Mississippi River Valley Division,
Regional Planning and Environment Division South

Port of Rosedale Feasibility Study

Appendix E - Economic and Social Consideration

June 2024

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Section 1
Introduction

1.1 PROJECT AREA

The project is located on the Mississippi River, approximately 2 miles south of Rosedale, Mississippi, on the left descending Mississippi River bank at River Mile 585. The Port of Rosedale (POR) has 168 acres of hydraulic fill for marine related industries, a general cargo dock, and dry-bulk unloading and loading docks. Two private docks are also located at the POR, as well as a major towing company on the Arkansas Navigation System. The channel itself is approximately 3.3 miles long with a depth of 9 feet (Figure 1).

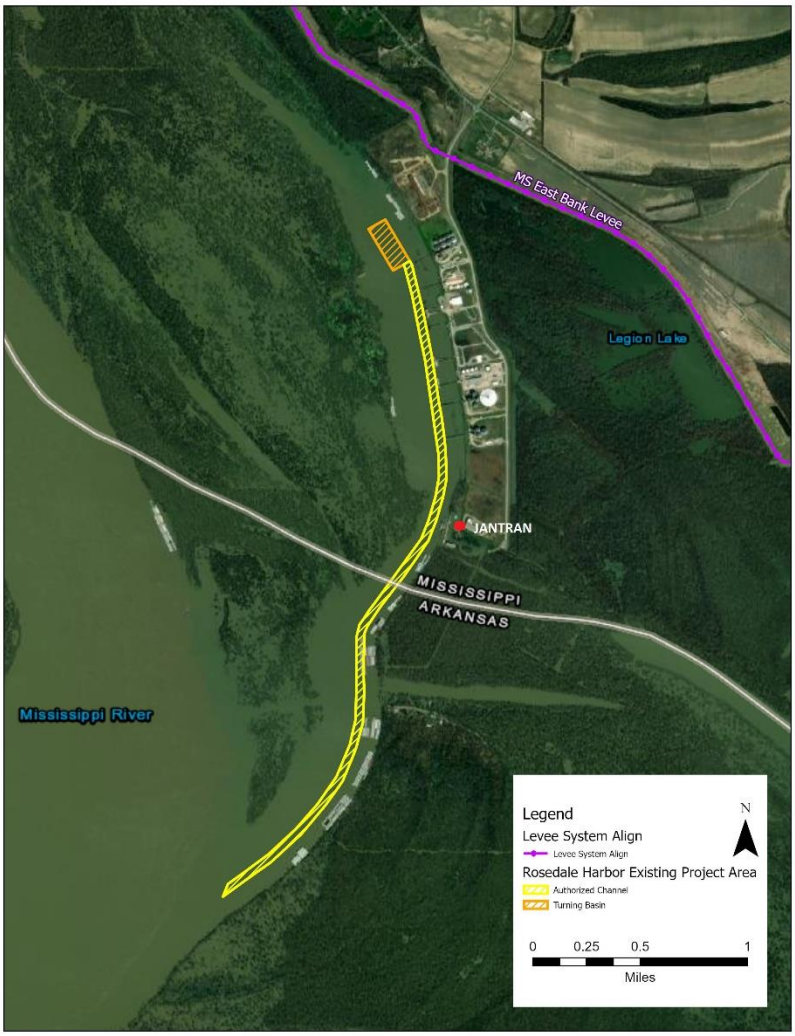

Figure 1. Project Area

Once the Lower Mississippi River (LMR) reaches 10 feet on the Arkansas City gauge, port tenants are forced to move their entire fleet of barges from the channel out to shorelines on the LMR. The channel in which the port tenants are located in the POR becomes just wide enough to hold the drydock and floating work barges with enough room for only a harbor boat and one barge to pass by. Unfortunately, this low water season coincides with the "peak season" that occurs during harvest time (August – November), incurring the additional cost of fleeting vessels along the Mississippi River instead of in the channel.

1.2 HINTERLAND

1.2.1 Overview

An intermodal facility, the POR is strategically located only 100 miles from Memphis and within a 500-mile radius of major markets including Houston, Atlanta, Birmingham, New Orleans, Nashville, Atlanta, and Houston. It offers access to both the LMR and the Arkansas River navigation systems (Figure 2).

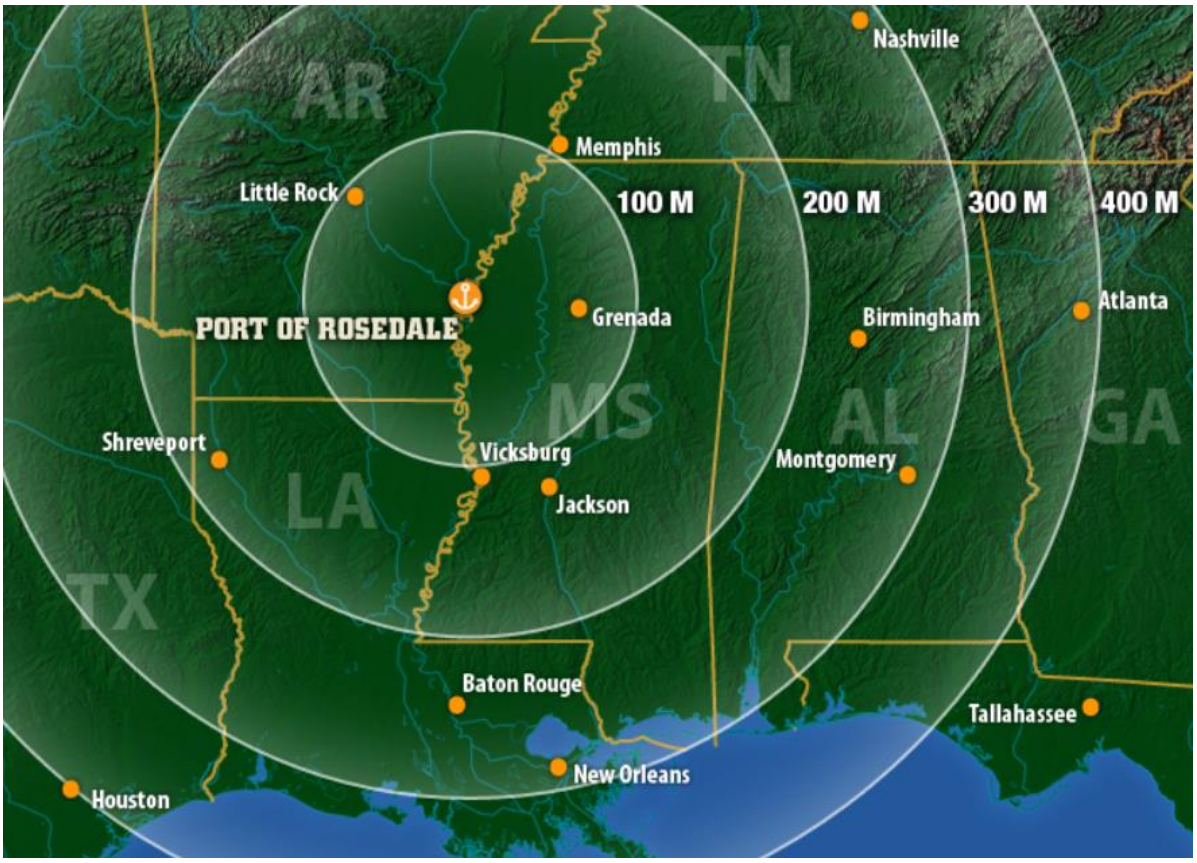

Figure 2. Major Market Radius

1.2.2 Waterway Access

The POR's location at mile 585 AHP[1] on the LMR offers five-day river transport to New Orleans for import/export as well as shipment to domestic markets. Additionally, the POR is located less than 15 miles from the McClellan–Kerr Arkansas River Navigation System (MKARNS), an inland waterway system originating at the Tulsa Port of Catoosa and running southeast through Oklahoma and Arkansas to the Mississippi River (Figure 3).

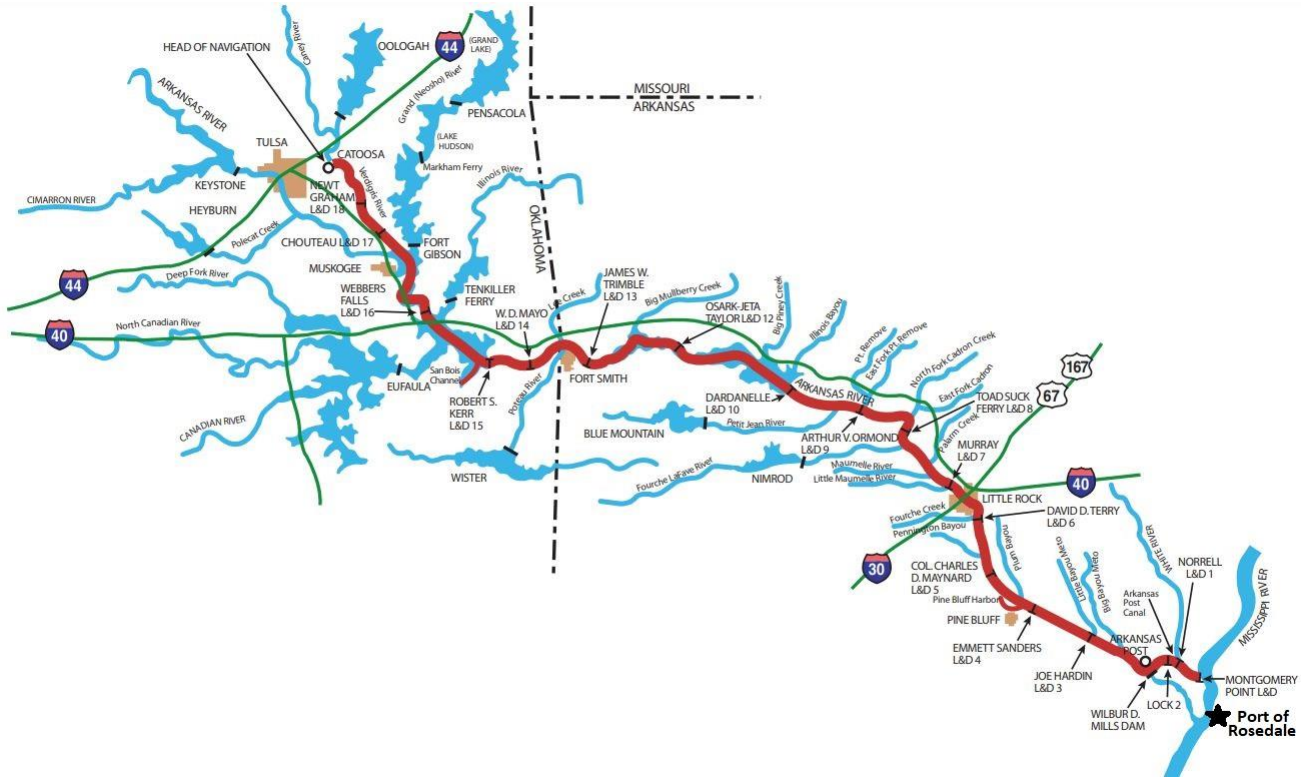

Figure 3. McClellan–Kerr Arkansas River Navigation System

1.2.3 Road Network

Quick north/south/east connections are available via Mississippi Highway 1 (MS-1) and Mississippi Highway 8 (MS-8). Running parallel to the Mississippi River, MS-1 connects to the Helena Bridge which crosses the Mississippi River between Helena, AR, and Lula, MS, a little over 50 miles north of Rosedale. MS-1 also connects to U.S. Highway 82 (US-82) in Greenville, MS, 40 miles to the south. An east-west state highway, MS-8 runs 168 miles from Rosedale through Aberdeen, MS, near the Alabama border. More notably, it connects to Interstate 55 (I-55) in Grenada, MS, about 75 miles to the east. Interstate 20 (I-20) can also be reached at Jackson, MS, about 114 miles south of Grenada, MS. Both major interstate highway systems allow for convenient long-haul truck shipments to and from the POR (Figure 4).

[1] Above Head of Passes

MISSISSIPPI
Road Map
TENNESSEE
ARKANSAS
LOUISIANA
ALABAMA
Hom Lake
Olive Branch
Corinth
Ashland
Iuka
Hernando
Tunica
Senatobia
Holly Springs
Ripley
Booneville
New Albany
Sardis
Oxford
Tupelo
Marks
Pontotoc
Fulton
Clarksdale
Water Valley
Charleston
Sumner
Pittsboro
Okolona
Rosedale
Coffeeville
Houston
Aberdeen
Grenada
Cleveland
Walthall
West Point
Greenwood
Carrollton
Greenville
Indianola
Winona
Starkville
Columbus
Vaiden
Ackerman
Belzoni
Lexington
Kosciusko
Louisville
Macon
Rolling Fork
Mayersville
Yazoo City
De Kalb
Carthage
Canton
Philadelphia
Madison
Ridgeland
Decatur
Vicksburg
Clinton
Jackson
Forest
Meridian
Raymond
Pearl
Brandon
Raleigh
Paulding
Port Gibson
Quitman
Hazlehurst
Mendenhall
Bay Springs
Fayette
Laurel
Waynesboro
Brookhaven
Prentiss
Collins
Natchez
Ellisville
Meadville
Monticello
Hattiesburg
Columbia
New Augusta
Leakesville
Woodville
Magnolia
Purvis
Liberty
Tylertown
Poplarville
Wiggins
Lucedale
Picayune
Ocean Springs
Gautier
Gulfport
Biloxi
Moss Point
LEGEND
State Boundary
Interstate Highway
US Federal
State Highway
City
0
50 Km
0
25 Miles

Figure 4. Mississippi Road Map

Section 2
Existing Conditions

2.1 SOCIOECONOMIC

The socioeconomics of the communities in the study area are summarized in this section. The study area includes four counties in Mississippi and one county in Arkansas that may be directly impacted by the project. The parameters used to describe the demographic and socioeconomic environment include recent trends in population, employment, and wage earnings by sectors. Other social characteristics such as race, age distribution, and poverty are also examined.

2.1.1 Population

Mississippi and Arkansas rank as the 34th and 33rd largest states in the Union, respectively, in terms of resident population as of the 2020 United States census.

Between the years of 1990 and 2020, Mississippi's population increased by 16 percent from 2.6 million to 3.0 million persons, or about half of the national average of 31 percent. Across the four Mississippi counties during that same time period, a 27 percent reduction in growth was observed indicating significant decreases in population.

The state of Arkansas saw its population grow from 2.4 million to 3.0 million persons in the years 1990 to 2020, an increase of 28 percent that is much closer to the 31 percent national average. Desha County, however, experienced a very large dip (-31%) as its population dropped from 16,798 in 1990 to 11,538 persons in 2020 (Table 1).

Table 1. Population Trends for Selected Mississippi and Arkansas Counties – 1990 to 2020

County/City	Population				Percentage Change			
	1990	2000	2010	2020	1990 to 2000	2000 to 2010	2010 to 2020	1990 to 2020
United States	**248,709,873**	**281,421,906**	**308,745,538**	**326,569,308**	**13%**	**10%**	**6%**	**31%**
Mississippi	**2,573,216**	**2,844,658**	**2,967,297**	**2,981,835**	**11%**	**4%**	**0%**	**16%**
Bolivar County	41,875	40,633	34,145	31,253	-3%	-16%	-8%	-25%
Rosedale	2,595	2,414	1,873	1,855	-7%	-22%	-1%	-29%
Cleveland	15,384	13,841	12,334	11,363	-10%	-11%	-8%	-26%
Coahoma County	31,665	30,622	26,151	22,685	-3%	-15%	-13%	-28%
Clarksdale	19,717	20,645	17,962	15,342	5%	-13%	-15%	-22%
Sunflower County	32,867	34,369	29,450	25,759	5%	-14%	-13%	-22%
Indianola	11,809	12,066	10,683	9,258	2%	-11%	-13%	-22%

Washington County	67,935	62,977	51,137	45,072	-7%	-19%	-12%	-34%
Greenville	45,226	41,633	34,400	29,854	-8%	-17%	-13%	-34%
Arkansas	**2,350,725**	**2,673,400**	**2,915,918**	**3,011,873**	**14%**	**9%**	**3%**	**28%**
Desha County	16,798	15,341	13,008	11,538	-9%	-15%	-11%	-31%
Dumas	5,520	5,238	4,706	3,850	-5%	-10%	-18%	-30%

Source: American Community Survey, Demographic Characteristics, 2020 5-Year Estimates

2.1.2 Employment

Mississippi employment in 2020 totaled about 1.2 million. Of the major industry sectors within the state, the educational services and health care and social assistance sector employs the most persons at 316,000. This industry is followed by manufacturing (164,000) and retail trade (140,000).

Arkansas employment in 2020 totaled about 1.3 million. Similar to Mississippi, the greatest number of workers are found in the educational services and health care and social assistance sector and total 322,000. The next largest sectors are manufacturing and retail at 175,000 and 171,000 workers, respectively.

The proportions of workers per sector in the counties in the study area fairly parallel what is observed at the state level (Table 2).

Table 2. Employment by Industry – 2020

Industry	United States	Mississippi	Bolivar County	Coahoma County	Sunflower County	Washington County	Arkansas	Desha County
Agriculture, forestry, fishing and hunting, and mining	2,658,413	28,694	694	405	532	420	35,004	485
Construction	10,416,196	83,156	548	312	324	923	90,504	179
Manufacturing	15,617,461	163,939	1,059	759	724	1,482	175,414	550
Wholesale trade	3,971,773	29,983	238	103	291	410	32,037	183
Retail trade	17,195,083	140,140	1,443	864	881	3,028	170,961	512
Transportation and warehousing, and utilities	8,576,862	81,316	419	286	453	1,158	77,392	147
Information	3,066,743	14,477	96	34	91	363	18,007	40
Finance and insurance, and real estate and rental and leasing	10,319,201	56,316	307	242	357	584	64,276	184
Professional, scientific, and management, and administrative and waste management services	18,312,454	86,231	903	235	250	1,018	100,720	249
Educational services, and health care and social assistance	36,315,080	316,357	3,470	2,380	2,526	4,309	321,734	1,085
Arts, entertainment, and recreation, and accommodation and food services	14,651,909	117,848	757	1,272	903	1,798	103,098	178
Other services, except public administration	7,516,616	58,887	391	309	398	751	63,059	177
Public administration	7,271,189	65,751	623	539	701	934	57,542	408
TOTAL	**155,888,980**	**1,243,095**	**10,948**	**7,740**	**8,431**	**17,178**	**1,309,748**	**4,377**

Source: American Community Survey, Economic Characteristics, 2020 5-Year Estimates

2.1.3 Median Household Income for Selected Counties

Median household incomes for the five counties in 2020 are shown in Table 3. The average median household income across the four Mississippi counties is $31,675, which is much lower than the state median of $46,511 and the national median of $64,994. Likewise, the median household income of Desha County in Arkansas at $31,855 is below the state median of $49,475 as well as that of the nation.

Table 3. Median Household Income – 2020

Geography	Median Household Income	% of State Median Household Income	% of National Median Household Income
United States	**$ 64,994**	**-**	**-**
Mississippi	**$ 46,511**	**-**	**72%**
Bolivar County	$ 32,412	70%	50%
Coahoma County	$ 30,761	66%	47%
Sunflower County	$ 31,515	68%	48%
Washington County	$ 32,011	69%	49%
Arkansas	**$ 49,475**	**-**	**76%**
Desha County	$ 31,855	64%	49%

Source: American Community Survey, Economic Characteristics, 2020 5-Year Estimates

As shown in Table 4, the unemployment rates range from 5.0 percent (Desha County) to 12.0 percent (Coahoma County). The average rate of 10.1 percent across the four Mississippi counties is higher than the rate of 7.1 percent for the state and nearly double that of the national rate of 5.4 percent. Desha County's unemployment rate, however, is below both that of Arkansas (5.2%) and the nation.

Table 4. Unemployment Rate – 2020

Geography	Unemployment Rate
United States	5.4%
Mississippi	7.1%
Bolivar County	7.4%
Coahoma County	12.0%
Sunflower County	11.0%
Washington County	10.1%
Arkansas	5.2%
Desha County	5.0%

Source: American Community Survey, Economic Characteristics, 2020 5-Year Estimates

2.1.4 Race

In 2020 the majority populations of both Mississippi and Arkansas are characterized as "White," though Arkansas's is much higher at 75 percent and is closer to the national average of 70 percent compared to Mississippi's 58 percent.

The next largest population for both states is the "Black or African American" population. Mississippi's "Black or African American" population percentage at 38 percent is nearly three times that of the national average (13%); Arkansas's "Black or African American" population at 15 percent is much closer to the national average. All four of the Mississippi counties' "Black or African American" population percentages are very high (64% – 77%) compared to that of the nation, and Desha County's 47 percent is a little less than four times the national percentage.

"Asian" population percentages across both states and counties are less than the national average of 6 percent. Additionally, the "Hispanic or Latino" population percentages for both states and counties are well below the national average of 18 percent with Desha County being the closest at 6 percent (Table 5 and Table 6).

Table 5. Racial Composition (Number) – 2020

Race	United States	Mississippi	Bolivar County	Coahoma County	Sunflower County	Washington County	Arkansas	Desha County
White	229,960,813	1,729,353	10,101	4,711	6,297	11,326	2,269,959	5,631
Black or African American	41,227,384	1,123,545	20,068	17,465	19,069	32,445	457,840	5,471
American Indian & Alaska Native	2,688,614	13,951	46	75	60	21	19,146	40
Asian	18,421,637	29,742	235	109	7	306	46,130	46
Native Hawaiian & Other Pacific Islander	611,404	1,215	-	-	-	-	10,455	-
Some other race	16,783,914	33,999	496	124	99	468	88,363	176
Two or more races	16,875,542	50,030	307	201	227	506	119,980	174
Hispanic or Latino[2]	59,361,020	94,342	689	357	483	756	229,629	734
TOTAL	**326,569,308**	**2,981,835**	**31,253**	**22,685**	**25,759**	**45,072**	**3,011,873**	**11,538**

Source: American Community Survey, Demographic Characteristics, 2020 5-Year Estimates

Table 6. Racial Composition (Percentage) – 2020

Race	United States	Mississippi	Bolivar County	Coahoma County	Sunflower County	Washington County	Arkansas	Desha County
White	70%	58%	32%	21%	24%	25%	75%	49%
Black or African American	13%	38%	64%	77%	74%	72%	15%	47%
American Indian & Alaska Native	0.8%	0.5%	0.1%	0.3%	0.2%	0.05%	1%	0.3%
Asian	6%	1%	1%	0.5%	0.0%	1%	2%	0.4%
Native Hawaiian & Other Pacific Islander	0.2%	0.04%	-	-	-	-	0.3%	-
Some other race	5%	1%	2%	0.5%	0.4%	1%	3%	2%
Two or more races	5%	2%	1.0%	1%	0.9%	1%	4%	2%
Hispanic or Latino[3]	18%	3%	2%	1.6%	2%	2%	8%	6%
TOTAL	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: American Community Survey, Demographic Characteristics, 2020 5-Year Estimates

[2] Hispanic or Latino numbers not included in TOTAL
[3] Hispanic or Latino numbers not included in TOTAL

2.1.5 Age Distribution

The age characteristics of the counties are shown in Table 7 and Table 8. The average median age across all four Mississippi counties is 36.2 years and is a year and a half less than the state median of 37.7 years. The Arkansas county of Desha has a median age of 40.8 years and is two and a half years greater than the state median of 38.3 years. The median age of the United States is 38.2 years.

Table 7. Age Characteristics (Number) – 2020

Age	United States	Mississippi	Bolivar County	Coahoma County	Sunflower County	Washington County	Arkansas	Desha County
Under 18 years	73,296,738	707,221	7,733	6,112	5,683	11,601	702,832	2,962
18 - 65 years	200,909,753	1,800,344	18,644	13,137	16,601	26,095	1,798,924	6,412
65 years and older	52,362,817	474,270	4,876	3,436	3,475	7,376	510,117	2,164
Median age	38.2	37.7	36.0	35.4	36.3	37.1	38.3	40.8
Total population	**326,569,308**	**2,981,835**	**31,253**	**22,685**	**25,759**	**45,072**	**3,011,873**	**11,538**

Source: American Community Survey, Demographic Characteristics, 2020 5-Year Estimates

Table 8. Age Characteristics (Percent) – 2020

Age	United States	Mississippi	Bolivar County	Coahoma County	Sunflower County	Washington County	Arkansas	Desha County
Under 18 years	22%	24%	25%	27%	22%	26%	23%	26%
18 - 65 years	62%	60%	60%	58%	64%	58%	60%	56%
65 years and older	16%	16%	16%	15%	13%	16%	17%	19%
Total population	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: American Community Survey, Demographic Characteristics, 2020 5-Year Estimates

2.1.6 Income and Poverty

Income and poverty data for the counties are summarized in Table 9 for 2020. Although Mississippi and Arkansas have median household income levels and per capita income less than the national average, all counties in the study area show a substantial gap when compared to that of the nation. These five counties' medium household income levels are all less than half the national average of $64,994 and their per capita income is more than $10,000 less than the national average of $35,384. Additionally, all five counties have a greater percentage of persons below the poverty level compared to the national average of 12.8 percent. Coahoma County in Mississippi has the highest percentage at 36.5 percent, while Desha County in Arkansas has the lowest percentage at 25.5 percent.

Table 9. Income and Poverty Data – 2020

Income and Poverty	United States	Mississippi	Bolivar County	Coahoma County	Sunflower County	Washington County	Arkansas	Desha County
Persons per Household	2.67	2.67	2.58	2.63	3.09	2.52	2.57	2.28
Median Household Income	$64,994	$46,511	$32,412	$30,761	$31,515	$32,011	$49,475	$31,855
Per Capita Income	$35,384	$25,444	$21,420	$19,649	$16,437	$22,181	$27,724	$19,090
Persons Below Poverty Level	12.8%	19.6%	31.1%	36.5%	30.6%	30.9%	16.1%	25.5%

Source: American Community Survey, Economic Characteristics, 2020 5-Year Estimates

2.1.7 Education

The educational attainment levels for the counties in 2020 are presented in Table 10 and Table 11. On average across the counties in the study area, 79.6 percent of persons age 25 years and older had completed high school, while 18.8 percent had a bachelor's degree or higher. These values are lower than both Mississippi's and Arkansas's high school graduate rates of 85.3 percent and 87.2 percent, respectively, as well as their bachelor's degree or higher rates of 22.8 percent and 23.8 percent, respectively. Only Bolivar County in Mississippi at 25.4 percent had a bachelor's degree or higher rate that exceeded its state rate. The national statistics for both high school and college graduates are greater than those at the state and county level at 88.5 percent and 32.9 percent, respectively.

Table 10. Educational Attainment for Persons 25 Years or Older (Number) – 2020

Education	United States	Mississippi	Bolivar County	Coahoma County	Sunflower County	Washington County	Arkansas	Desha County
High School Graduate or Higher	197,274,154	1,692,077	16,416	11,548	13,020	24,087	1,766,362	6,185
Bachelor's Degree or Higher	73,356,319	451,199	5,164	2,534	2,864	6,039	482,695	1,082

Source: American Community Survey, Social Characteristics, 2020 5-Year Estimates

Table 11. Educational Attainment for Persons 25 Years or Older (Percent) – 2020

Education	United States	Mississippi	Bolivar County	Coahoma County	Sunflower County	Washington County	Arkansas	Desha County
High School Graduate or Higher	88.5%	85.3%	80.7%	80.8%	74.9%	81.6%	87.2%	80.1%
Bachelor's Degree or Higher	32.9%	22.8%	25.4%	17.7%	16.5%	20.5%	23.8%	14.0%

Source: American Community Survey, Social Characteristics, 2020 5-Year Estimates

2.2 FACILITIES AND INFRASTRUCTURE

The POR includes a more than a 3.3-mile slack-water harbor with minimum 9 feet of draft and over a mile of turning basin. There is a general cargo dock, two dry-bulk unloading and loading docks, 168 acres of hydraulic fill for marine related industries, and a 270-acre industrial park constructed on the landside of the Mississippi River levee system.

2.2.1 Docks

General Cargo Dock: Handles a range of materials such as coil rod, coil steel, cottonseed and cottonseed hulls; lightering and shifting of cargoes is also available.

Dry-Bulk, Truck-to-Barge Loading Dock: Handles movement of all types of grain and other dry-bulk free-flowing commodities, including soybeans, rice, winter wheat, and corn.

Dry-Bulk, Barge-to-Truck Unloading Dock: Handles movement of aggregates (limestone and sandstone), fertilizer, and other dry-bulk materials.

2.2.2 Industrial Park

Available acreage is located on or near the POR slack-water harbor offering stevedoring services and access to the Mississippi River and the Arkansas River. This includes 70 acres of hydraulic fill (100-year flood-free) and 200 acres of natural elevation land adjacent to the channel.

2.2.3 Warehouse

On site is a 20,000 square-foot humidity-controlled warehouse with cargo docks on both the north and south sides.

2.2.4 Equipment

Equipment includes:

200 TPH Drag System
400 TPH Conveyor Belt
600 TPH Conveyor Belt
1,300 TPH Conveyor Belt
150-Ton Crawler crane
Three 30K Pound Forklifts
Two 10K Pound Forklifts
Department of Agriculture and Commerce certified truck scales

2.3 HISTORICAL COMMERCE

2.3.1 Total Tons

The trend for total tonnage at the POR has been relatively flat over the past 10 years ranging from 1.36 million tons in 2011 to 1.41 million tons in 2020. Average tonnage over

those 10 years is 1.31 million tons with a high of 1.44 million tons in 2019 and a low of 1.07 million tons in 2018. In general, annual shipment tonnage has been about six times greater than annual receipt tonnage over that same period. A high of 1.22 million shipment tons occurred in 2017 and a low of 900,000 shipment tons occurred in 2018; receipt tonnage saw a high of 260,000 tons in 2020 and a low of 130,000 tons in 2012 (Table 12 and Figure 5). Data was obtained through the Waterborne Commerce Statistics Center (WCSC).

Table 12. Total Tons (Receipts and Shipments)

Year	Receipts	Shipments	Total
2011	221,810	1,142,727	1,364,537
2012	132,153	1,052,157	1,184,310
2013	243,315	1,096,686	1,340,001
2014	204,869	1,175,274	1,380,143
2015	158,313	1,119,316	1,277,629
2016	173,078	1,039,243	1,212,321
2017	185,744	1,223,305	1,409,049
2018	161,208	904,977	1,066,185
2019	218,315	1,216,815	1,435,130
2020	257,393	1,155,203	1,412,596
Avg	195,620	1,112,570	1,308,190

Source: Ports and Waterways, WCSC

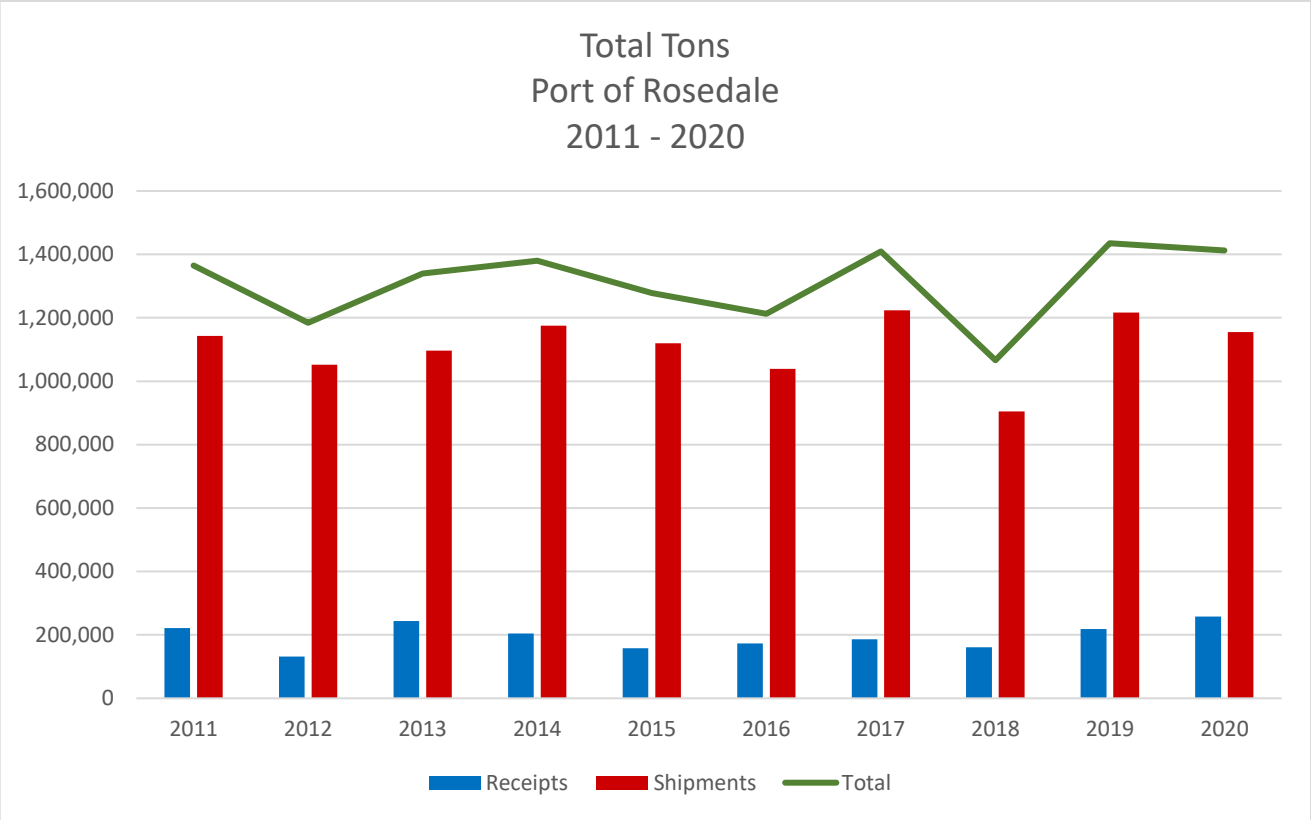

Figure 5. Total Tons (Receipts and Shipments)

Source: Ports and Waterways, WCSC

2.3.2 Commodity Tons

Food stuffs dominate the commodity mix in terms of total tonnage passing through the POR. A total of 10.8 million tons of food stuffs moved through the POR from 2011 – 2020. Over this time period, soybeans comprised the largest tonnage at 6.3 million tons followed by corn (2.0 million tons), rice (1.7 million tons), and wheat (571,00 tons). Rest of food stuffs totaled 252,000 tons.[4]

The next highest commodity group is fertilizer at 1.8 million tons. Clay and refractory materials and the "Other" category round out the bottom at 297,000 tons and 190,000 tons, respectively.[5]

Except for soybeans and fertilizer, commodities seem to be trending downward or holding steady with wheat and rice showing significant declines (Table 13 and Figure 6).

[4] Rest of food stuffs include sorghum grains, oilseeds NEC, vegetables and produce, and animal feed (prepared).
[5] Other category includes wood in the rough, limestone, gypsum, sand & gravel, waterway improvement materials, iron & steel scrap, aluminum ore, non-metal minerals NEC, I&S plates and sheets, I&S bars and shapes, and primary I&S NEC.

Table 13. Commodity Tons

Year	Wheat	Corn	Rice	Soybeans	Rest of Food Stuffs	Fertilizer	Clay & Refrac. Mat.	Other	Total Tonnage
2011	155,484	201,848	288,570	372,719	68,564	194,430	30,785	52,137	1,364,537
2012	119,068	220,509	237,286	407,420	14,093	133,779	21,670	30,485	1,184,310
2013	114,034	290,469	166,666	468,613	11,664	218,429	30,778	39,348	1,340,001
2014	52,789	212,078	170,511	673,882	44,949	189,027	24,378	12,529	1,380,143
2015	57,094	108,773	221,260	627,929	78,291	127,754	28,595	27,933	1,277,629
2016	36,875	135,778	100,626	752,931	3,807	151,968	29,131	1,205	1,212,321
2017	25,136	259,054	154,972	735,836	-	184,100	46,833	3,118	1,409,049
2018	-	219,660	60,323	588,763	1,919	157,379	35,998	2,143	1,066,185
2019	1,749	164,554	153,856	867,633	4,118	205,632	23,247	14,341	1,435,130
2020	8,285	199,904	99,979	798,623	24,631	249,304	25,582	6,288	1,412,596
Total	**570,514**	**2,012,627**	**1,654,049**	**6,294,349**	**252,036**	**1,811,802**	**296,997**	**189,527**	**13,081,901**

Source: Ports and Waterways, WCSC

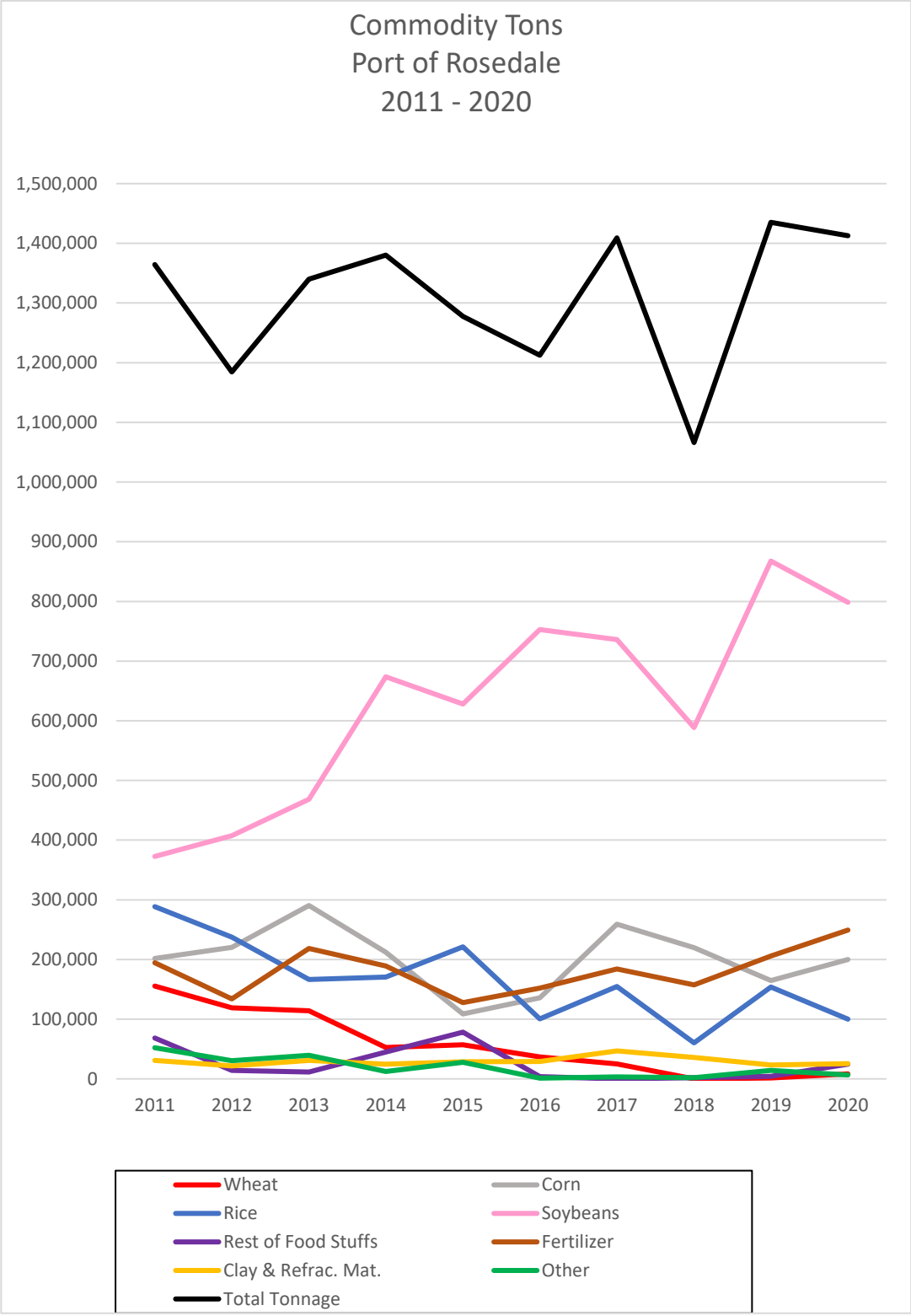

Figure 6. Commodity Tons

Source: Ports and Waterways, WCSC

2.3.3 Commodity Distribution

In terms of commodity distribution, food stuffs make up the highest percentage at 82 percent. Fertilizer is next at 14 percent followed by clay and refractory materials at 2 percent; the "Other" category comprises only 1 percent of total tonnage (Figure 7).

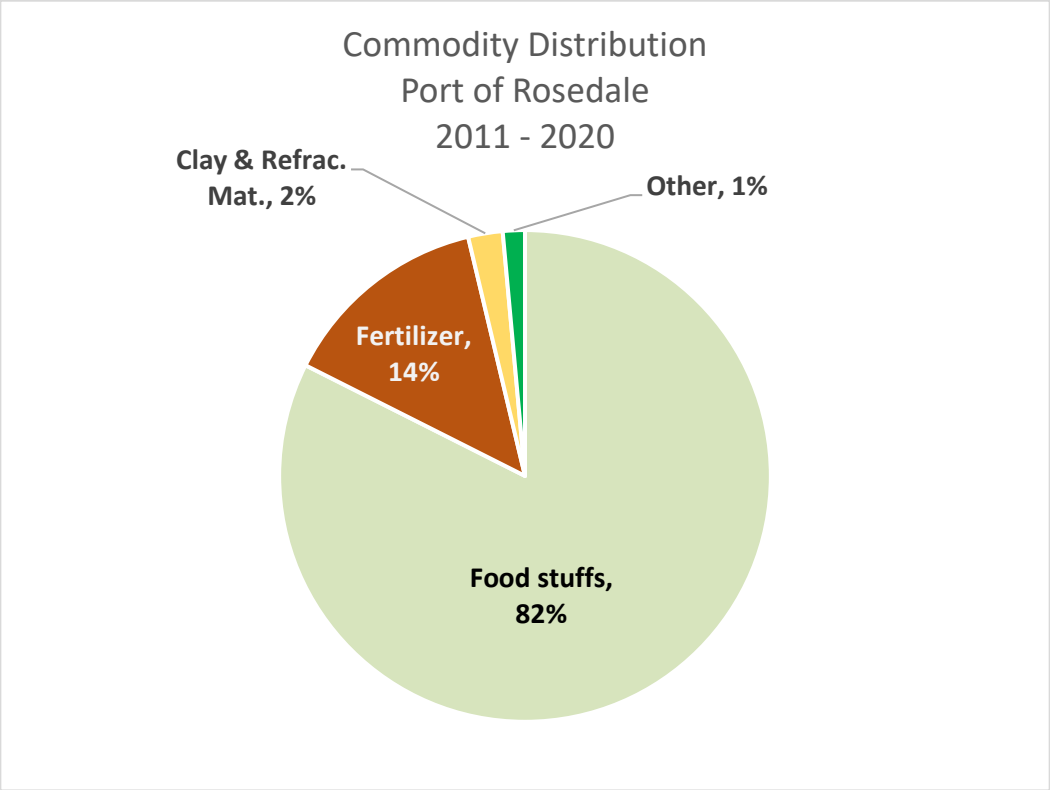

Figure 7. Commodity Distribution

Source: Ports and Waterways, WCSC

Within the food stuffs category, soybeans represents the largest contributor at 58 percent followed by corn and rice at 19 percent and 15 percent, respectively. Wheat represents 5 percent, and the rest of food stuffs totals 2 percent (Figure 8).

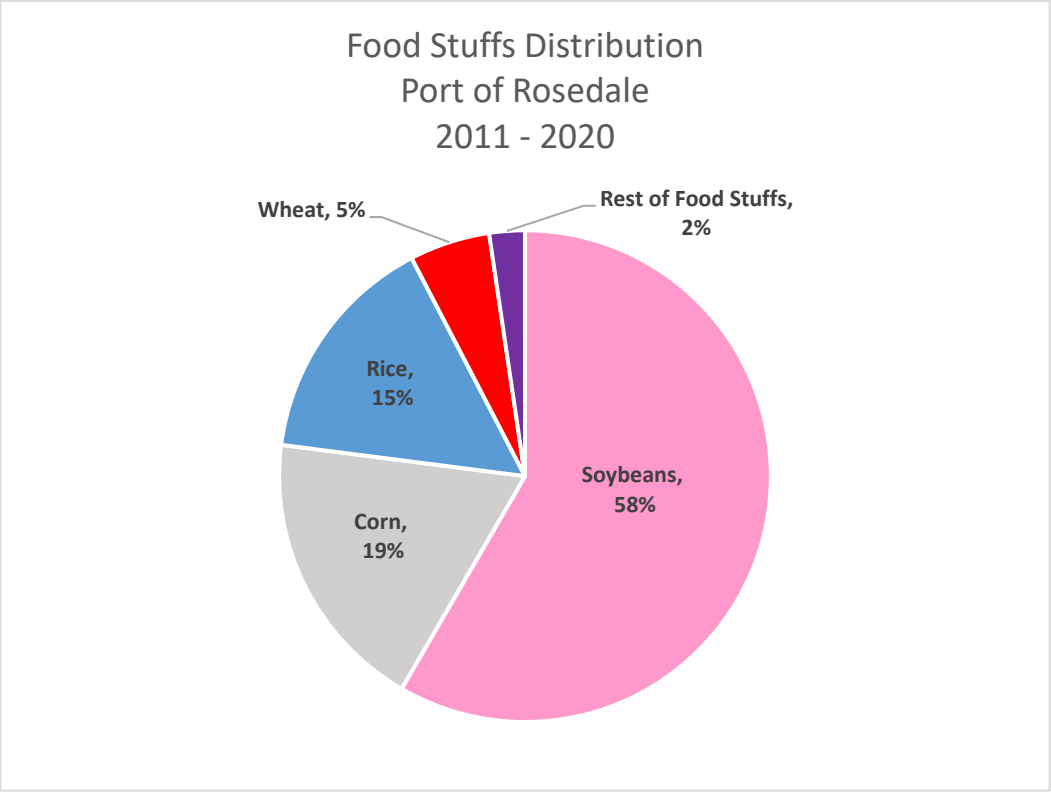

Figure 8. Food Stuffs Distribution

Source: Ports and Waterways, WCSC

2.4 SHIPPING OPERATIONS

JANTRAN is a company based out of Rosedale, MS, that provides towing and tugboat services for the POR. Barges are fleeted within the POR's channel until they are ready to be shunted by JANTRAN to their appropriate docks for loading/unloading or out onto the MKARNS or Mississippi River. Additionally, because of the POR's unique location at the Arkansas River's confluence with the Mississippi River, all barge traffic moving from the MKARNS to the Mississippi River switches to a bigger towboat in the POR's channel before proceeding to the Mississippi River (and vice versa proceeding to the MKARNS with a smaller towboat). The tow change occurs within the POR channel due to a safety issue—it is much safer to make the switch there because of the stronger current in the Mississippi River.

Although these barges can usually be fleeted in the channel itself during most months, the low water season forces the port tenants to move the barges out from the POR channel to the shorelines of the LMR when the LMR reaches 10 feet on the Arkansas City gauge. Furthermore, the low water creates a restriction at JANTRAN's facility prohibiting more than one harbor boat and one barge to pass the area of their drydock and floating work barges (Figure 9). Because this low water season occurs during the POR's busiest time of year

(harvest time typically runs from August to November), the port tenants must alter their fleeting practices and barge configurations when the POR is at its most active.

Figure 9. JANTRAN Location

Source: Google Earth

Section 3
Future Conditions

3.1 COMMODITY GROWTH FORECAST

An essential step when evaluating navigation improvements is to analyze the types and volumes of cargo moving through the port. Trends in cargo history can offer insights into a port's long-term trade forecast and the estimated cargo volume upon which future vessel trips are based. To minimize the impact of potential anomalies in trade volumes on long-term forecast, 3 years of data were employed to establish the baseline for the commodity forecast. Historic data from 2018 to 2020 (2020 was the latest year available from WCSC when the forecasts were developed) were used to develop a baseline, allowing the forecast to capture both economic prosperity and downturn which occurred over that timeframe.

The difficulty in determining commodity forecasts for a study such as this lies in the 50-year period of analysis that is required by USACE regulations. There are very few industry forecasts that project more than 10 or 20 years. With a study base year of 2027, the task becomes even more difficult. The U.S. Department of Agriculture (USDA) provides crop statistics and projections through its Economic Research Service (ERS). ERS is a federal statistical agency whose mission is to "anticipate trends and emerging issues in agriculture, food, the environment, and rural America and to conduct high-quality, objective economic research to inform and enhance public and private decision making." Their projections were used for this study.

ERS commodity projections were used specifically for the commodities of wheat, corn, rice, and soybeans through the year 2032. Fertilizer tonnage has annually averaged to be about 20 percent of the total tonnage of wheat, corn, rice, and soybeans over the past few years, so 20 percent of the tonnage of those projected food stuffs was used as the forecast for fertilizer. Likewise, clay & refractory materials tonnage has annually averaged to be about 2.4 percent of the sum of wheat, corn, rice, soybeans, and fertilizer tonnage, so a reasonable assumption was made to keep clay & refractory materials tonnage at a level where it remains 2.4 percent of that sum. The sum tonnage of all the above commodities comprises 97 percent of the total average annual tonnage of the POR over the past 10 years.

Because long-term projections are uncertain at best and because there is risk in extending forecasts beyond their intended scope, the growth rates for this study are kept constant up to year 2046 (20 years after the 2027 base year), after which no growth is assumed until the end of the study's scope in 2076. Compound annual growth rates (CAGR) from the base year are shown in Table 14; tonnage projections are shown in Figures 10-12.

Table 14. Compound Annual Growth Rates

Commodity	CAGR
Wheat	-0.16%
Corn	1.01%
Rice	0.39%
Soybeans	0.04%
Fertilizer	20% of total tonnage of wheat, corn, rice, and soybeans
Clay & Refrac. Mat.	2.4% of total tonnage of wheat, corn, rice, soybeans, and fertilizer

Source: Economic Research Service, U.S. Department of Agriculture and WCSC

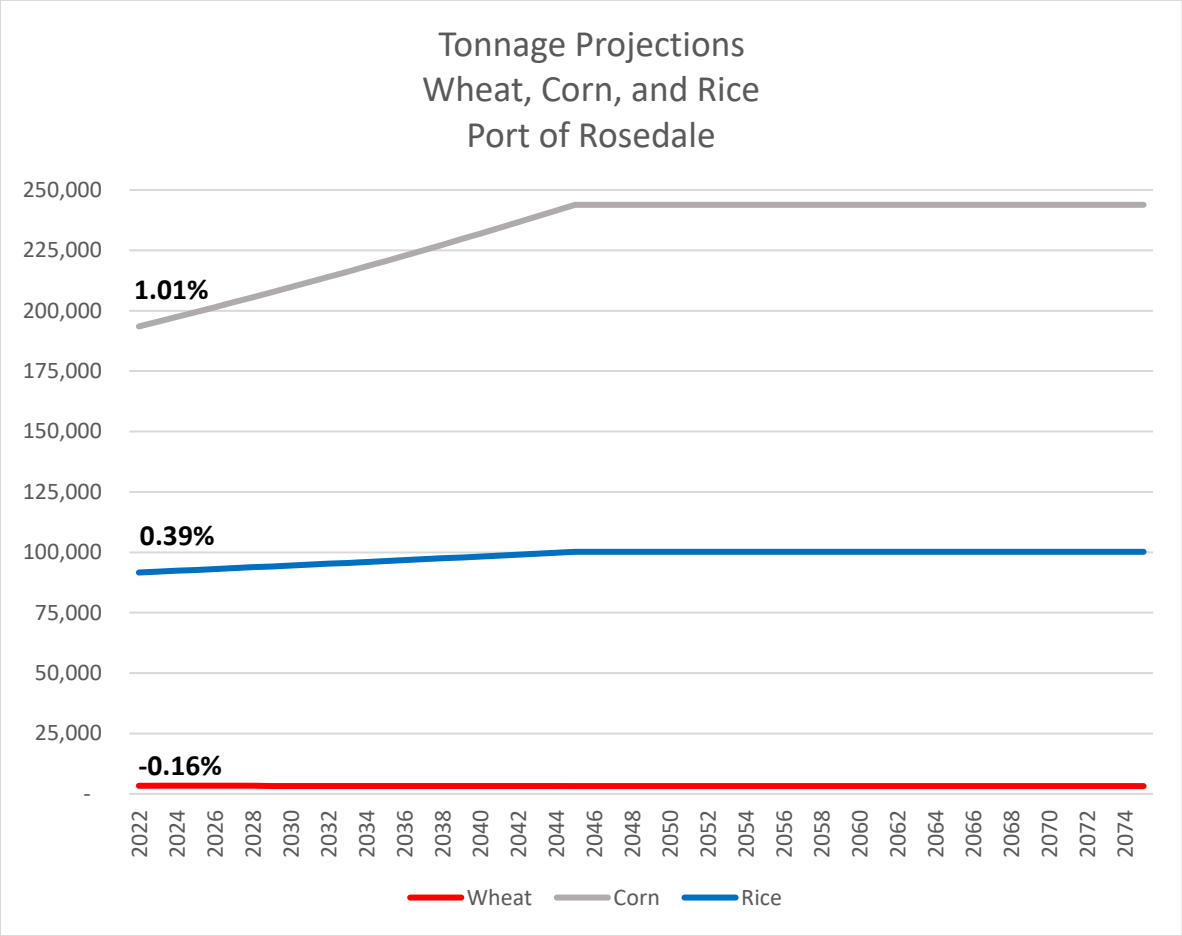

Figure 10. Tonnage Projections: Wheat, Corn, and Rice

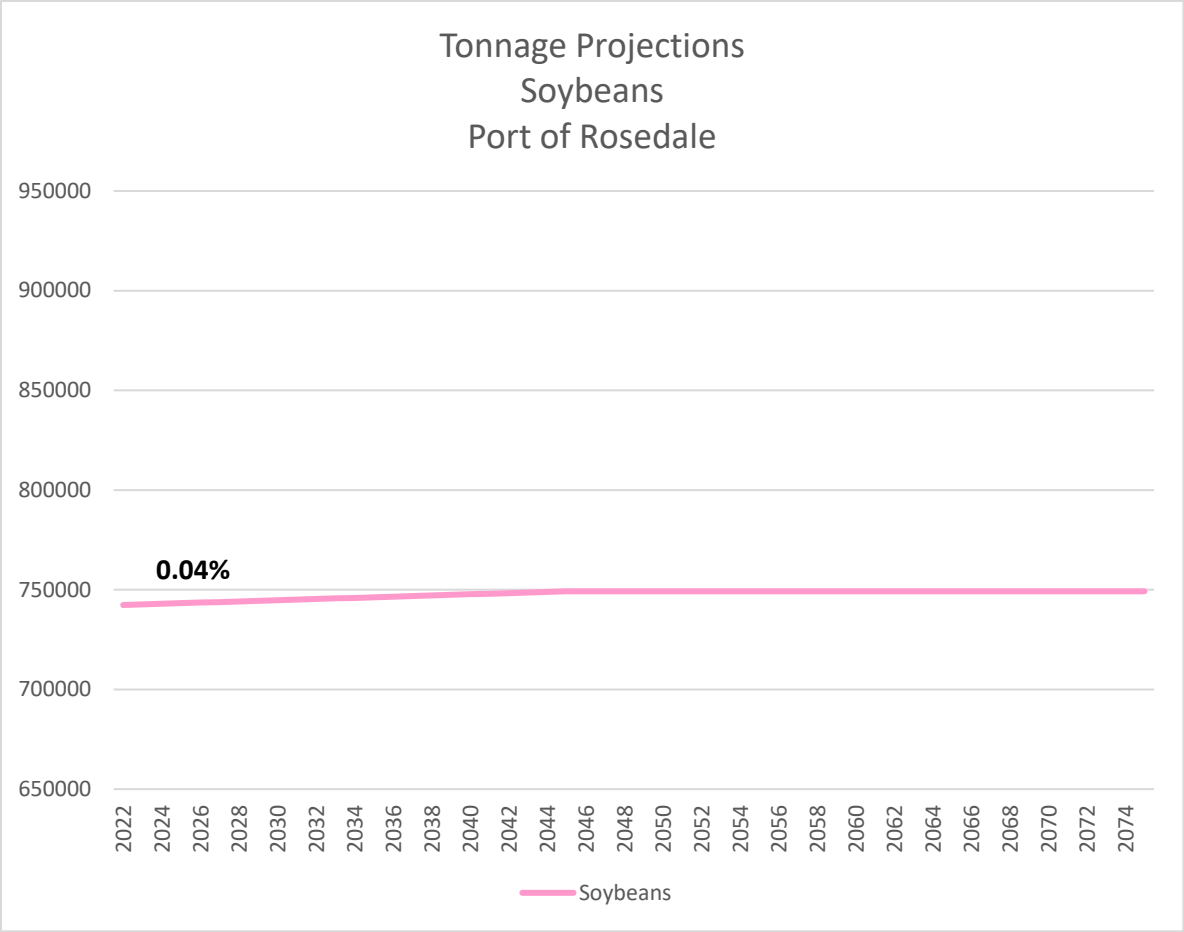

Figure 11. Tonnage Projections: Soybeans

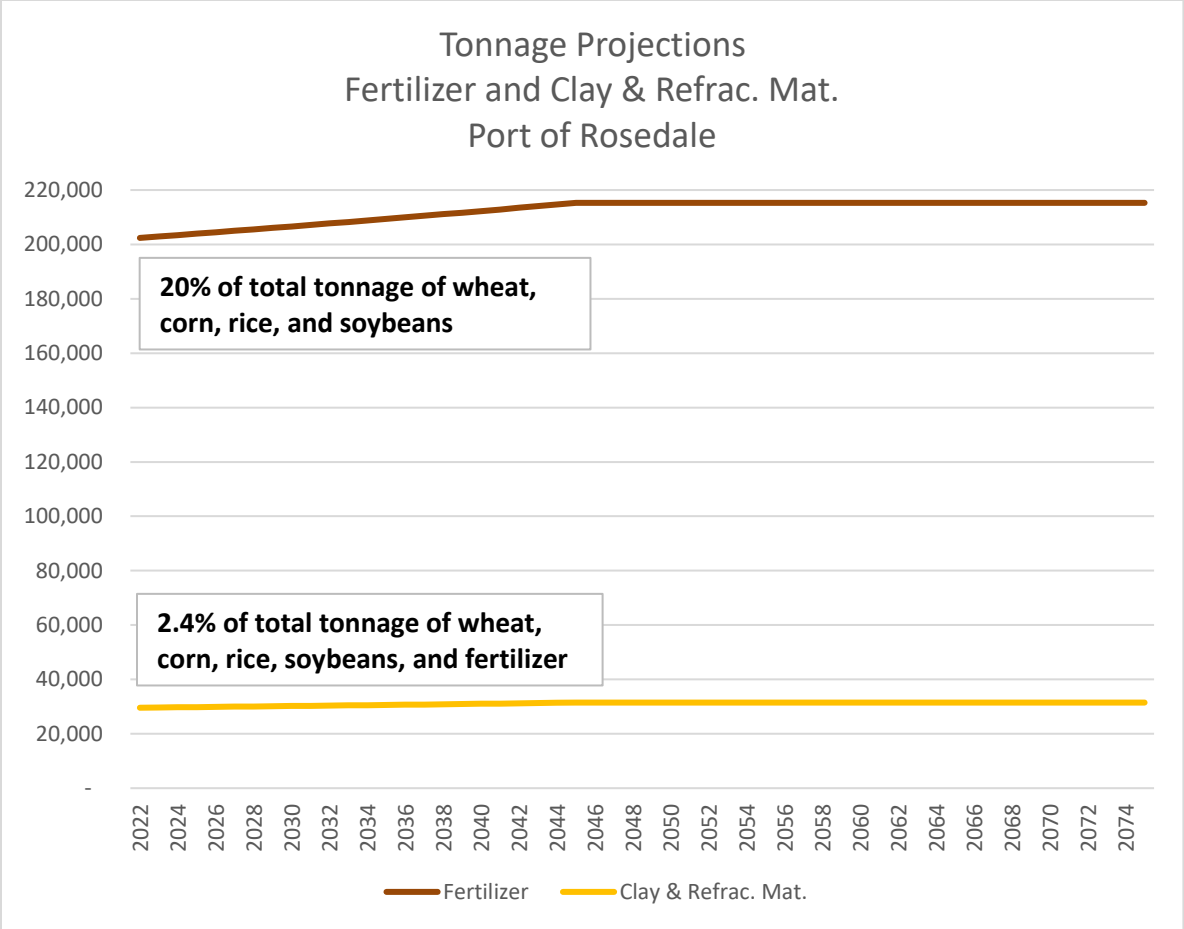

Figure 12. Tonnage Projections: Fertilizer and Clay & Refractory Materials

3.2 TONNAGE FORECAST

Using the baseline commodity tonnages created from historic WCSC data from 2018 – 2020, the commodity growth forecasts were applied to these baselines and projected 20 years from the 2027 base year of the study. After the year 2046, no growth is assumed until the end of the study's scope in 2076 (Table 15).

Table 15. Projected Commodity Tonnages
2027 - 2076

	Wheat	Corn	Rice	Soybeans	Fertilizer	Clay & Refrac. Mat.
2027	**3,313**	**201,453**	**93,068**	**743,533**	**204,469**	**29,900**
2028	3,308	203,489	93,431	743,831	204,997	29,977
2029	3,303	205,545	93,794	744,129	205,530	30,055
2030	3,298	207,623	94,160	744,427	206,067	30,134
2031	3,293	209,721	94,526	744,725	206,608	30,213
2032	3,287	211,841	94,894	745,023	207,154	30,293

2033	3,282	213,982	95,263	745,322	207,705	30,373
2034	3,277	216,144	95,634	745,620	208,260	30,454
2035	3,272	218,329	96,007	745,919	208,819	30,536
2036	3,267	220,535	96,380	746,218	209,384	30,619
2037	3,262	222,764	96,755	746,517	209,953	30,702
2038	3,256	225,015	97,132	746,816	210,526	30,786
2039	3,251	227,290	97,510	747,115	211,105	30,871
2040	3,246	229,587	97,890	747,414	211,688	30,956
2041	3,241	231,907	98,271	747,714	212,276	31,042
2042	3,236	234,251	98,653	748,013	212,869	31,129
2043	3,231	236,618	99,037	748,313	213,468	31,216
2044	3,226	239,010	99,423	748,613	214,071	31,304
2045	3,221	241,425	99,810	748,912	214,679	31,393
2046	**3,216**	**243,865**	**100,199**	**749,212**	**215,292**	**31,483**
-						
2076	**3,216**	**243,865**	**100,199**	**749,212**	**215,292**	**31,483**

Source: Ports and Waterways, WCSC

3.3 BARGE FORECAST

Data from WCSC was also used to create a baseline of barge usage at the POR. From 2018 – 2020 the POR saw an average of 652 barges per year and an average tons per barge of 1,953. Breaking the data down further, annual average number of barges and average tons per barge by commodity for 2018 – 2020 are shown in Table 16.

Table 16. Average Number of Barges and Tons per Barge
2018 – 2020

Commodity	Barges	Tons per Barge
Wheat	2	2,007
Corn	88	2,147
Rice	52	1,737
Soybeans	366	2,028
Fertilizer	115	1,752
Clay & Refrac. Mat.	18	1,542
Misc.	11	1,675

Source: WCSC

Projected commodity tonnage (Table 15, above) was then divided by the average tons per barge (Table 16, above) to project the annual number of barges for that commodity for the years 2027 – 2076 (Table 17).

Table 17. Projected Number of Barges
2027 – 2076

	Wheat	Corn	Rice	Soybeans	Fertilizer	Clay & Refrac. Mat.	TOTAL
2027	**367**	**94**	**2**	**54**	**117**	**19**	**652**
2028	367	95	2	54	117	19	653
2029	367	96	2	54	117	19	655
2030	367	97	2	54	118	20	657
2031	367	98	2	54	118	20	658
2032	367	99	2	55	118	20	660
2033	367	100	2	55	119	20	662
2034	368	101	2	55	119	20	664
2035	368	102	2	55	119	20	665
2036	368	103	2	55	120	20	667
2037	368	104	2	56	120	20	669
2038	368	105	2	56	120	20	671
2039	368	106	2	56	120	20	672
2040	368	107	2	56	121	20	674
2041	369	108	2	57	121	20	676
2042	369	109	2	57	121	20	678
2043	369	110	2	57	122	20	680
2044	369	111	2	57	122	20	682
2045	369	112	2	57	123	20	684
2046	**369**	**114**	**2**	**58**	**123**	**20**	**685**
-							
2076	**369**	**114**	**2**	**58**	**123**	**20**	**685**

Although the above numbers are annual numbers, the POR experiences restrictions mostly during harvest time (August – November) which coincides with the low water season. The POR estimates that 75 percent of the annual barge estimates operate during this low water season.

Furthermore, the POR typically encounters an additional 1,200 barges during the low water season that are not directing loading/unloading at the POR. Because of its strategic location near the MKARNS, all barge traffic that goes on or comes off the MKARNS must make a change at the POR, switching to a bigger/smaller tow vessel as is appropriate for the latter portion of its trip.[6] The change occurs at the POR because of safety issues resulting from the stronger current of the Mississippi River.

Table 18 provides final barge projections by taking 75 percent of the total projected number of barges from Table 17 and adding 1,200 barges.

Table 18. Final Projected Number of Barges
2027 – 2076

2027	**1,689**

[6] WCSC data shows an annual average of just over 1,200 barges traversing the MKARNS from 2016 – 2020.

2028	1,690
2029	1,691
2030	1,693
2031	1,694
2032	1,695
2033	1,696
2034	1,698
2035	1,699
2036	1,700
2037	1,702
2038	1,703
2039	1,704
2040	1,706
2041	1,707
2042	1,708
2043	1,710
2044	1,711
2045	1,713
2046	**1,714**
-	
2076	**1,714**

Section 4

Transportation Cost Savings Benefit Analysis

For the purposes of Navigation Economic Analysis per ER 1105-2-100, a NED benefit may include:

> "Cost reduction benefits for commodities for the same origin and destination and the same mode of transit thus increasing the efficiency of current users. This reduction represents a NED gain because resources will be released for productive use elsewhere in the economy. Examples for inland navigation are reductions in costs incurred from trip delays (e.g. reduction in lock congestions), reduction in costs associated with the use of larger or longer tows, and reduction in costs due to more efficient use of barges."

The intention of this analysis is to describe the benefits associated with the alternatives under consideration for the POR. NED benefits were estimated by calculating the reduction in transportation cost for each of these alternatives.

During normal water conditions, barges are fleeted within the POR's slack-water channel until they are ready to be shunted by port tenants to their appropriate docks for loading/unloading or out onto the MKARNS or Mississippi River. Although these barges can usually be fleeted in the channel itself during most months, the low water season requires port tenants to move the barges out from the POR channel to the shorelines of the LMR at miles 585 to 587 when the LMR reaches 10 feet on the Arkansas City gauge.

When the low water season forces the river fleet to be located at LMR miles 585 to 587, in the Without Project Condition (WOPC) it takes about 3.5 hours for a tug to go to the river fleet to retrieve a barge and bring it to its intended dock. Additionally, these low water conditions allow only a single barge to be pushed by a single boat from the LMR to a dock as well as allowing for only one-way traffic.

4.1 SAVINGS BY ALTERNATIVE

Barge time savings, vessel operating costs, and fee reductions were provided by POR officials and JANTRAN vessel operators.

4.1.1 Alternative 2 – Widen Channel Bend

Retrieving a barge fleeted at LMR miles 585 to 587 and then moving it to a tenant's dock takes approximately 3.5 hours. Widening the channel at the bend would allow a barge to be fleeted there, thereby reducing transit time by 1.5 hours per barge since the barge is now closer to the tenants' docks. At a cost of $600 per hour to operate a tow vessel, transportation cost savings are $900 per barge[7].

[7] A tug can vary between 800 hp and 2,000 hp with each boat having a 3-man crew. JANTRAN runs 5 tugs during harvest time.

1.5 (hours per barge) x $600 (per hour to operate a tow vessel) =	**$900 per barge**

4.1.2 Alternative 3 – Widen Entire Channel

Widening the entire channel in addition to the area at the bend would allow more barges to be fleeted closer to the tenants' docks; however, there is still a bottleneck at the bend that limits 2-way traffic even after the widening. This alternative adds 0.5 hour of time savings to the 1.5 hours saved by widening the channel only at the bend. Additionally, the POR would no longer have to pay an annual fee for the fleeting area outside of the harbor. This annual fleeting fee amounts to $30,000, and the transportation cost savings are $1,200 per barge + $30,000 fee reduction.

2 (hours per barge) x $600 (per hour to operate a tow vessel) + $30,000 fee reduction =	**$1,200 per barge + $30,000 fee reduction**

4.1.3 Alternative 4 – Widen Turning Basin

The turning basin is located a little less than 2.5 nautical miles from the entrance to the POR channel. Widening the turning basin would allow quicker reversal of direction and allow barges to be fleeted there (which would be closer to the docks). Total time savings are 0.5 hour. Using the same operating cost above of $600 per hour, transportation cost savings are $300 per barge.

0.5 (hour per barge) x $600 (per hour to operate a tow vessel) =	**$300 per barge**

4.1.4 Alternative 5 – Lengthen Channel, Relocate and Widen Turning Basin

Lengthening the channel as well as relocating the turning basin would allow the fleeting of more barges closer to the docks, thus reducing transit time by 0.5 hour per barge. This alternative adds 0.5 hour of time savings to the 0.5 hour saved by widening the turning basin for a total of 1 hour time savings.

1 (hour per barge) x $600 (per hour to operate a tow vessel) =	**$600 per barge**

4.1.5 Alternative 6 – Shift Channel Bend

The channel at the bend would be relocated 150 feet west from its current location, and the channel width would remain at 150 feet. POR officials and JANTRAN vessel operators state that there would be no alleviation of the bottleneck at the bend and thus no benefits for this alternative.

4.1.6 Alternative 7 – Widen Channel, Lengthen Channel, & Relocate and Widen Turning Basin (Alt. 3 and Alt. 5)

This alternative is simply the combination of both Alternative 3 and Alternative 5:

$1,200 per barge + $30,000 fee reduction + $600 per barge	**$1,800 per barge + $30,000 fee reduction**

4.2 ANNUAL TRANSPORTATION COST SAVINGS BENEFITS

Projected number of barges by year (Table 18) were multiplied by estimated savings per barge for each alternative. To this number fee reductions and crew reduction savings were added, when appropriate, to generate annual transportation cost savings benefits. Annual transportation cost savings benefits are shown for each alternative for the project years 2027 – 2076 in Table 19.

Table 19. Transportation Cost Savings Benefits
2027 – 2076

	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
2027	**$ 1,519,881**	**$ 2,056,508**	**$ 506,627**	**$ 1,013,254**	**$ -**	**$ 3,069,762**
2028	$ 1,520,997	$ 2,057,996	$ 506,999	$ 1,013,998	$ -	$ 3,071,993
2029	$ 1,522,121	$ 2,059,495	$ 507,374	$ 1,014,747	$ -	$ 3,074,242
2030	$ 1,523,255	$ 2,061,006	$ 507,752	$ 1,015,503	$ -	$ 3,076,510
2031	$ 1,524,398	$ 2,062,530	$ 508,133	$ 1,016,265	$ -	$ 3,078,795
2032	$ 1,525,550	$ 2,064,066	$ 508,517	$ 1,017,033	$ -	$ 3,081,100
2033	$ 1,526,711	$ 2,065,615	$ 508,904	$ 1,017,808	$ -	$ 3,083,423
2034	$ 1,527,882	$ 2,067,176	$ 509,294	$ 1,018,588	$ -	$ 3,085,764
2035	$ 1,529,063	$ 2,068,750	$ 509,688	$ 1,019,375	$ -	$ 3,088,125
2036	$ 1,530,253	$ 2,070,337	$ 510,084	$ 1,020,169	$ -	$ 3,090,506
2037	$ 1,531,453	$ 2,071,937	$ 510,484	$ 1,020,968	$ -	$ 3,092,905
2038	$ 1,532,662	$ 2,073,550	$ 510,887	$ 1,021,775	$ -	$ 3,095,324
2039	$ 1,533,882	$ 2,075,176	$ 511,294	$ 1,022,588	$ -	$ 3,097,764
2040	$ 1,535,111	$ 2,076,815	$ 511,704	$ 1,023,408	$ -	$ 3,100,223
2041	$ 1,536,351	$ 2,078,468	$ 512,117	$ 1,024,234	$ -	$ 3,102,702
2042	$ 1,537,601	$ 2,080,134	$ 512,534	$ 1,025,067	$ -	$ 3,105,202
2043	$ 1,538,861	$ 2,081,815	$ 512,954	$ 1,025,907	$ -	$ 3,107,722
2044	$ 1,540,132	$ 2,083,509	$ 513,377	$ 1,026,754	$ -	$ 3,110,263
2045	$ 1,541,413	$ 2,085,217	$ 513,804	$ 1,027,608	$ -	$ 3,112,825
2046	**$ 1,542,704**	**$ 2,086,939**	**$ 514,235**	**$ 1,028,470**	**$ -**	**$ 3,115,409**
-						
2076	**$ 1,542,704**	**$ 2,086,939**	**$ 514,235**	**$ 1,028,470**	**$ -**	**$ 3,115,409**

Section 5
NED Benefits and Costs

5.1 NED COSTS

Financial costs of the proposed project consist of the construction and mitigation costs accrued during construction of the project and over its lifecycle. USACE cost engineers prepared the cost estimate for each of the proposed alternatives for use in the economic analysis. The sum of these costs is used to determine Interest During Construction (IDC), which represents the economic cost of building a project.

Another financial cost is the annual cost accrued over the life of a project due to Operation, Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R) activities that represent an increase over the current OMRR&R costs to maintain the entrance channel. OMRR&R was excluded from the list of financial costs above because it is not included in the calculation of IDC. IDC takes into account only those costs incurred during construction.

IDC represents an economic cost of building a project that is considered in the selection of the recommended plan but does not factor in as a paid cost. IDC is the cost of the foregone opportunity to invest the money required to construct a project for another use. The hypothetical return on another investment, measured as IDC, is counted as an NED cost. As an economic cost rather than a financial cost, IDC is not considered in the determination of cost-sharing responsibilities.

IDC reflects that project construction costs are not incurred in one lump sum, but as a flow over the construction period. This analysis assumes that construction expenditures are incurred at a constant rate over the period of construction, an assumption which is supported by the *NED Manual for Deep Draft Navigation*.

The calculation of IDC is summarized in the *NED Manual for Deep Draft Navigation* as:

> If B is the project base year (the year in which construction costs end and the project begins to derive benefits), then the total cost incurred during construction, including actual expenditures and implicit interest payment, is the equivalent lump-sum expenditure in the base year, C_B, which is computed as:
>
> $C_B = \Sigma_{t\ i=1}\ C_i\ (1+r)_{t-1}$; where
>
> C_i construction expenditures in period i
>
> r per unit interest rate; and
>
> t number of construction periods up to the year that the

project is implemented, which is the start of the period of analysis

Therefore, IDC = C_B – Estimated First Cost of Construction

Calculating the hypothetical interest earned on each yearly construction payment and summing them to arrive at the total construction investment cost (C_B) enables the calculation of IDC by taking the difference between C_B and estimated construction cost. IDC is, therefore, a function of both estimated total construction cost and construction time. The longer it takes to construct a project, the larger the hypothetical alternative investment grows. The implication behind this fact is that IDC accounts for a larger proportion of NED Costs the larger the project and the longer it takes to construct. Total present value is the sum of the present value of first cost and annual OMRR&R costs over the 50-year period of analysis; average annual cost is calculated by multiplying total present value by the 50-year amortization factor.

Table 20 shows the NED first costs for all alternatives; Table 21 shows total investment, IDC, average annual first costs, average annual incremental OMRR&R, and total average annual costs for all alternatives. Values are at FY2024 price levels and amortized at the 2024 Federal discount rate of 2.75 percent.

Table 20. First Costs

Alternative	Item	Cost	Contingency	Project First Cost
2	Construction	$ 1,703,940	$ 527,113	$ 2,231,053
	Preconstruction Engineering, and Design	$ 410,000	$ 101,557	$ 511,557
	Construction Management	$ 148,000	$ 42,429	$ 190,429
	Mitigation	$ 38,250	$ 15,813	$ 54,063
	TOTAL	**$ 2,261,940**	**$ 671,099**	**$ 2,987,000**
3	Construction	$ 3,034,825	$ 1,340,448	$ 4,375,273
	Preconstruction Engineering, and Design	$ 410,000	$ 101,557	$ 511,557
	Construction Management	$ 255,000	$ 73,104	$ 328,104
	Mitigation	$ 42,000	$ 16,750	$ 58,750
	TOTAL	**$ 3,699,825**	**$ 1,515,108**	**$ 5,274,000**
4	Construction	$ 1,360,470	$ 447,977	$ 1,808,447
	Preconstruction Engineering, and Design	$ 540,000	$ 133,758	$ 673,758
	Construction Management	$ 121,000	$ 39,284	$ 160,284
	Mitigation	$ 28,000	$ 13,250	$ 41,250
	TOTAL	**$ 2,021,470**	**$ 621,019**	**$ 2,684,000**
5	Construction	$ 2,180,085	$ 938,886	$ 3,118,971
	Preconstruction Engineering, and Design	$ 540,000	$ 133,758	$ 673,758
	Construction Management	$ 186,000	$ 60,387	$ 246,387
	Mitigation	$ 37,000	$ 15,500	$ 52,500
	TOTAL	**$ 2,906,085**	**$ 1,133,031**	**$ 4,092,000**
6	Construction	$ 1,723,350	$ 535,540	$ 2,258,890
	Preconstruction Engineering, and Design	$ 410,000	$ 101,557	$ 511,557
	Construction Management	$ 150,000	$ 43,002	$ 193,002
	Mitigation	$ 39,500	$ 16,125	$ 55,625
	TOTAL	**$ 2,283,350**	**$ 680,099**	**$ 3,019,000**
7	Construction	$ 4,547,940	$ 2,358,337	$ 6,906,277
	Preconstruction Engineering, and Design	$ 590,000	$ 146,143	$ 736,143
	Construction Management	$ 376,000	$ 122,073	$ 498,073
	Mitigation	$ 81,820	$ 20,500	$ 102,320
	TOTAL	**$ 5,513,940**	**$ 2,626,552**	**$ 8,243,000**

Table 21. Total Costs

Alternative	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
First Cost	$ 2,987,000	$ 5,274,000	$ 2,684,000	$ 4,092,000	$ 3,019,000	$ 8,243,000
Interest During Construction	$ 41,000	$ 72,000	$ 37,000	$ 56,000	$ 41,000	$ 113,000
Total Investment Cost	$ 3,028,000	$ 5,346,000	$ 2,720,000	$ 4,147,000	$ 3,060,000	$ 8,355,000
Average Annual First Cost	$ 112,000	$ 198,000	$ 101,000	$ 154,000	$ 113,000	$ 309,000
Average Annual Increm. OMRR&R	$ 69,000	$ 206,000	$ 86,000	$ 275,000	$ 121,000	$ 480,000
Total Average Annual Cost	$ 182,000	$ 404,000	$ 187,000	$ 428,000	$ 234,000	$ 790,000

5.2 PRELIMINARY NET BENEFITS AND BENEFIT-COST (B/C) RATIO

Having identified the costs and benefits associated with all POR alternatives, identification of the tentatively selected plan (TSP) requires a comparison of the average annual net benefits resulting from each alternative. Table 22 contains the NED annual costs and benefits as well as the resulting average annual net benefits and benefit-cost ratios at FY2024 price levels and amortized at the 2024 Federal discount rate of 2.75 percent.

Using preliminary cost estimates, Alternative 7 has the greatest average annual net benefits at $2,353,000 and a B/C ratio of 4.0 to 1.

Table 22. Preliminary Average Annual Costs and Benefits

Alternative	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
First Cost	$ 2,987,000	$ 5,274,000	$ 2,684,000	$ 4,092,000	$ 3,019,000	$ 8,243,000
Interest During Construction	$ 41,000	$ 72,000	$ 37,000	$ 56,000	$ 41,000	$ 113,000
Total Investment Cost	$ 3,028,000	$ 5,346,000	$ 2,720,000	$ 4,147,000	$ 3,060,000	$ 8,355,000
Average Annual First Cost	$ 112,000	$ 198,000	$ 101,000	$ 154,000	$ 113,000	$ 309,000
Average Annual Increm. OMRR&R	$ 69,000	$ 206,000	$ 86,000	$ 275,000	$ 121,000	$ 480,000
Total Average Annual Cost	$ 182,000	$ 404,000	$ 187,000	$ 428,000	$ 234,000	$ 790,000
Total Average Annual Benefits	$ 1,556,000	$ 2,106,000	$ 519,000	$ 1,038,000	$ -	$ 3,143,000
Net Excess Benefits	**$ 1,374,000**	**$ 1,702,000**	**$ 332,000**	**$ 610,000**	**$ (234,000)**	**$ 2,353,000**
B/C Ratio	**8.5**	**5.2**	**2.8**	**2.4**	**0.0**	**4.0**

5.3 RECOMMENDED PLAN

After selection of Alternative 7 as the recommended plan, costs were further refined. With the refined costs, the recommended plan has average annual net benefits of $2,367,000 and a B/C ratio of 4.1 to 1 (Table 23).

Table 23. Average Annual Costs and Benefits of Recommended Plan (Alt. 7)

Investment Cost	
First Cost	$ 7,877,000
Interest During Construction	$ 108,000
Total Investment Cost	$ 7,985,000
Average Annual Cost	
Average Annual First Cost	$ 296,000
Average Annual Incremental OMRR&R	$ 480,000
Total Average Annual Cost	$ 776,000
Benefits	
Average Annual Benefits	$ 3,143,000
Net Annual Benefits	$ 2,367,000
B/C Ratio (computed at 2.75%)	**4.1**

5.4 RISK & UNCERTAINTY AND SENSITIVITY ANALYSIS

The Principles & Guidelines and subsequent ER1105-2-100 recognize the inherent variability to water resources planning. Because navigation projects in particular are fraught with uncertainty about future conditions, a sensitivity analysis in which key quantitative assumptions and computations are changed is required to assess their effect on the final outcome.

In this instance time savings per barge, operating cost per barge, and number of barges were studied to determine the variability of the outcome. Because the recommended plan has a B/C ratio well above 1.0, high scenarios were unnecessary—the B/C ratio would only increase. Instead low scenarios were introduced to determine their effect on the economic viability of the project.

5.4.1 Scenario—Time Savings per Barge

In discussions with POR officials and JANTRAN vessel operators, a low range of time savings per barge was estimated. Per these discussions, time savings per barge (Section 4.1) for the following alternatives were lowered as follows:

	Original (hours)	Sensitivity Scenario (hours)
Alt 2:	1.5	1.0

Alt 3:	2.0	1.5
Alt 4:	0.5	0.25
Alt 5:	1.0	0.5
Alt 6:	0.0	no change
Alt 7:	3.0	2.0

In this low time savings per barge scenario, Alternative 7 is still not only justified but also remains the alternative with the greatest net benefits. Average annual benefits are $2,106,000 and average annual net benefits are $1,316,000 with a B/C ratio of 2.7 (Table 24).

Table 24. Average Annual Costs and Benefits (Low Time Savings per Barge)

Alternative	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
First Cost	$ 2,987,000	$ 5,274,000	$ 2,684,000	$ 4,092,000	$ 3,019,000	$ 8,243,000
Interest During Construction	$ 41,000	$ 72,000	$ 37,000	$ 56,000	$ 41,000	$ 113,000
Total Investment Cost	$ 3,028,000	$ 5,346,000	$ 2,720,000	$ 4,147,000	$ 3,060,000	$ 8,355,000
Average Annual First Cost	$ 112,000	$ 198,000	$ 101,000	$ 154,000	$ 113,000	$ 309,000
Average Annual Increm. OMRR&R	$ 69,000	$ 206,000	$ 86,000	$ 275,000	$ 121,000	$ 480,000
Total Average Annual Cost	$ 182,000	$ 404,000	$ 187,000	$ 428,000	$ 234,000	$ 790,000
Total Average Annual Benefits	$ 1,038,000	$ 1,587,000	$ 259,000	$ 519,000	$ -	$ 2,106,000
Net Excess Benefits	**$ 856,000**	**$ 1,183,000**	**$ 72,000**	**$ 91,000**	**$ (234,000)**	**$ 1,316,000**
B/C Ratio	**5.7**	**3.9**	**1.4**	**1.2**	**0.0**	**2.7**

5.4.2 Scenario—Operating Cost per Barge

Because of fluctuations in fuel prices, the cost per hour of $600 to operate a tug (Section 4.1) was lowered to $450 through discussions with POR officials and JANTRAN vessel operators.

In this low operating cost per barge scenario, Alternative 7 is still not only justified but also remains the alternative with the greatest net benefits. Average annual benefits are $2,365,000 and average annual net benefits are $1,575,000 with a B/C ratio of 3.0 (Table 25).

Table 25. Average Annual Costs and Benefits (Low Operating Cost per Barge)

Alternative	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
First Cost	$ 2,987,000	$ 5,274,000	$ 2,684,000	$ 4,092,000	$ 3,019,000	$ 8,243,000

Interest During Construction	$ 41,000	$ 72,000	$ 37,000	$ 56,000	$ 41,000	$ 113,000
Total Investment Cost	$ 3,028,000	$ 5,346,000	$ 2,720,000	$ 4,147,000	$ 3,060,000	$ 8,355,000
Average Annual First Cost	$ 112,000	$ 198,000	$ 101,000	$ 154,000	$ 113,000	$ 309,000
Average Annual Increm. OMRR&R	$ 69,000	$ 206,000	$ 86,000	$ 275,000	$ 121,000	$ 480,000
Total Average Annual Cost	$ 182,000	$ 404,000	$ 187,000	$ 428,000	$ 234,000	$ 790,000
Total Average Annual Benefits	$ 1,167,000	$ 1,587,000	$ 389,000	$ 778,000	$ -	$ 2,365,000
Net Excess Benefits	**$ 985,000**	**$ 1,183,000**	**$ 202,000**	**$ 350,000**	**$ (234,000)**	**$ 1,575,000**
B/C Ratio	**6.4**	**3.9**	**2.1**	**1.8**	**0.0**	**3.0**

5.4.3 Scenario—Number of Barges

Because the 1,200 barges that go on or come off the MKARNS to make a tow change at the POR are not directly loading or unloading at the POR, one-half of these barges were removed from the barge forecast (Section 3.3) to create the low-traffic scenario. Final barge projections in this sensitivity analysis now consist of the barge totals from Table 18 less 600 barges (Table 26).

Table 26. Final Projected Number of Barges (Less 600 Barges)
2027 – 2076

2027	1,089
2028	1,090
2029	1,091
2030	1,093
2031	1,094
2032	1,095
2033	1,096
2034	1,098
2035	1,099
2036	1,100
2037	1,102
2038	1,103
2039	1,104
2040	1,106
2041	1,107
2042	1,108
2043	1,110
2044	1,111
2045	1,113
2046	1,114
-	

2076	**1,114**

Using this low-traffic scenario, Alternative 7 is still not only justified but also remains the alternative with the greatest net benefits. Average annual benefits are $2,049,000 and average annual net benefits are $1,259,000 with a B/C ratio of 2.6 (Table 27).

Table 27. Average Annual Costs and Benefits (Less 600 Barges)

Alternative	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
First Cost	$ 2,987,000	$ 5,274,000	$ 2,684,000	$ 4,092,000	$ 3,019,000	$ 8,243,000
Interest During Construction	$ 41,000	$ 72,000	$ 37,000	$ 56,000	$ 41,000	$ 113,000
Total Investment Cost	$ 3,028,000	$ 5,346,000	$ 2,720,000	$ 4,147,000	$ 3,060,000	$ 8,355,000
Average Annual First Cost	$ 112,000	$ 198,000	$ 101,000	$ 154,000	$ 113,000	$ 309,000
Average Annual Increm. OMRR&R	$ 69,000	$ 206,000	$ 86,000	$ 275,000	$ 121,000	$ 480,000
Total Average Annual Cost	$ 182,000	$ 404,000	$ 187,000	$ 428,000	$ 234,000	$ 790,000
Total Average Annual Benefits	$ 1,009,000	$ 1,376,000	$ 336,000	$ 673,000	$ -	$ 2,049,000
Net Excess Benefits	**$ 827,000**	**$ 972,000**	**$ 149,000**	**$ 245,000**	**$ (234,000)**	**$ 1,259,000**
B/C Ratio	**5.5**	**3.4**	**1.8**	**1.6**	**0.0**	**2.6**

Section 6

Regional Economic Development

6.1 RECONS MODEL

The U.S. Army Corps of Engineers (USACE) Institute for Water Resources, Louis Berger, and Michigan State University have developed a regional economic impact modeling tool, RECONS (Regional ECONomic System), that provides estimates of jobs and other economic measures such as labor income, value added, and sales that are supported by USACE programs, projects, and activities. This modeling tool automates calculations and generates estimates of jobs, labor income, value added, and sales through the use of IMPLAN®'s multipliers and ratios, customized impact areas for USACE project locations, and customized spending profiles for USACE projects, business lines, and work activities. RECONS allows the USACE to evaluate the regional economic impact and contribution associated with USACE expenditures, activities, and infrastructure.

6.2 RESULTS

Table 28. Local, State, and National Impacts: Alt 2

Area	Local Capture	Output	Jobs*	Labor Income	Value Added
Local					
Direct Impact		$1,373,742	15.1	$931,339	$1,024,350
Secondary Impact		$529,243	3.2	$152,349	$296,875
Total Impact	$1,373,742	$1,902,985	18.3	$1,083,688	$1,321,224
State					
Direct Impact		$2,041,353	20.6	$1,311,928	$1,387,834
Secondary Impact		$1,552,453	8.7	$466,518	$835,439
Total Impact	$2,041,353	$3,593,806	29.3	$1,778,446	$2,223,274
US					
Direct Impact		$2,839,821	25.6	$1,726,287	$1,833,725
Secondary Impact		$4,827,277	21.5	$1,515,725	$2,616,846
Total Impact	$2,839,821	$7,667,098	47.1	$3,242,012	$4,450,571

* Jobs are presented in full-time equivalence (FTE)

Table 29. Local, State, and National Impacts: Alt 3

Area	Local Capture	Output	Jobs*	Labor Income	Value Added
Local					
Direct Impact		$2,425,549	26.7	$1,644,419	$1,808,644
Secondary Impact		$934,458	5.6	$268,996	$524,177
Total Impact	$2,425,549	$3,360,007	32.3	$1,913,415	$2,332,821
State					
Direct Impact		$3,604,318	36.4	$2,316,407	$2,450,431
Secondary Impact		$2,741,090	15.4	$823,707	$1,475,095
Total Impact	$3,604,318	$6,345,407	51.8	$3,140,115	$3,925,526
US					
Direct Impact		$5,014,133	45.2	$3,048,020	$3,237,719
Secondary Impact		$8,523,288	38.0	$2,676,242	$4,620,438
Total Impact	$5,014,133	$13,537,421	83.1	$5,724,262	$7,858,157

* Jobs are presented in full-time equivalence (FTE)

Table 30. Local, State, and National Impacts: Alt 4

Area	Local Capture	Output	Jobs*	Labor Income	Value Added
Local					

Direct Impact		$1,234,390	13.6	$836,864	$920,440
Secondary Impact		$475,557	2.8	$136,895	$266,760
Total Impact	$1,234,390	$1,709,947	16.4	$973,759	$1,187,200
State					
Direct Impact		$1,834,279	18.5	$1,178,847	$1,247,053
Secondary Impact		$1,394,972	7.8	$419,194	$750,693
Total Impact	$1,834,279	$3,229,252	26.4	$1,598,041	$1,997,746
US					
Direct Impact		$2,551,751	23.0	$1,551,173	$1,647,713
Secondary Impact		$4,337,600	19.3	$1,361,971	$2,351,395
Total Impact	$2,551,751	$6,889,351	42.3	$2,913,144	$3,999,107

* Jobs are presented in full-time equivalence (FTE)

Table 31. Local, State, and National Impacts: Alt 5

Area	Local Capture	Output	Jobs*	Labor Income	Value Added
Local					
Direct Impact		$1,881,939	20.7	$1,275,875	$1,403,294
Secondary Impact		$725,029	4.3	$208,709	$406,699
Total Impact	$1,881,939	$2,606,968	25.0	$1,484,584	$1,809,993
State					
Direct Impact		$2,796,524	28.2	$1,797,258	$1,901,244
Secondary Impact		$2,126,761	12.0	$639,099	$1,144,499
Total Impact	$2,796,524	$4,923,285	40.2	$2,436,357	$3,045,743
US					
Direct Impact		$3,890,374	35.0	$2,364,903	$2,512,087
Secondary Impact		$6,613,063	29.5	$2,076,447	$3,584,913
Total Impact	$3,890,374	$10,503,437	64.5	$4,441,350	$6,097,000

* Jobs are presented in full-time equivalence (FTE)

Table 32. Local, State, and National Impacts: Alt 6

Area	Local Capture	Output	Jobs*	Labor Income	Value Added
Local					
Direct Impact		$1,388,459	15.3	$941,316	$1,035,324
Secondary Impact		$534,913	3.2	$153,982	$300,055
Total Impact	$1,388,459	$1,923,371	18.5	$1,095,298	$1,335,379
State					
Direct Impact		$2,063,222	20.8	$1,325,983	$1,402,702
Secondary Impact		$1,569,084	8.8	$471,515	$844,390
Total Impact	$2,063,222	$3,632,307	29.6	$1,797,498	$2,247,092

US					
Direct Impact		$2,870,244	25.9	$1,744,781	$1,853,370
Secondary Impact		$4,878,992	21.7	$1,531,963	$2,644,881
Total Impact	$2,870,244	$7,749,237	47.6	$3,276,744	$4,498,251

* Jobs are presented in full-time equivalence (FTE)

Table 33. Local, State, and National Impacts: Alt 7

Area	Local Capture	Output	Jobs*	Labor Income	Value Added
Local					
Direct Impact		$3,791,012	41.7	$2,570,145	$2,826,821
Secondary Impact		$1,460,512	8.7	$420,427	$819,263
Total Impact	$3,791,012	$5,251,524	50.4	$2,990,572	$3,646,083
State					
Direct Impact		$5,633,369	56.9	$3,620,430	$3,829,902
Secondary Impact		$4,284,187	24.1	$1,287,413	$2,305,500
Total Impact	$5,633,369	$9,917,556	80.9	$4,907,843	$6,135,401
US					
Direct Impact		$7,836,841	70.6	$4,763,904	$5,060,394
Secondary Impact		$13,321,476	59.3	$4,182,833	$7,221,515
Total Impact	$7,836,841	$21,158,316	129.9	$8,946,737	$12,281,909

* Jobs are presented in full-time equivalence (FTE)