electric Power Coop	Big Cajun 2, LA	5,344
Tampa Electric	Big Bend, FL	1,018
Subtotal		**8,483**
Overseas Export		
Steam Coal	Spain	1,221
Petroleum Coke	NA	968
Subtotal		**2,189**
Grand Total		**10,672**

Source: Criton Corporation

IV. Major Factors Affecting Current and Prospective Riverborne Coal Distribution in the Upper Mississippi River Basin

Since the early 1990's coal traffic along the upper Mississippi has experienced a significant shift in both coal sourcing and modal transportation patterns. The specific nature of these shifts and the causes of these shifts are discussed in greater detail below.

A. Increased Prevalence of Western Coal

Historically, most of the coal traveling on the upper Mississippi River has been high-sulfur coal produced in the Illinois Basin for use in area utility and industrial boilers. Since the early 1990's, however, the Illinois Basin has be supplanted by the western U.S. as the primary coal supply source to the region. Since 1991, at least three coal-fired power plants on the upper Mississippi above the mouth of the Missouri River have shifted most, if not all, of their coal purchases from the Illinois Basin to the Western U.S.: Muscatine Water & Power's Muscatine Plant, IES Utilities' Burlington Plant, and Interstate Power's Kapp Plant. The Muscatine and Burlington plants continue to burn small quantities of Illinois Basin coals in older units which cannot efficiently burn the lower-btu Powder River Basin coals.

Two coal-fired power plants on the Illinois Waterway also have switched most of their coal purchases to western coal producers. These plants, Illinois Power's Hennepin and Havana plants, now purchase almost all of their coal from Colorado and Utah suppliers. In the past, these plants purchased the vast majority of their coal requirements from Central Appalachia.

Coal-fired power plants outside of the upper Mississippi Basin also have switched their sourcing patterns away from traditional Illinois Basin and central Appalachian suppliers to western coal sources. The most notable among these is Associated Electric's New Madrid plant, which now burns exclusively Powder River Basin coal at the expense of Illinois Basin Coal which originated primarily on the Kaskaskia River. Other river-served utilities recently switching to western supply regions include Indiana-Kentucky Electric, which recently began receiving approximately three million tons of western coal annually at its Clifty Creek plant, and the Tennessee Valley Authority, which is burning approximately two million tons of western coal annually at its Allen plant. Western coal moving to both the Clifty Creek and Allen plants is currently transloaded from rail to barge at docks on the upper Mississippi River between the mouth of the Missouri River and the mouth of the Ohio River.

The growing prevalence of western coal coming into or moving through the upper Mississippi River inland waterway network is due primarily to two significant developments: the need for utilities to reduce their sulfur dioxide emissions to come into compliance with the Clean Air Act Amendments of 1990; and the favorable delivered price economics of western coal.

For many of the utilities in the study region switching to western coal, the favorable economics is the primary driving force behind their recent fuel switches. The fact that the western coal is low in sulfur is merely an added bonus. In fact, favorable pricing of western coal prompted at least one utility, Iowa Southern, to switch its Burlington plant to western coal at least two years before the Phase I Clean Air Act deadline of 1995.

As will be discussed later, the increased prevalence of western coal coupled with shifts in modal delivery options has had a significant impact on coal traffic in the upper Mississippi River Basin.

B. Growth in Direct-Rail Shipments at Expense of Barge Receipts

Utilities' recent shift to increased use of western coal has generally been accompanied by a shift from barge deliveries to all-rail deliveries. The primary reason for this modal shift is the significant cost savings that can be realized by most of these utilities by by-passing the inland river system.

In general, direct-rail distances from western mines to river-served power plants on the upper Mississippi typically are comparable to distances from these same mines to rail-barge transloading facilities on the upper Mississippi. Consequently, rail rates from western mines to upper Mississippi power plants also are comparable to rail rates from these origins to upper Mississippi transfer terminals. As a result, by choosing to receive western coal via an all-rail routing, the utility can avoid the additional costs associated with coal transloading and moving the coal by barge from the transfer terminal to the power plant. In addition, plants along those segments of the upper Mississippi which are closed to navigation during the winter must stockpile a three-to-four-month's supply of coal on-site if the utility relies exclusively on barge deliveries. With a direct-rail option, however, the plant can receive coal on a year-round basis, obviating the need to create a large winter stockpile. This also generates savings for the utility.

The savings associated with direct-rail shipments of western coal vs. all-barge movements of Illinois Basin coal to plants on the upper Mississippi is significant. These savings, using 1994 delivered coal price data, are illustrated in Table 8 for two upper Mississippi plants receiving both direct-rail deliveries of Powder River Basin coal and barged deliveries of Illinois Basin Coal. At both plants, direct-rail shipments of Powder River Basin coal enjoys a delivered price advantage in excess of $0.30/MMBtu over barge-delivered Illinois Basin coals.

Table 8.
Comparison of Delivered Coal Prices:
Direct Rail Powder River Basin vs. Barged Illinois Basin

Utility Plant	Direct Rail PRB $/ton	Direct Rail PRB $/MMBtu	Barge Illinois Basin $/ton	Barge Illinois Basin $/MMBtu
IES Utilities				
Burlington	$14.88	$0.881	$27.70	$1.214
Muscatine Wtr & Pwr				
Muscatine	$12.71	$0.748	$23.59	$1.076

Source: U.S. Dept. of Energy, Cost and Quality of Fuels for Electric Utility Plants for 1994.

Overall, two plants on the upper Mississippi, Burlington and Muscatine, have opted to receive all of their western coal by rail, bypassing the inland river system. This shift in traffic has resulted in the loss of nearly one million tons of riverborne coal traffic on the upper Mississippi.

Opting for direct-rail shipments is not unique to the upper Mississippi, however. On the Illinois Waterway, Illinois Power anticipates that it will shift all western coal deliveries at its Havana generating station to rail beginning in early 1996. Commonwealth Edison, which has received western coal by barge at its Will County plant for more than ten years, also plans to install a rotary-dump railcar unloading facility at this plant. All coal shipments to the Will County plant should shift from barge to rail beginning in early 1997. Shifting these two plants to direct rail deliveries will cost the Illinois Waterway approximately two million tons of traffic based on 1992 deliveries.

Finally, Associated Electric Cooperative, which received nearly three million tons of Illinois Basin coal annually by barge at its New Madrid plant through much of the early 1980s and early 1990s, shifted its coal purchases exclusively to Wyoming's Powder River Basin in mid-1994. All of this tonnage now arrives by rail. As a result of this regional and modal shift, the upper Mississippi River between the Missouri and Ohio Rivers has lost over two million tons of coal traffic.

While a considerable volume of coal demand is the five-state Upper Mississippi study region is expected to shift to western sources and move by direct-rail routings at the expense of barge, as noted earlier, a considerable volume already has shifted. For example, barge deliveries of coal in the five-state study region peaked in 1984 at 16.6 million tons. By 1994, barge deliveries were approximately 12.5 million tons (see Table 9).

Table 9. Coal Deliveries by Mode to the Five-State Upper Mississippi Study Region: 1980-1994 (000s of Tons)

Year	Missouri				Minnesota				Iowa			
	Rail	Barge	Other	Total	Rail	Barge	Other	Total	Rail	Barge	Other	Total
1980	15,999	4,006	3,928	23,933	11,453	1,424	398	13,275	9,357	2,112	1,099	12,568
1981	15,894	4,072	3,158	23,124	11,783	872	633	13,288	8,653	2,364	1,110	12,127
1982	17,192	3,773	4,060	25,025	11,587	548	330	12,465	8,878	2,841	986	12,705
1983	16,215	3,422	5,055	24,692	9,665	1,389	139	11,193	9,478	3,595	599	13,672
1984	19,320	4,941	5,840	30,101	11,791	1,162	175	13,128	10,852	3,308	736	14,896
1985	15,620	3,353	4,564	23,537	10,740	1,547	346	12,633	9,613	3,676	760	14,049
1986	15,236	3,085	4,416	22,737	9,826	586	168	10,580	9,240	3,300	785	13,325
1987	15,971	2,955	5,027	23,953	14,130	307	85	14,522	11,265	3,363	603	15,231
1988	18,613	3,110	4,700	26,423	16,731	235	65	17,031	12,066	3,751	384	16,201
1989	17,155	3,920	4,321	25,396	17,616	271	141	18,028	11,989	3,923	489	16,401
1990	16,104	4,985	3,645	24,734	18,196	179	215	18,590	14,276	3,667	393	18,336
1991	17,328	4,189	3,085	24,602	17,443	217	391	18,051	14,889	2,959	364	18,212
1992	16,994	3,850	3,363	24,207	16,170	142	912	17,224	14,234	2,426	328	16,988
1993	14,729	4,071	1,121	19,921	17,230	64	872	18,166	17,235	1,388	327	18,950
1994	19,952	6,321	1,005	27,278	19,507	154	837	20,498	16,209	1,881	169	18,259

Year	Wisconsin				Illinois				Five-State Total			
	Rail	Barge	Other	Total	Rail	Barge	Other	Total	Rail	Barge	Other	Total
1980	12,201	1,550	2,907	16,658	28,630	6,609	6,867	42,106	77,640	15,701	15,199	108,540
1981	11,708	1,267	1,886	14,861	24,686	5,174	6,725	36,585	72,724	13,749	13,512	99,985
1982	11,817	1,385	2,091	15,293	22,987	6,363	6,992	36,342	72,461	14,910	14,459	101,830
1983	12,340	1,400	2,316	16,056	23,717	3,980	8,635	36,332	71,415	13,786	16,744	101,945
1984	13,105	1,638	2,416	17,159	24,682	5,516	8,538	38,736	79,750	16,565	17,705	114,020
1985	14,042	1,298	2,204	17,544	25,538	3,744	7,740	37,022	75,553	13,618	15,614	104,785
1986	15,421	1,850	2,022	19,293	25,229	4,524	8,336	38,089	74,952	13,345	15,727	104,024
1987	18,352	1,282	1,335	20,969	22,599	4,671	8,092	35,362	82,317	12,578	15,142	110,037
1988	16,715	1,497	1,236	19,448	21,907	3,857	7,118	32,882	86,032	12,450	13,503	111,985
1989	16,927	1,187	1,525	19,639	19,397	3,953	6,766	30,116	83,084	13,254	13,242	109,580
1990	18,049	912	1,284	20,245	19,523	4,995	7,943	32,461	86,148	14,738	13,480	114,366
1991	19,215	1,369	1,027	21,611	19,790	4,919	8,322	33,031	88,665	13,653	13,189	115,507
1992	17,685	1,158	1,634	20,477	21,502	3,088	6,596	31,186	86,585	10,664	12,833	110,082
1993	18,588	832	1,242	20,662	23,787	3,840	6,806	34,433	91,569	10,195	10,368	112,132
1994	18,999	1,087	2,145	22,231	28,834	3,039	6,872	38,745	103,501	12,482	11,028	127,011

Source: U.S. Dept. of Energy, Energy Information Administration, Coal Distribution, 1980-1994

The barge industry's share of coal traffic to the five-state region has fallen from approximately 14.5 percent during the 1980s to less than 10 percent in 1994 (see Table 10). Significant erosion in barge market share is evident in all states of the upper Mississippi study region with the exception of Missouri.

Table 10. Modal Share of Coal Delivered to the Five-State Upper Mississippi Study Region

Year	Missouri				Minnesota				Iowa			
	Rail	Barge	Other	Total	Rail	Barge	Other	Total	Rail	Barge	Other	Total
1980	66.8%	16.7%	16.4%	100.0%	86.3%	10.7%	3.0%	100.0%	74.5%	16.8%	8.7%	100.0%
1981	68.7%	17.6%	13.7%	100.0%	88.7%	6.6%	4.8%	100.0%	71.4%	19.5%	9.2%	100.0%
1982	68.7%	15.1%	16.2%	100.0%	93.0%	4.4%	2.6%	100.0%	69.9%	22.4%	7.8%	100.0%
1983	65.7%	13.9%	20.5%	100.0%	86.3%	12.4%	1.2%	100.0%	69.3%	26.3%	4.4%	100.0%
1984	64.2%	16.4%	19.4%	100.0%	89.8%	8.9%	1.3%	100.0%	72.9%	22.2%	4.9%	100.0%
1985	66.4%	14.2%	19.4%	100.0%	85.0%	12.2%	2.7%	100.0%	68.4%	26.2%	5.4%	100.0%
1986	67.0%	13.6%	19.4%	100.0%	92.9%	5.5%	1.6%	100.0%	69.3%	24.8%	5.9%	100.0%
1987	66.7%	12.3%	21.0%	100.0%	97.3%	2.1%	0.6%	100.0%	74.0%	22.1%	4.0%	100.0%
1988	70.4%	11.8%	17.8%	100.0%	98.2%	1.4%	0.4%	100.0%	74.5%	23.2%	2.4%	100.0%
1989	67.6%	15.4%	17.0%	100.0%	97.7%	1.5%	0.8%	100.0%	73.1%	23.9%	3.0%	100.0%
1990	65.1%	20.2%	14.7%	100.0%	97.9%	1.0%	1.2%	100.0%	77.9%	20.0%	2.1%	100.0%
1991	70.4%	17.0%	12.5%	100.0%	96.6%	1.2%	2.2%	100.0%	81.8%	16.2%	2.0%	100.0%
1992	70.2%	15.9%	13.9%	100.0%	93.9%	0.8%	5.3%	100.0%	83.8%	14.3%	1.9%	100.0%
1993	73.9%	20.4%	5.6%	100.0%	94.8%	0.4%	4.8%	100.0%	90.9%	7.3%	1.7%	100.0%
1994	73.1%	23.2%	3.7%	100.0%	95.2%	0.8%	4.1%	100.0%	88.8%	10.3%	0.9%	100.0%

Year	Wisconsin				Illinois				Total			
	Rail	Barge	Other	Total	Rail	Barge	Other	Total	Rail	Barge	Other	Total
1980	73.2%	9.3%	17.5%	100.0%	68.0%	15.7%	16.3%	100.0%	71.5%	14.5%	14.0%	100.0%
1981	78.8%	8.5%	12.7%	100.0%	67.5%	14.1%	18.4%	100.0%	72.7%	13.8%	13.5%	100.0%
1982	77.3%	9.1%	13.7%	100.0%	63.3%	17.5%	19.2%	100.0%	71.2%	14.6%	14.2%	100.0%
1983	76.9%	8.7%	14.4%	100.0%	65.3%	11.0%	23.8%	100.0%	70.1%	13.5%	16.4%	100.0%
1984	76.4%	9.5%	14.1%	100.0%	63.7%	14.2%	22.0%	100.0%	69.9%	14.5%	15.5%	100.0%
1985	80.0%	7.4%	12.6%	100.0%	69.0%	10.1%	20.9%	100.0%	72.1%	13.0%	14.9%	100.0%
1986	79.9%	9.6%	10.5%	100.0%	66.2%	11.9%	21.9%	100.0%	72.1%	12.8%	15.1%	100.0%
1987	87.5%	6.1%	6.4%	100.0%	63.9%	13.2%	22.9%	100.0%	74.8%	11.4%	13.8%	100.0%
1988	85.9%	7.7%	6.4%	100.0%	66.6%	11.7%	21.6%	100.0%	76.8%	11.1%	12.1%	100.0%
1989	86.2%	6.0%	7.8%	100.0%	64.4%	13.1%	22.5%	100.0%	75.8%	12.1%	12.1%	100.0%
1990	89.2%	4.5%	6.3%	100.0%	60.1%	15.4%	24.5%	100.0%	75.3%	12.9%	11.8%	100.0%
1991	88.9%	6.3%	4.8%	100.0%	59.9%	14.9%	25.2%	100.0%	76.8%	11.8%	11.4%	100.0%
1992	86.4%	5.7%	8.0%	100.0%	68.9%	9.9%	21.2%	100.0%	78.7%	9.7%	11.7%	100.0%
1993	90.0%	4.0%	6.0%	100.0%	69.1%	11.2%	19.8%	100.0%	81.7%	9.1%	9.2%	100.0%
1994	85.5%	4.9%	9.6%	100.0%	74.4%	7.8%	17.7%	100.0%	81.5%	9.8%	8.7%	100.0%

V. Major Assumptions and Methodology used to Derive Upper Mississippi River Basin Riverborne Coal Forecast

To derive coal traffic forecasts for the waterways of the upper Mississippi River Basin, Criton evaluated current and prospective supply and demand conditions for each of the major coal using sectors contributing traffic to the upper Mississippi River Basin. These include the domestic utility sector, domestic metallurgical coal sector, the domestic industrial coal sector, the export coal sector, and the regional petroleum coke industry. Criton developed riverborne coal forecasts for each individual sector, relying on a specific and unique set of assumptions for each. Sector-specific methodologies and assumptions are discussed below.

A. Domestic Utility Sector

For the domestic utility sector, Criton identified each power plant on the inland river system which contributed coal traffic to the upper Mississippi River basin during the 1992-1995 period. Data on coal consumption at each plant during this period was obtained from the U.S. Dept. of Energy. Criton supplemented this information with modal delivery data for plants receiving coal by more than one mode from Criton's own proprietary databases and interviews with appropriate utility executives.

Once the universe of relevant power plants was developed, Criton then forecast prospective riverborne demand for each plant using power production forecasts compiled and published by the North American Electric Reliability Council (NERC). The NERC presents 10-year power production forecasts by major prime mover (primary fuel) for each major NERC region in the United States and Canada. Criton extracted 10-year coal-fired generation forecasts (1995-2004) for each of the relevant NERC regions within the study area. These NERC regions include: Mid-America Interconnected Network (MAIN) Eastern Missouri, MAIN Northern Illinois, MAIN South-Central Illinois, MAIN Wisconsin and Upper Michigan, and the Mid-Continent Area Power Pool (MAPP) which was used to generate forecasts for coal-fired electric generation in Iowa. These forecasts are summarized in Table 11.

Table 11.
Projected Electricity Production by Coal
(000s of Megawatt-Hours)

Year	MAPP	MAIN (WUM)	MAIN (SCI)	MAIN (EM)	MAIN, (NI)
1994	104,287	35,063	33,204	21,775	23,533\
1995	107,162	36,782	34,877	24,047	24,449
1996	109,600	37,759	36,687	24,692	26,980
1997	107,596	37,774	36,408	24,474	29,925
1998	112,437	38,003	38,668	24,993	33,747
1999	111,933	38,546	39,162	24,354	33,912
2000	113,640	38,547	36,385	25,934	35,890
2001	115,210	38,973	38,076	26,421	35,864
2002	116,880	39,159	37,506	26,883	35,146
2003	114,158	39,243	36,954	26,448	35,297
2004	116,958	39,678	38,668	27,681	36,064

Source: North American Electric Reliability Council

The NERC forecasts were utilized to generate riverborne coal demand forecasts through 2004 by escalating/de-escalating the projected coal consumption of each power plant in the target region by the forecast change in coal-fired generation for the appropriate NERC Region. Projected coal generation for the remainder of the study period were forecast by extrapolating the annual average change in coal-fired generation for the last five years of the NERC forecast.

Uncertainty bands for the base forecast were generated by evaluating the volatility of the year-to-year growth estimates for each of the NERC-region forecasts. For each forecast series, arithmetic means were calculated for the year-to-year growth estimates. Using this distribution, upper and lower confidence bands for the growth rate estimates were calculated at a 95 percent confidence level. These estimates are summarized in Table 12.

Table 12.
Upper and Lower 95% Confidence Bands for Coal-Fired Electricity Production Growth Rates

Region	Upper and Lower Bands
MAPP	MAPP Annual Growth Rate +/- 1.52%
MAIN WU	MAIN WI Annual Growth Rate +/- 1.08%
MAIN SCI	MAIN SCI Annual Growth Rate +/- 3.06%
MAIN EM	MAIN EM Annual Growth Rate +/- 2.81%
MAIN NI	MAIN NI Annual Growth Rate +/- 3.75%

Once plant and utility-specific coal demand forecasts were developed, it was necessary to adjust these forecasts to account for recent and pending shifts in coal origination and delivery patterns. Specifically, Criton adjusted riverborne tonnage to several utility plants that had switched are were planning to switch their coal sourcing and modal delivery patterns since the 1992-1994 period. These plants and the impact of these adjustments on Criton's forecasts are listed in Table 13.

Table 13.
Major Changes in Utility Coal Procurement Patterns Affecting Riverborne Coal Traffic Forecasts on Upper Mississippi

Utility Plant	Nature of Change	Impact on Riverborne Traffic
IES Utilities Burlington	Shift from barge delivered Illinois Basin coal to rail-delivered PRB coal	Riverborne coal falls from 476,000 tons in 1992 to 33,000 tons in '94
Muscatine Wtr. & Pwr. Muscatine	Shift from barge-delivered Illinois Basin coal to rail-delivered PRB coal	Riverborne coal falls from 559,000 tons in 1992 to 160,000 tons in '94.
Interstate Power Kapp	Shift in coal sourcing from Illinois Basin to Colorado	"Through " shipments on upper Miss between Ohio and MO Rivers falls from 503,000 tons in '94 to zero in '95.
Illinois Power Havana	Shift from all-barge deliveries to all-rail deliveries in early 1996	Riverborne receipts fall from projected 761,000 ton in '95 to and zero tons by 1997.
Commonwealth Edison Will County	Shift from all-barge deliveries to all-rail deliveries in early 1997	Riverborne receipts fall from projected projected 2.3 million tons in '95 to zero tons by 1998.

1. Electric Utility Deregulation and the Future of Nuclear Power

Two developments likely to occur during the study period are expected to have a significant impact on coal use both nationally and the upper Midwest: the pending deregulation of the electric utility industry and the anticipated decommissioning of large amounts of nuclear electric generating capacity.

With the advent of electric utility deregulation, it is expected that the nation's power grid will be opened to allow any utility to transmit power across another utility's power lines at a pre-established tariff rate much in the same way the natural gas transmission industry was deregulated in the 1980s. As a result, utilities will no longer be assured of the right to provide power to a large segment of their customer base, especially large industrial power users.

In this environment, utilities will be forced to minimize their electric generating costs to prevent others from selling power to their traditional customers. Likewise, in order to increase market sales outside of its traditional market territory, a utility must be able to compete with other utilities pursuing the same strategy. Again, minimizing electric generating costs will be essential.

For the most part, utilities in the relevant study area already have undertaken several significant initiatives to reduce generation costs: primarily switching to low-cost rail-delivered western coal. In the upper Midwest, those utilities that are able to take advantage of lower western coal costs and direct-rail shipments of coal at the expense of barge already have done so or will do so in the next three years. To the extent some plants have not shifted, this is likely the result of some technical constraint which prevents the utility from taking advantage of the lower cost fuel. As a result, with the exception of the plants already discussed, Criton assumes that riverborne coal demand within the upper Mississippi Basin will be restricted to those plants which currently burn barge-delivered coal. To the extent that new base-loaded generating capacity is added, Criton assumes that these plants will be designed to specifically burn the lowest cost fuel: low-sulfur sub-bituminous Powder River Basin coal. As several utilities already have found, the lowest cost method of transporting this coal to plants on the upper Mississippi is a direct-rail routing. Consequently, Criton does not anticipate that any new coal traffic will be generated on the upper Mississippi and Illinois Waterways as a result of new coal-fired power plant construction on these waterways during the forecast period.

Nuclear power plants account for a significant portion of the power generated in the Upper Mississippi River Basin. Presently, three utilities receiving riverborne coal in the area also operate nuclear power plants: Commonwealth Edison, Union Electric, and Illinois Power.

The future of nuclear generation in the U.S. is questionable. Recently, the only major utility which had an on-going nuclear construction program, Tennessee Valley Authority, canceled practically all of its unfinished nuclear projects. Other utilities, notably Public Service of Colorado and Northern States Power, have either idled existing nuclear capacity or announced that they would not renew their nuclear licenses at existing plants. Given these circumstances, Criton assumes that no new nuclear capacity will be added in the study area during the forecast period. Criton also assumed that all existing nuclear capacity in the study area would be retired when these plants' operating licenses expire.

The earliest retirement is expected to take place in 2006, when unit one of Commonwealth Edison's Dixon generating station is retired. One additional Commonwealth Edison nuclear unit is expected to be retired in 2011, followed by two each in 2012 and 2013. All remaining nuclear units operated by Commonwealth Edison, Union Electric and Illinois Power are expected to be retired between 2025 and 2030.

Criton anticipates that these nuclear retirements will have little or no impact on riverborne coal traffic in the region. First, by the time these nuclear generating units are expected to retire, river-served coal plants should be approaching their maximum operating capacities. In addition, utilities and industrial customers likely will be operating in a deregulated electric market. As such, utilities and industrial customers likely will replace some of the lost nuclear generation by purchasing power from the wholesale power grid. Finally, as noted earlier, to the extent new base-load coal-fired generation capacity is added to replace retiring nuclear units, these plants likely will be optimized to burn Powder River Basin coal, and take delivery of this coal via an all-rail routing.

B. Metallurgical Coal Sector

Presently, three integrated steel producers receive significant quantities of coal on the upper Mississippi River Basin waterways. The coal is used to make coke, which is ultimately combined with iron ore in a blast furnace to produce either molten iron or pig iron.

The U.S. Steel industry has experienced a major rebound beginning in late 1993, as demand from the automotive and construction sectors has forced U.S. steelmakers to operate at 90 percent capacity factors. Despite the high production rates at U.S. mills, approximately 30 percent of U.S. steel demand in 1994 was met by imports.

Prospects for the U.S. steel industry remain bright, but the future of metallurgical coal sector is not as certain. Integrated steel producers who rely on metallurgical coal to produce coke should be able to maintain and potentially increase their domestic steel sales through 2000 by displacing imports. These same producers also are beginning to export considerable quantities of steel.

Over the longer term, however, technological advances in the U.S. steel sector should begin cutting demand for metallurgical coal. For example, there is presently approximately 20 million tons of new steelmaking capacity planned for the U.S. All of this capacity, however, will rely on electric-arc furnace technology, which relies on scrap steel and scrap substitutes such as direct-reduced iron as their primary raw material feed stock. No coke is utilized in this process. As these mills become operational later in this decade, the proportion of steel produced by traditional integrated steelmaking operations should decline.

In addition, integrated steel producers have been experimenting with alternate technologies which displaces coke in the production process. The most significant is pulverized coal injection (PCI). PCI technology involves injecting pulverized coal directly into the blast furnace instead of coke. This development is significant because it allows steelmakers to use traditional steam quality coal in the process, eliminating the need for significant quantities of coal with good coking qualities. While it is possible the steam coal used for PCI purposes ultimately could move by barge into this area, practically all PCI coal moving into this region is delivered via a direct-rail routing. Lake delivery of PCI from the western U.S. also is being contemplated. In addition, integrated steel makers also have been experimenting with natural gas in their blast furnaces instead of coke.

Given these circumstances -- the increased prevalence of electric-arc minimills, and the use of PCI and natural gas in blast furnaces -- the long-term future of riverborne metallurgical coal demand appears bleak. While Sun Coal and Coke and Inland Steel recently announced plans to build new coke production facililities at Inland's Indiana Harbor Works facility, all of the metallurgical coal moving to this facility will be moving by rail.

To estimate prospective demand for metallurgical coal on the waterways Upper Mississippi River Basin, Criton relied upon long-term forecasts of metallurgical coal demand generated by the U.S. Department of Energy for the East North Central Census Division. Criton assumed that riverborne shipments would increase or decrease at the same rate as the overall demand forecast by the Dept. of Energy. DOE's projected demand for metallurgical coal is summarized in Table 14. Criton assumed that metallurgical demand beyond 2010 would continue to fall at the same rate as DOE forecasts during the 2005 to 2010 period.

Table 14.
Forecast Metallurgical Coal Demand in the East North Central Census Division: 1993-2010
(Millions of short tons)

1993	2000	2005	2010
11.6	11.9	10.4	9.1

Source: U.S. Dept. of Energy, Supplement to the Annual Energy Outlook: 1995, February 1995, Table 81.

C. Industrial Coal Sector

Industrial coal use in the U.S. has been relatively flat for the past several years. Its growth has been constrained by relatively cheap natural gas prices and the perception that natural gas-fired boilers carry considerably less environmental baggage than comparable coal-fired boilers. In the upper Mississippi Basin, the majority of the riverborne coal consumed in the region is used to either manufacture cement or to fuel corn processing plants producing either ethanol or high-fructose corn syrup.

While total U.S. industrial coal use has been relatively flat, industrial coal use has experienced significant growth in the midwestern U.S., especially Iowa. This growth has been fueled by a major expansion in the corn processing industry. Industrial coal growth in Iowa has been especially strong, growing from 1.9 million tons in 1991 to 2.8 million tons in 1994 according to U.S. Dept. of Energy figures.

Based on a survey of current and prospective coal users on the upper Mississippi Basin, Criton has identified at least two additional corn processing expansion projects planned for the next few years. Consequently, Criton estimates that riverborne industrial coal demand on the upper Mississippi River above the mouth of the Missouri River will grow at a six percent annual rate through 1998. In the following years, Criton assumes that riverborne industrial coal demand in the region will mirror overall U.S. industrial coal demand and grow at an annual average rate of one percent.

Industrial coal demand on the upper Mississippi between the Missouri and Ohio Rivers and also on the Illinois Waterway were assumed to grow at a one percent annual rate through the entire forecast period.

D. Petroleum Coke Sector

Given that petroleum coke is a by-product of the oil refining process, Criton assumed that petroleum coke production and shipments would remain constant during the entire forecast period. Criton believes that it is highly unlikely that any new oil refineries would be constructed in the Upper Mississippi Basin during the forecast period. Existing refineries equipped with cokers will continue marketing their petroleum coke to their existing customers.

VI. Riverborne Coal Traffic Forecasts.

Criton has prepared separate coal traffic forecasts for two waterway segments comprising the upper Mississippi River Basin navigation study area: The Upper Mississippi River between the Twin Cities and the mouth of the Missouri River, and the entire length of the Illinois Waterway. The forecasts for the upper Mississippi between the Twin Cities and the mouth of the Missouri River are presented in Table 15. Forecasts for the Illinois Waterway, meanwhile, are presented in Table 16.

For both the upper Mississippi and Illinois Waterway forecasts, the upper and lower confidence bounds are not symmetric around the base case forecast. This is due to the fact that under higher generation growth scenarios, total riverborne coal traffic will be capped as coal-fired generating capacity reaches is full practical capacity. As noted earlier in this report, Criton assumed that any incremental generating capacity built in the study region will be optimized to burn the lowest cost fuel available: Powder River Basin coal delivered via an direct-rail routing.

Table 15. Upper Mississippi Basin Coal Traffic Forecasts: Twin Cities to the Mouth of the Missouri River (Millions of Short Tons)

	Low				Base				High			
Year	Inbound/ Intra	Outbound	Through	Total	Inbound/ Intra	Outbound	Through	Total	Inbound/ Intra	Outbound	Through	Total
1992	5.6	0.2	3.9	9.7	5.6	0.2	3.9	9.7	5.6	0.2	3.9	9.7
1994	5.5	0.3	4.8	10.6	5.5	0.3	4.8	10.6	5.5	0.3	4.8	10.6
1995	5.3	0.2	4.1	9.6	5.3	0.2	4.1	9.6	5.4	0.2	4.1	9.7
1996	5.4	0.2	3.7	9.3	5.6	0.2	3.7	9.5	5.7	0.2	3.8	9.7
1997	5.4	0.2	3.6	9.1	5.6	0.2	3.6	9.4	5.9	0.2	3.7	9.8
1998	5.6	0.2	3.6	9.3	5.9	0.2	3.6	9.7	6.3	0.2	3.8	10.3
1999	5.6	0.2	3.6	9.3	6.0	0.2	3.7	9.8	6.4	0.2	3.8	10.5
2000	5.5	0.2	3.6	9.2	5.9	0.2	3.6	9.7	6.5	0.2	3.9	10.6
2001	5.5	0.2	3.5	9.2	6.0	0.2	3.6	9.8	6.8	0.2	3.9	10.9
2002	5.5	0.2	3.5	9.2	6.0	0.2	3.6	9.8	6.9	0.2	4.0	11.0
2003	5.4	0.2	3.5	9.0	6.0	0.2	3.6	9.7	6.9	0.2	4.0	11.1
2004	5.4	0.2	3.4	9.0	6.1	0.2	3.6	9.9	7.1	0.2	4.0	11.3
2005	5.4	0.2	3.4	9.0	6.1	0.2	3.6	9.9	7.2	0.2	3.9	11.4
2006	5.4	0.2	3.4	8.9	6.2	0.2	3.6	9.9	7.3	0.2	3.9	11.5
2007	5.3	0.2	3.3	8.9	6.2	0.2	3.5	9.9	7.4	0.2	3.9	11.5
2008	5.2	0.2	3.3	8.8	6.1	0.2	3.5	9.9	7.4	0.2	3.9	11.4
2009	5.2	0.2	3.3	8.7	6.2	0.2	3.5	9.9	7.5	0.2	3.9	11.5
2010	5.2	0.2	3.3	8.7	6.2	0.2	3.5	9.9	7.6	0.2	3.9	11.6
2015	4.9	0.2	3.2	8.3	6.0	0.2	3.5	9.6	7.2	0.2	3.8	11.2
2020	4.9	0.2	3.1	8.1	6.2	0.2	3.4	9.9	7.5	0.2	3.7	11.5
2025	5.0	0.2	3.0	8.2	6.4	0.2	3.4	10.1	7.6	0.2	3.7	11.5
2030	5.1	0.2	2.9	8.2	6.7	0.2	3.4	10.3	7.7	0.2	3.7	11.6
2035	5.1	0.2	2.9	8.2	6.9	0.2	3.4	10.6	7.9	0.2	3.6	11.7
2040	5.1	0.2	2.9	8.2	7.2	0.2	3.5	10.8	8.0	0.2	3.6	11.8
2045	5.1	0.2	2.8	8.2	7.4	0.2	3.5	11.1	8.1	0.2	3.6	11.9
2050	5.2	0.2	2.8	8.2	7.6	0.2	3.5	11.4	8.2	0.2	3.6	12.0

Table 16. Upper Mississippi Basin Coal Traffic Forecasts: Illinois Waterway (Millions of Short Tons)

	Low			Base			High		
Year	Inbound/ Intra/ Through	Outbound	Total	Inbound/ Intra/ Through	Outbound	Total	Inbound/ Intra/ Through	Outbound	Total
1994	7.6	1.5	9.1	7.6	1.5	9.1	7.6	1.2	8.8
1995	7.7	1.2	8.8	7.8	1.3	9.1	8.2	1.5	9.6
1996	7.5	1.2	8.7	7.8	1.3	9.2	8.6	1.5	10.0
1997	5.6	1.2	6.8	6.0	1.3	7.3	6.6	1.5	8.1
1998	5.1	1.2	6.3	5.5	1.3	6.8	6.3	1.5	7.8
1999	5.1	1.2	6.2	5.5	1.3	6.8	6.6	1.5	8.0
2000	5.1	1.2	6.3	5.6	1.3	7.0	7.0	1.5	8.5
2001	5.0	1.2	6.2	5.6	1.3	7.0	7.3	1.5	8.8
2002	4.9	1.2	6.0	5.6	1.3	6.9	7.4	1.5	8.9
2003	4.8	1.2	5.9	5.5	1.3	6.9	7.5	1.5	9.0
2004	4.8	1.2	5.9	5.6	1.3	6.9	7.6	1.5	9.1
2005	4.7	1.2	5.8	5.6	1.3	6.9	7.8	1.5	9.2
2006	4.6	1.2	5.8	5.6	1.3	6.9	7.7	1.5	9.2
2007	4.5	1.2	5.7	5.6	1.3	6.9	7.7	1.5	9.2
2008	4.5	1.2	5.6	5.6	1.3	6.9	7.7	1.5	9.2
2009	4.4	1.2	5.6	5.6	1.3	7.0	7.7	1.5	9.2
2010	4.4	1.2	5.5	5.7	1.3	7.0	7.7	1.5	9.2
2015	4.1	1.2	5.2	5.7	1.3	7.0	7.6	1.5	9.1
2020	3.9	1.2	5.0	5.8	1.3	7.1	7.6	1.5	9.1
2025	3.7	1.2	4.8	5.9	1.3	7.2	7.6	1.5	9.1
2030	3.5	1.2	4.7	6.1	1.3	7.4	7.6	1.5	9.1
2035	3.4	1.2	4.6	6.2	1.3	7.5	7.6	1.5	9.1
2040	3.3	1.2	4.5	6.4	1.3	7.7	7.6	1.5	9.1
2045	3.3	1.2	4.4	6.6	1.3	7.9	7.6	1.5	9.1
2050	3.2	1.2	4.3	6.7	1.3	8.0	7.7	1.5	9.1