III. CONCEPTUAL FRAMEWORK, ASSUMPTIONS, AND DATA

Given the extent of socioeconomic distress in the study region, the proposed $35-million investment in the port and industrial park is likely to transform regional socioeconomic dynamics in a positive way. However, measuring these socioeconomic contributions is a challenging task given the time frame of this study (July 2009-August 2009). The challenge comes from the lack of data regarding the operational phase of the port and industrial park build-out. Ideally, a survey of local businesses regarding the potential use of the port for cargo transportation is necessary to estimate the average volume of cargo the port will handle in a given year. Having information about the volume of cargo then will allow us to derive the marine-related employment figures. To overcome this challenge, the Business and Economic Research Center (BERC) has developed several assumptions using the existing port impact studies and regional impact assessment modals to calculate the average marine-related employment figures in the study region. Box 1 below summarizes the general assumptions and issues that will affect the BERC's benefit-cost analysis and economic impact estimates.

Box 1: General Assumptions and Issues

I. The estimates of total cargo volume are model--driven. The IMPLAN regional model is used to extract commodity flows data for the core and surrounding region.

II. A survey of potential port users is necessary to calculate the inbound/outbound cargo volume but was not available at the time of this study.

III. Furthermore, the time frame for grant application does not allow us to conduct a comprehensive survey.

IV. Anecdotal data from the previous Army Corps of Engineers study, the Northwest Tennessee Regional Port Authority, and a study by Younger Associates is used in making assumptions about the potential port use by sector.

V. This study has two scenarios: (1) current cargo movement (baseline) and (2) cargo movement with the Port Authority.

VI. The first scenario (current) assumes a "single modal" cargo movement (rail or truck), whereas the second scenario (with the port) assumes an "intermodal" cargo movement (barge to rail, or barge to truck, and vice versa)

III.a. Cargo Volume and Economic Impact

In the absence of survey data, the BERC has made several specific assumptions to derive total cargo volume systematically. Aiding our decisions were the databases, surveys, and studies highlighted below:

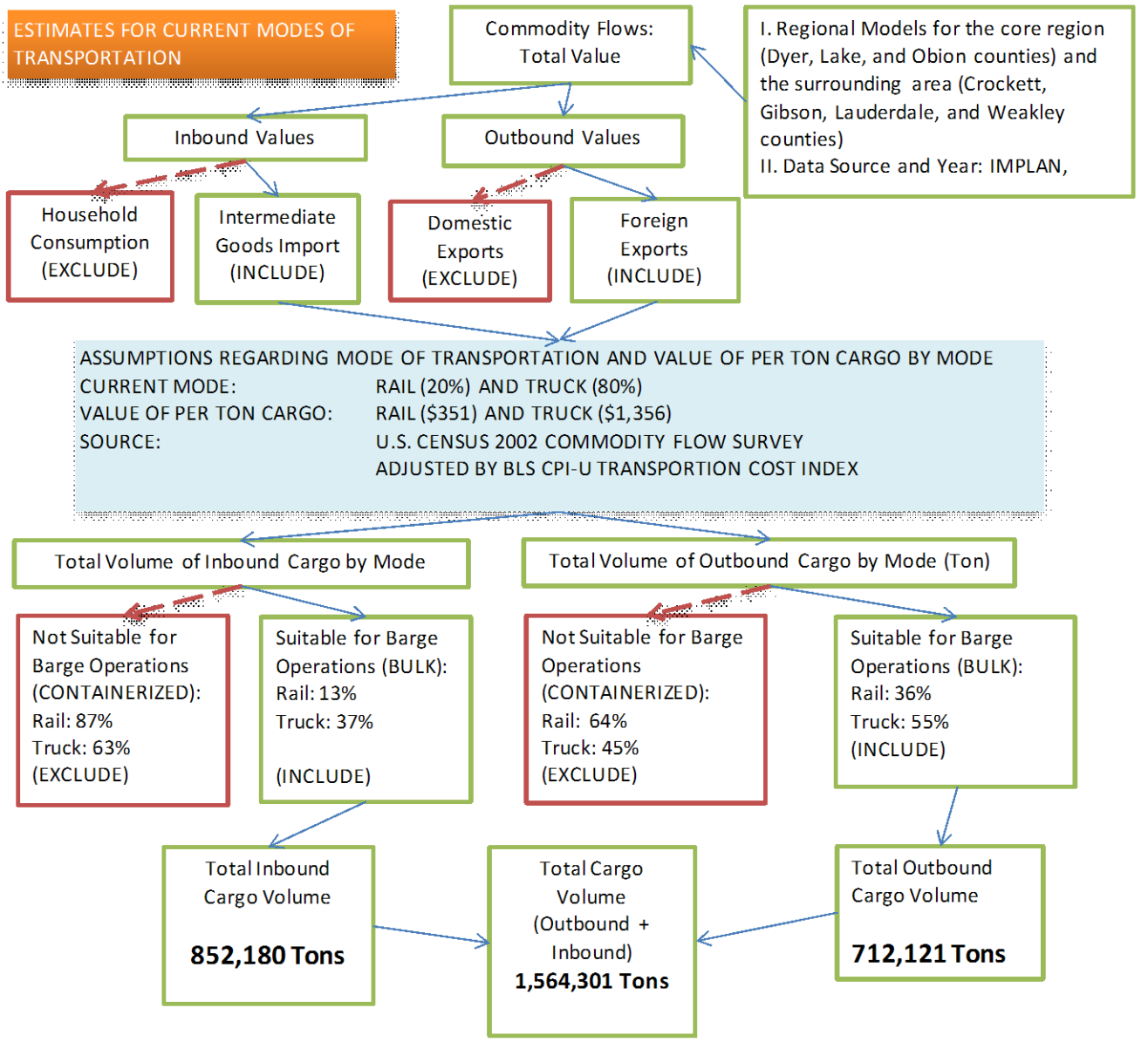
- IMPLANpro economic impact model (www.implan.gov) for the core and surrounding regions
- U.S. Census Bureau, 2002 Commodity Flow Survey (www.census.gov)
- BLS, CPI-U Transportation Cost Index (www.bls.gov)
- Congressional Budget Office, *The Economic Cost of Disruptions in Container Shipments (2006)*, (www.cbo.gov)
- Northwest Tennessee Port Authority business plans and other official documents (www.portofcateslanding.com)
- MARAD PortKit, MARAD, A. Strauss-Wieder, Inc., and CUPR at Rutgers University (www.marad.dot.gov)

Based on the aforementioned data sources and studies, the BERC procedure includes the following six (6) steps to calculate the inbound and outbound cargo volumes the port is likely to handle.

I. Extracting the value of total commodity flow from the regional IMPLAN model
II. Separating foreign exports from domestic exports and intermediate goods imports from the goods imports for household consumption
III. Estimating the share of each mode of transportation in cargo movement using 2002 commodity flow survey for Tennessee and then applying those shares to the regional export-import data
IV. Converting the total value of freight transportation for the region to tonnage by using average value of per ton freight by mode (rail and truck) for Tennessee and then applying these average values to the regional data
V. Further fine-tuning the data by estimating the freight cargo eligible for barge operations (containerized versus bulk), using national estimates from a Congressional Budget Office study to obtain freight volume by cargo type for each mode of transportation
VI. Estimating total outbound and inbound freight volume likely to go through the port

These estimates are for the freight volume currently transported by truck and rail but likely to shift to the port once it becomes operational. Chart 1 provides a visual description of the six-step process.

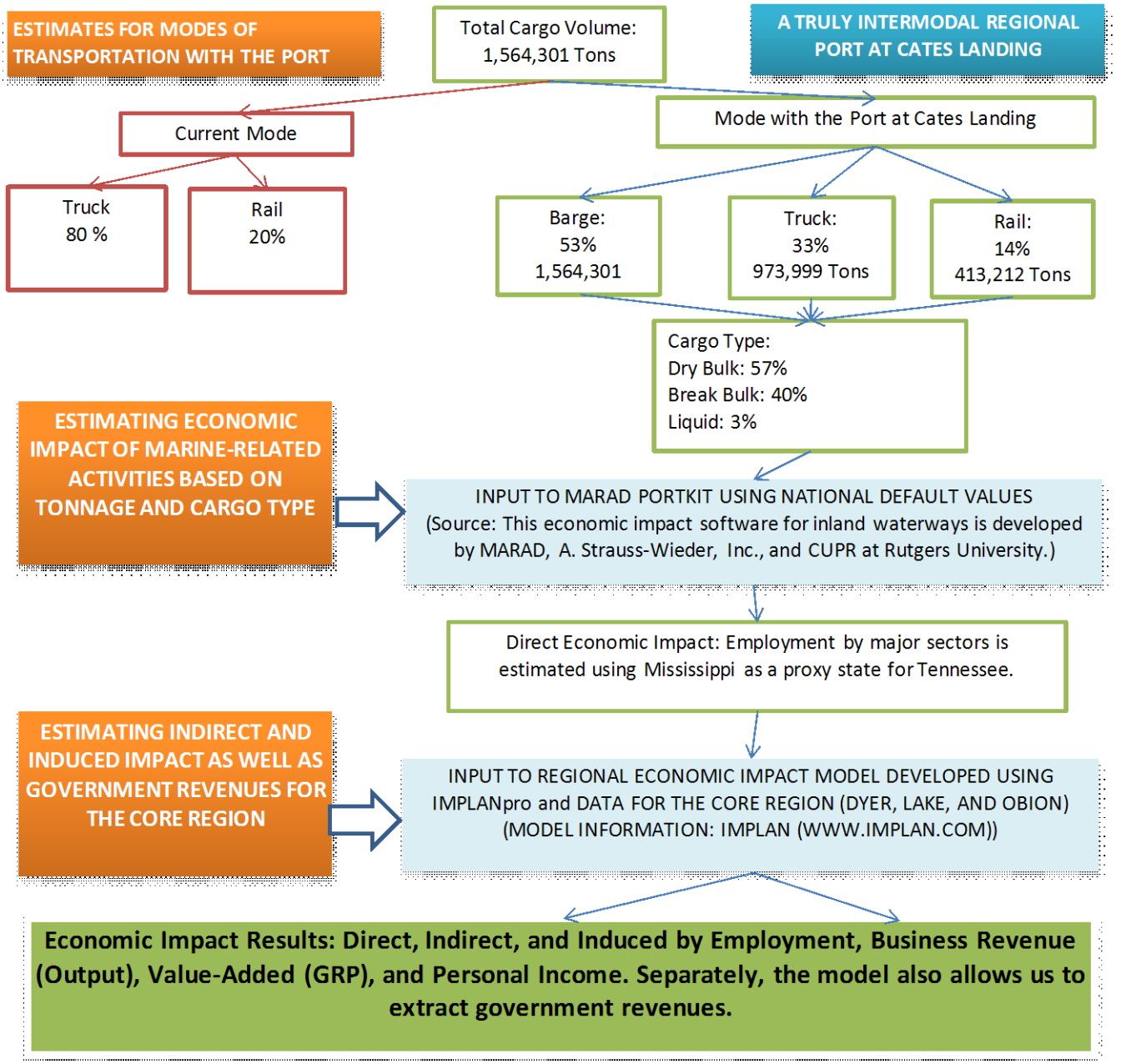
Chart 1: Estimating Cargo Volume at Cates Landing: Conceptual Framework



After calculating the current cargo volume by mode of transportation, the BERC then used the following steps (Chart 2) to calculate the economic impact of the port operation and marine-related economic activities.

I. Identify the share of each mode of transportation in a truly intermodal transportation system similar to the one proposed at Cates Landing. This involves truck to barge, rail to barge, and vice versa. The trucks involved in the intermodal transportation system are short trucks as opposed to the long trucks in the current system of transportation. The port business plan is used to derive these estimates.
II. Similarly, the port business plan is used to identify the port cargo volume by cargo type (dry bulk, break bulk, and liquid).
III. The findings in steps I and II are then used as inputs to MARAD PortKit. The BERC used the national default values for cost per ton of handling cargo and Mississippi as a proxy state for Tennessee.
IV. Step III allowed us to extract the direct employment necessary to handle nearly 1.6 million tons of cargo volume.
V. The BERC then used direct employment figures identified in Step IV as inputs to the IMPLAN regional model to calculate indirect and induced employment as well as business revenue, value-added, personal income, and government revenues.

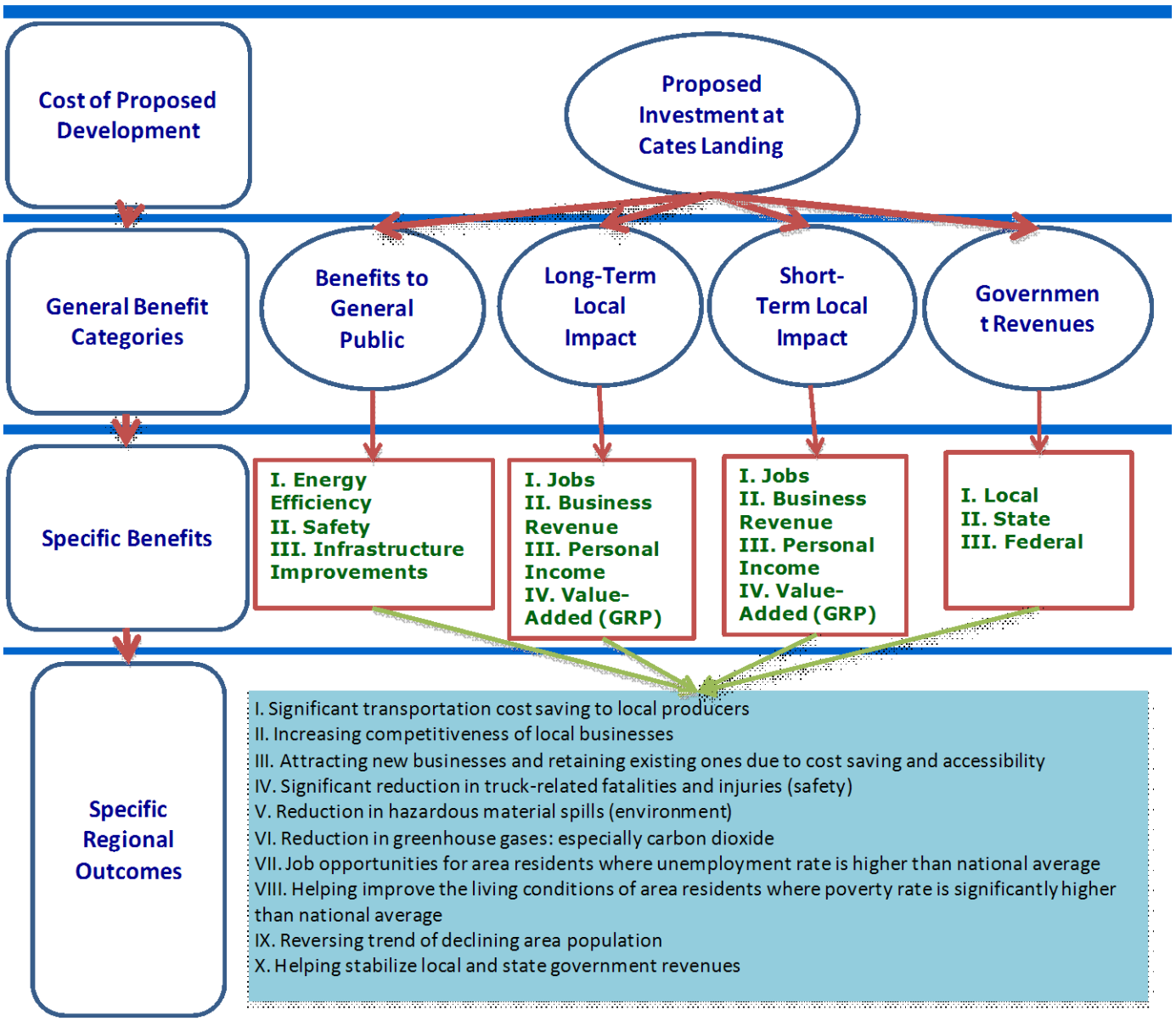
Chart 2: Estimating Cargo Volume at Cates Landing: Conceptual Framework



III.b. Benefit-Cost Analysis

A truly intermodal transportation system in northwest Tennessee will have a wide range of impact on the study region. Chart 3 provides a detailed view of benefit categories and expected regional outcomes as a result of constructing and operating the port and adjacent industrial park.

Chart 3: Analyzing the Benefits of the Proposed Investment in the NWTRP at Cates Landing



III.c. Assumptions and Data

In calculating benefit-cost analysis and economic impact figures, the BERC has developed several assumptions regarding cargo volume, marine-related employment, transportation cost savings, major industry relocation, fatality reduction, injury reduction, and "related jobs." This section briefly reviews the assumptions made and the source of data.

III.c.i. Construction

Table 5 presents a breakdown of the proposed port-related construction spending in the core region. These figures are used as inputs in the IMPLAN regional model to generate short-term employment and other regional aggregate figures. A total of nearly $35 million will be invested in the region to complete the final phase of the port's construction. This is also the amount the Northwest Tennessee Regional Port Authority is requesting in its grant application.

Table 5:
Northwest Tennessee Regional Port at Cates Landing and Industrial Park
Construction Phase: Construction Spending by Major Sectors
(Data Source: Northwest Tennessee Regional Port Authority)

I.	Professional Services	$1,652,685
II.	Construction	$29,031,072
III.	Inspection & Testing	$768,691
IV.	Government	$142,155
V.	Real Estate	$1,665,847
VI.	Legal	$665,497
VII.	Water Transportation	$315,900
VIII.	Banking/Insurance	$526,500
IX.	Grand Total	$34,768,347

Note: Contingency amount of $1,750,000 is allocated across construction-related spending items based on their share in total proposed construction-related spending.

III.c.ii. The Port and Industrial Park

The build-out scenario involving the port and adjacent industrial park requires a series of assumptions regarding both marine-related employment and the tenants of the industrial park. As previously mentioned in the context of Chart 2, the marine-related direct employment figures are primarily driven by the total cargo volume that will flow through the port and estimated by using MARAD PortKit. However, the employment estimates for non-marine related but somewhat port-dependent industrial park tenants required a comprehensive assessment of several ports located along the inland waterways. The BERC emphasized among other factors the type of industries in

the industrial park, the number of jobs, industrial park occupancy rates, and total acreage of industrial parks.

Table 6 below presents the results of a review of several studies of industrial parks adjacent to an inland waterway port. The information in Table 6 allows us to develop scenarios regarding the likely occupancy rate of the proposed industrial park, the type of industrial park tenants, and the number of jobs involved. The estimates presented in the subsequent tables (especially Table 8) may be considered conservative, as we assigned lower-range employment figures to the potential industrial park tenants.

Table 6:
Northwest Tennessee Regional Port at Cates Landing and Industrial Park—
Industrial Park Background Assumptions
(Data Source: Missouri Ports, International Port of Memphis, Colliers, and other Web sources)

I. Assumptions and Background			***Year***
IA. Industrial Occupancy Rate for Northwest Memphis		80%	2008
IB. New Madrid County and Pemiscot County Port Authorities			2007
1. Total acreage	163		
1. Percent of acreage occupied	71.78		
2. Average employment per occupied acre	1.72		
IC. Port of Shreveport-Bossier (Foreign Trade Zone)			2009
1. Industrial park acreage (estimated)	1000		
2. Percent of acreage occupied	50%		
3. Number of tenants	14		
ID. Duluth Seaway Port Authority (BERC estimates)			2009
1. Number of tenants	16		
2. Number of employees	394		
3. Average number of employees per tenant	24.63		
4. Estimated acreage	220		
5. Employment per acreage	1.79		
IE. Industries are downsizing to cut costs.			
1. Employment density per acre is likely to be less now than in 2007.			
IF. Foreign Trade Zone designation is likely to attract more businesses to the industrial park.			
II. The Port Authority and Industrial Park are not independent of each other.			
IIA. Industrial park is not likely to exist without the Port Authority.			
III. Likely businesses in the industrial park (based on review of businesses in similar port locations):			
1. Warehousing and Distribution			
2. Transportation (Truck and Rail)			
3. Packaging			
4. Paper and Packaging			
5. Petroleum Distribution			
6. Steel and Plastic Fabrication and Distribution			
7. Scrap Smelting			
8. Wood Treating			
9. Towing and Repair Services			

Based on a review of industrial park tenants across several inland waterway ports, the BERC estimated that once the port becomes operational, seven (7) to 10 companies will move to the industrial park, creating an estimated 203 jobs and occupying about 35 percent of the available industrial park space. Table 7 highlights the industrial park occupancy rate and employment by the type of industrial park tenants.

Table 7:
Northwest Tennessee Regional Port at Cates Landing and Industrial Park—
Industrial Park Employment Estimates
(Data Source: Missouri Ports, International Port of Memphis, Colliers, and other Web sources)

Based on the assumptions in Table 6, the BERC's employment projection for the industrial park in the medium term (three years after the port becomes operational) is presented below. It is important to bear in mind that these estimates are conservative and may be construed as an absolute minimum. As the port receives its Foreign Trade Zone designation, the interest in the industrial park is likely to increase.

Port-Dependent Industrial Park Tenants*	***Estimated Employment***	***Industrial Park (Acreage) (Occupancy Rate)***
I. Packaging	20	5% (two companies)
II. Towing and Repair Services	50	10% (one company)
III. Scrap Metal Handling Facilities	40	10% (two companies)
IV. Steel and Plastic Fabrication and Distribution	18	5% (two companies)
V. In-Transit Warehousing/Distribution/Packagin	75	5% (one company)
Total Employment	203	35% (Eight Companies)
Industrial Park Vacancy Rate		20%-30% Vacancy Rate

*Number, type, and size of companies in this section are based on a detailed analysis of the port tenants of two inland ports: Shreveport-Bossier and Duluth Seaway.

Duluth Seaway Port Authority

1. 45 million net tons annually
2. Principal Cargos: Coal (40%), Ore (40%), Grain (10%)
3. Foreign Trade

Shreveport-Bossier

1. Foreign Trade Zone and Enterprise Zone
2. Access to Red River, Mississippi River, and Gulf of Mexico
3. Multi-modal
4. Annual tonnage (2008): 800,000
5. Acres: 2,100

As highlighted as part of the procedural steps in estimating economic impact in Chart 2, the marine-related employment figures are obtained inputting the total cargo volume information to the MARAD PortKit using national default values for the cost of handling one (1) ton of cargo. Table 8 presents direct employment figures by industry type. A total of 783 direct permanent jobs will be created across more than 10 sectors in the region's economy. This magnitude of job creation not only benefits area residents but also increases much-needed economic diversity in the study area counties. These marine-related businesses are likely to occupy somewhere between 20 and 35 percent of the industrial park space.

Table 8:
Northwest Tennessee Regional Port at Cates Landing and Industrial Park
Port Operation/Marine-Related Employment Estimates
(Data Source: Direct employment figures extracted from the MARAD PortKit using 1.6 million tons of cargo volume)

Port Operation/Marine-Related	***Estimated Employment***	***Industrial Park (Acreage) (Occupancy Rate)***
I. Agricultural Services	1	
II. Petroleum and Coal Production	6	
III. Railroad Transportation	8	
IV. Trucking and Warehousing	159	
V. Water Transportation	310	
VI. Electric, Gas, and Sanitary Services	1	
VII. Wholesale-Nondurable Goods	9	
VIII. Food Stores	2	
IX. Personal Services	1	
X. Business Services	265	
XI. Health Services	1	
XII. Government	20	
Total Employment/Occupancy	783	20%-35%
Industrial Park		20%-30% Vacancy Rate

III.c.iii. Industry Relocation Assumptions

In addition to the industrial park tenants, the BERC developed a "what-if" scenario based on the review of more than 10 letters of interest from major businesses indicating they seriously considered Cates Landing as their next home but chose elsewhere because the port is not operational. Given these letters of interest, the BERC assumes that once the port becomes operational and receives Free Trade Zone designation, a major industry will relocate to the area with an average investment of $550 million and 300 permanent jobs. Table 9 summarizes the

letters of interests from the selected companies, their proposed investment level, and the number of permanent jobs involved.

Table 9:
Northwest Tennessee Regional Port at Cates Landing and Industrial Park
What-if Scenario: Relocating a Major Industry to the Area
(Data Source: Based on the actual letters of interest sent to the Port officials between 1995 and 2008)

Name of Company	Type	Proposed Investment	Jobs Involved	Date	Reason for not choosing
I. Excalibar Minerals	Processor and Supplier of Industrial Mineral		50	5-Apr-02	The Port is not ready
II. LALLEMAND		$250 million	48	4-Apr-02	The Port is not ready
III. Renewable Agricultural Energy, Inc.			250	8-Aug-06	
IV. River BioEnergy**	Food Grade Ethanol Plant	$477 million	250	30-Jan-07	The Port is not ready
V. Reelfoot Ethanol	Food Grade Ethanol Plant	$300 million	250	11-Oct-06	
VI. Nucor Steel*	Steel Mill	$800 million	300	18-Dec-97	The Port is not ready
VII. WARFAB	Steel Plate Mill	$800 million	500	7-Sep-07	
VIII. IPSCO	Steel Mill	$800 million	300		
IX. ConAgra	Starch Plant	$155 million	275		The Port is not ready

Inquiries from Two Types of Businesses			*Average*	
	Investment	***Employment***	*Investment*	*Employment*
1. Steel Mill	$800 million	370	$550 Million	300
2. Agriculture/Renewable Energy	$300 million	215		

* Employment range in current steel mills of Nucor across the U.S.: 250-499
**Employment range in ethanol plants: 20-59
In some instances, the range is between 50 and 99
A few of them employ between 100 and 250

III.c.iv. Basic Cargo Assumptions and Data

Following the steps discussed in Box 1 and Charts 1 and 2, the BERC estimated total tonnage of foreign exports suitable for the barge operation for the core and surrounding regions separately. Similarly, total tonnage of intermediate goods imports is estimated. Tables 10 and 11 below report the estimated data by region and type (exports/imports). To give a quick guide to the tables, global assumptions IA and IB apply to both foreign exports and intermediate goods imports. The label "CL Share (Tons)" in the last column of the data tables refers to the adjusted cargo volume suitable for Cates Landing. The adjustments were made to the manufacturing exports and imports data using bulk cargo ratios reported in Table 10 under the "II. Foreign Exports (Outbound—Manufacturing" for the former and in Table 11 under the "III. Intermediate Goods Imports (Inbound)—Manufacturing" for the latter.

Table 10:
Foreign Exports- Cargo Assumptions

(Data Source: IMPLAN, 2002 Commodity Flow Survey, IHS et al.(2009),* Congressional Budget Office (2006), The Port Authority Business Plan)

I. Global Assumptions

IA. Cargo Transportation (Current)

Mode	Share	*With the Port* Share
Truck	80%	33%
Rail	20%	14%
Barge	0%	53%

IB. Value per Ton (Current) (2007)

Mode	Value per Ton ($)
Truck	$1,356
Rail	$351

II. Foreign Exports (Outbound)-Manufacturing

Types of Cargo	Mode of Transportation (%)	
	Truck	Rail
Bulk	55	36
Containerized	45	64

CL core region foreign exports (FEX) (ton)

(80% Truck/20%Rail)	Truck	Rail	Tons	CL Share (Ton)
Cotton	10,681	10,316	20,997	20,997
Forestry & Logging	1,128	1,089	2,217	2,217
Manufacturing	354,185	342,076	696,261	317,944
Mining	0	0	0	0
Scrap	3,426	3,309	6,735	6,735
Grains and Oilseeds	28,081	27,121	55,203	55,203
Grand Total	397,501	383,911	781,412	403,095

Surrounding region foreign exports (FEX) (ton)

(80% Truck/20%Rail)	Truck	Rail	Ton	CL Share (Ton)
Cotton	47,576	45,950	93,526	93,526
Forestry & Logging	756	730	1,486	1,486
Manufacturing	147,515	142,471	289,986	132,422
Mining	2,283	2,205	4,488	4,488
Scrap	5,479	5,292	10,771	10,771
Grains and Oilseeds	33,741	32,588	66,329	66,329
Grand Total	237,350	229,235	466,585	309,021

*IHS (2009): A study by IHS Global Insight, Wilbur Smith Associates, and the University of Memphis, entitled "The Memphis Regional Infrastructure Plan," for the Memphis Regional Chamber. The study cites Cates Landing several times as a port whose completion should be among the top priorities of the authorities for a better regional transportation system.

According to BERC estimates, total Cates Landing throughput is 1,564,301 tons. The type of throughput reported here includes foreign exports and intermediate goods imports, for which transportation cost saving is critically important for businesses to remain globally competitive.

Table 11:
Intermediate Goods Import- Cargo Assumptions
(Data Source: IMPLAN, 2002 Commodity Flow Survey, IHS (2009), Congressional Budget Office (2006), The Port Authority Business Plan)

III. Intermediate Goods Imports (Inbound)-Manufacturing

Types of Cargo	Mode of Transportation (%)	
	Truck	Rail
Bulk	37	13
Containerized	63	87

Total (Inbound and Outbound) CL Throughput (Tons)

Commodity	Core	Surrounding	Total
Cotton	21,470	95,261	116,731
Forestry &	64,700	9,611	74,310
Manufactu	719,216	461,411	1,180,627
Mining	9,295	24,306	33,600
Scrap	7,703	11,261	18,964
Grains and	61,717	78,351	140,068
Total	884,101	680,200	1,564,301

CL core region imports (intermediate goods) (ton)

(80% Truck/20%Rail)	Truck	Rail	Tons	CL Share (Ton)
Cotton	240	232	473	473
Forestry & Logging	31,785	30,698	62,483	62,483
Manufacturing	809,731	782,048	1,591,780	401,267
Mining	4,728	4,566	9,295	9,295
Scrap	493	476	968	968
Grains and Oilseeds	3,314	3,201	6,515	6,515
Grand Total	850,291	821,222	1,671,513	481,000

Surrounding region imports (intermediate goods) (ton)

(80% Truck/20%Rail)	Truck	Rail	Tons	CL Share (Ton)
Cotton	883	852	1,735	1,735
Forestry & Logging	4,133	3,992	8,125	8,125
Manufacturing	663,880	641,183	1,305,063	328,989
Mining	10,081	9,737	19,818	19,818
Scrap	249	241	490	490
Grains and Oilseeds	6,115	5,906	12,022	12,022
Grand Total	685,342	661,911	1,347,253	371,179

III.c.v. Transportation Cost-Saving Assumptions

Transportation cost savings associated with the port operation are a critically important part of the benefit-cost analysis of the proposed investment. The assumptions and estimates regarding the transportation cost savings will be used to calculate the benefit-cost ratio. Table 12 below summarizes the cost-saving assumptions along with the calculations of average annual cost savings by the core and surrounding-area businesses. The calculations in the table are based on two scenarios:

- Current transportation system labeled as "Current Transportation Mode," and
- Intermodal transportation system labeled as "Transportation Mode with the Port."

The difference between the mode with the port and the current mode is used for all benefit types attributable to a shift in transportation mode from the current mode (single mode) to a truly intermodal transportation system.

Some general assumptions highlighted in the table are as follows:

- We assume that current cargo volume breakdown by mode for Tennessee holds for the study region: Truck – 80 percent; and Rail – 20 percent.
- We assume that share of each mode in the intermodal transportation system will be as follows: Truck – 33 percent; Rail – 14 percent; and Barge – 53 percent (estimated from the port business plan and tariff schedule).
- We assume that all trucks return 100 percent empty.

- Ton-miles per gallon figures used, presented in Box B, Table 12, are from a national study done by Center for Ports and Waterways, Texas Transportation Institute, College Station, Texas.
- Percentages of cargo types with the port are provided by the Northwest Tennessee Regional Port Authority and presented in Box C, Table 12.
- Box A includes the following calculations:
  - Tons = actual tons
  - Ton-miles = tons X distance (distance to/from Cates Landing)
  - Units = tons X tons per unit by mode
  - Vehicle Mile Traveled (VMT) = 2 X (distance to/from X tons)
  - Fuel (Gallon) = ton-miles/ton-miles per gallon
- Box D, Table 12, gives the dollar value of annual transportation savings due to modal shift.

Table 12: Cost Saving Assumptions and Societal Benefits

Distance to CL (From Dyersburg and Union City): 27.5 miles
Distance to Memphis (Dyersburg and Union City): 96.5 miles
Distance to CL (From Weakley, Gibson, Crockett, and Lauderdale): 50 miles
Distance to Memphis (From Weakley, Gibson, Crockett, and Lauderdale): 95 miles

Current Transportation Mode		**A**			
Core Region	Tons	Ton-Miles	Units	VMT	Fuel (Gallons)
Truck	707,281	136,505,194	56,582	5,460,208	880,679
Rail	176,820	17,063,149	1,607		41,315
Barge	0	0	0		0

Transportation Mode with the Port		**A**			
Core Region	Tons	Ton-Miles	Units	VMT	Fuel (Gallons)
Truck	550,478	30,276,290	44,038	1,211,052	195,331
Barge	884,101	79,569,090	497		138,141
Rail	233,536	6,422,240	2,123		15,550

Current Transportation Mode		**A**			
Surrounding Region	Tons	Ton-Miles	Units	VMT	Fuel (Gallons)
Truck	544,160	103,390,400	43,533	4,135,616	667,035
Rail	136,040	12,923,800	1,237		31,292
Barge	0	0	0		0

Transportation Mode with the Port		**A**			
Surrounding Region	Tons	Ton-Miles	Units	VMT	Fuel (Gallons)
Truck	423,521	42,352,100	33,882	1,694,084	273,239
Barge	680,200	61,218,000	382		106,281
Rail	179,676	8,983,800	1,633		21,753

Average Decline in Per-Ton Transportation Cost of Local Businesses			
Region	Current $/ton	With the Port $/Ton	% Decline in Cost/Ton
Core Region	2.66	1.01	-62.14
Surrounding Region	2.61	1.50	-42.54
Total	2.64	1.22	-53.69

VMT= Vehicle Miles Travel Truck= 100 % empty return	**B**		
Ton-Miles per Gallon	Tons per Unit		Ton-Miles/Gallon
Truck	25		155
Barge	1750	(Liquid=3935)	576
Rail	110		413

Cargo Type with the Port	**C**
Dry Bulk	57%
Break Bulk	40%
Liquid	3%

Energy Information Administration (Midwest Region)
(http://tonto.eia.doe.gov)
Diesel (cents per gallon) (week of August 3rd) 254.7

Annual Transportation Saving			
Region	Gallons Saved	Price per Gallon	Total Saved(Cents)
Core Region	572,972	254.7	145,935,944
Surrounding Region	297,054	254.7	75,659,701
Total	870,026	254.7	221,595,645

Annual Transportation Savings to Producers		**D**
Region	Total Saved($)	$/ton
Core Region	$1,459,359	$1.65
Surrounding Region	$756,597	$1.11
Total	$2,215,956	$1.42

Source: The BERC's calculations are based on national figures estimated by the Center for Ports and Waterways in a study titled "A Modal Comparison of Domestic Freight Transportation Effects on the General Public" (2009).