APPENDIX D

Economics

APPENDIX D – ECONOMICS

D-1.0 INTRODUCTION

The Mississippi River Ship Channel Deepening Study focuses on the stretch of the Mississippi River from the Gulf of Mexico to the Port of Baton Rouge and encompasses four major deep-water ports (the Port of Plaquemines, the Port of New Orleans, the Port of South LA, and the Port of Baton Rouge).[1]

According to 2014 data provided by the Waterborne Commerce Statistics Center (WCSC), the 4 above-mentioned ports are all in the top 12 ranking of annual tonnage for U.S. ports. The Port of South LA is 1st with 267.4 million shorts tons followed by the Port of New Orleans (7th: 84.5 million), the Port of Baton Rouge (8th: 69.2 million), and the Port of Plaquemines (12th: 55.5 million).

To allow for navigation, 2 areas are typically dredged in the Mississippi River Ship Channel. Southwest Pass is the first area and is located in the lower Mississippi extending from river mile 10 Above Head of Passes (AHP) to river mile 22 Below Head of Passes (BHP). The second area consists of 12 crossings that begin at river mile 115 AHP and end at river mile 232.4 AHP. Three of these crossings, Fairview, Belmont, and Rich Bend, serve the Port of South LA while the remaining 9 crossings serve the Port of Baton Rouge (Figure D-1).

[1] Although St. Bernard Port lies within the area of study, it is not mentioned specifically in the report because of its relatively small size and because its data are included in the numbers reported for the Port of New Orleans.

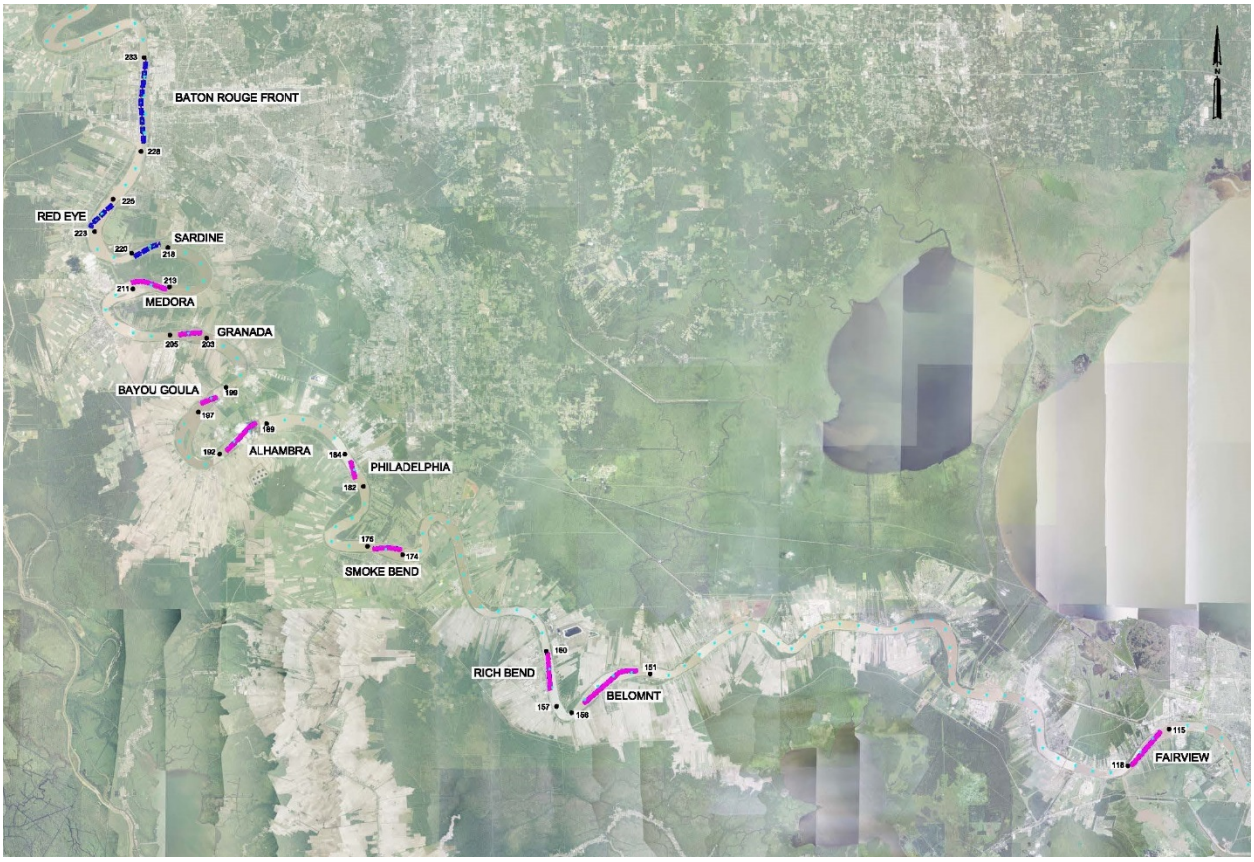

Figure D-1 Channel Crossings

Deepening the first area (from river mile 22 BHP to river mile 10 AHP) essentially connects 136 miles of the Mississippi River because of the naturally deep channel up to the Fairview Crossing at Mile 115 AHP. Deepening the second area would begin at Fairview Crossing and require dredging at several crossings to the Baton Rouge Harbor at mile 232.4 AHP.

Table D-1 lists the maintained project dimensions by reach, and Table D-2 lists the four major deep-water ports along this stretch of the Mississippi River that will be affected by the project. Figure D-2 shows this information geographically.

Table D-1 Authorized Project Dimensions by Reach

Project Dimensions	Reach by River Mile	Authorized Dimension
Baton Rouge	Mile 233.8 to Mile 232.4 AHP	40' by 500'
Baton Rouge to New Orleans	Mile 232.4 to Mile 104.5 AHP	45' by 500'
New Orleans to SWP Jetties	Mile 104.5 to Mile 18 BHP	45' by 750'
SWP Jetty to Bar Channel	Mile 18 BHP to Mile 22 BHP	48' by 600'

Note: Above Mile 233.8 is 9 ft. depth

Table D-2 Deep-Water Ports

Major Ports	Mile Marker
Baton Rouge	Mile 168.5 AHP to 253 AHP
South LA	Mile 114.9 AHP to 168.5 AHP
New Orleans	Mile 81.2 AHP to 114.9 AHP
Plaquemines	Mile 0 to 81.2 AHP

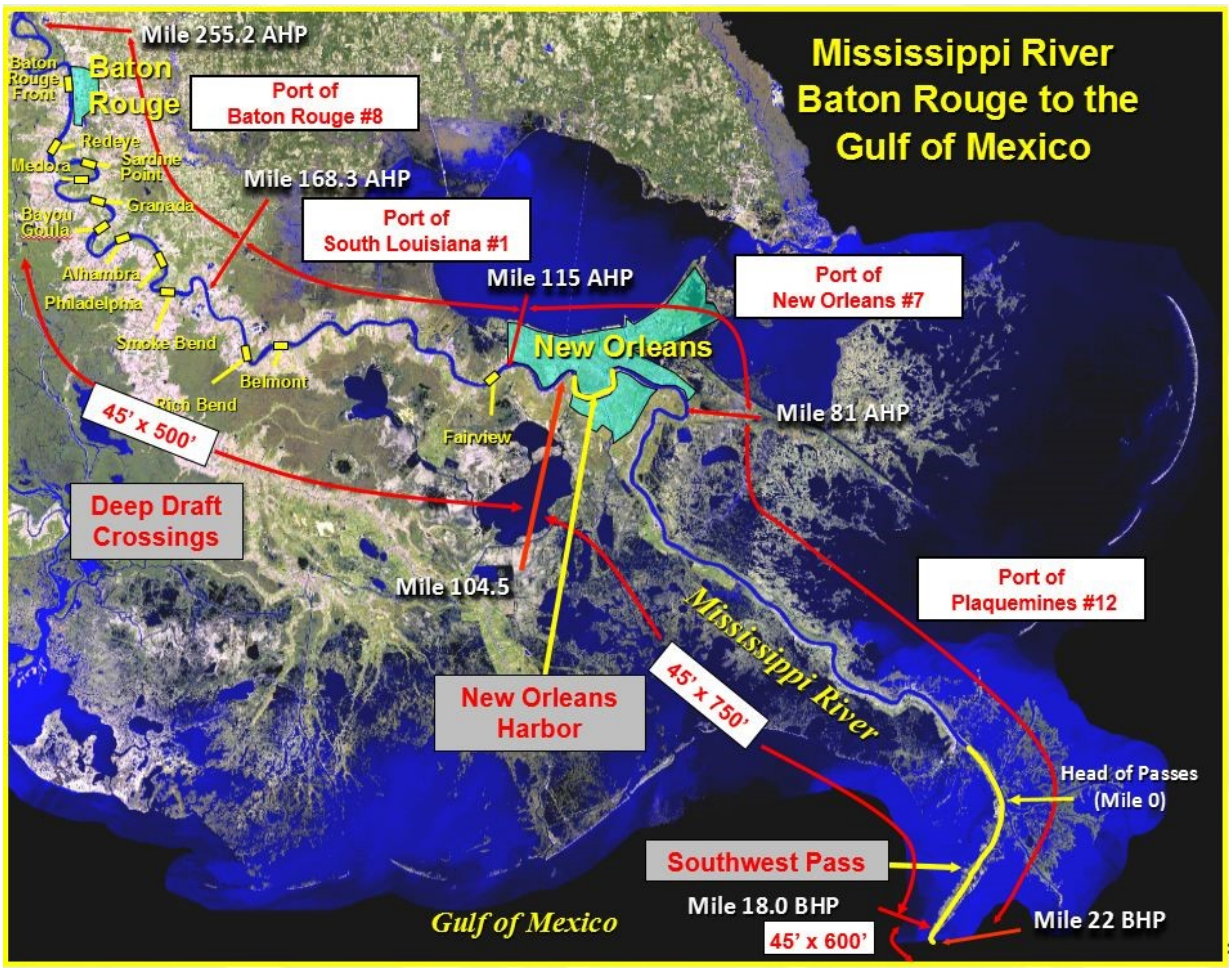

Figure D-2 Study Area Map

The 4 ports collectively make up the largest port cluster in the United States, effectively servicing a large portion of the country by connecting inland waterways, rail, and road while also serving as a gateway to foreign trade with Latin America, North Europe, and the Mediterranean.

Within a 500 mile radius alone, these ports can provide quick market access to a number of US metropolitan areas (Figure D-3).

Figure D-3 Metro Areas within 500 Miles

The strength of the 4 ports lies in their location, namely the intersection of the Mississippi River and the Gulf of Mexico. Access to the 14,500 miles of inland waterways through the Mississippi River and its tributaries provides convenient barge and vessel transportation throughout the Mississippi valley, and the Gulf Intracoastal Waterway, running approximately 1050 miles from Carrabelle, Florida, to Brownsville, Texas, provides direct access along the Gulf Coast. The vast majority of transported cargo is dry bulk for the Midwest through the use of the Mississippi River network and petroleum and petroleum products. Although oil is largely processed on site or transported by pipeline, a significant portion (along with chemical products) is shipped by barge. These 2 commodity groups comprise approximately two-thirds of the tonnage transported along the Mississippi River from Minneapolis, MN, to Mouth of Passes (Table D-3).

Table D-3 Mississippi River Minneapolis, MN to Mouth of Passes

2014 - Tonnages by Major Commodity Group

Commodity Group	Tons (1,000's)	Distribution
Food and Farm Products	167,313	31%
Petroleum and Petroleum Products	163,656	31%
Crude Materials	66,933	13%
Chemicals and Related Products	59,592	11%
Coal, Lignite & Coal Coke	42,501	8%
Primary Manufactured Goods	32,084	6%
Manufactured Equipment	1,569	< 1%
Total	533,648	100%

Source: WCSC

Rail plays an effective role as well. Customers of the Port of New Orleans benefit from direct access to a 133,000 mile rail network. In fact, the Port of New Orleans is the only seaport in the United States to be served by all 6 Class 1 railroads, effectively linking it to nearly every region in the country. The New Orleans Public Belt Railroad connects these railroads to the Port of New Orleans with 26 miles of track along the New Orleans riverfront and inner harbor. The Union Pacific railroad, one of 3 trunk line railroads servicing the Port of South LA, operates on the west bank of the Mississippi River and provides access to the western states. The other 2 railroads, Canadian National and Kansas City Southern, operate on the east bank and serve the mid-continental United States and Canada. Three Class 1 railroads (Union Pacific, Illinois Central/Canadian National Railway, and Kansas City Southern) serve the Port of Baton Rouge (Figure D-4).

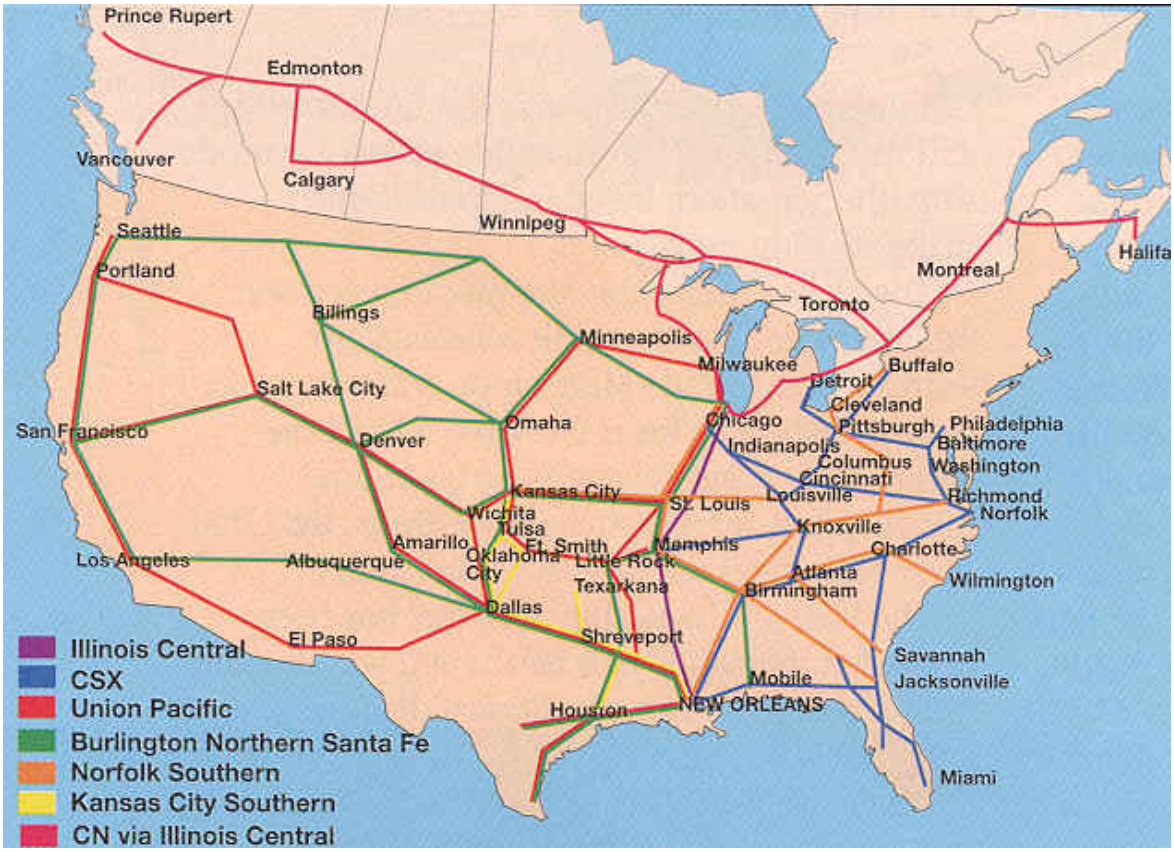

Figure D-4 Railroad Network for 4 Ports

Additionally, convenient access to the Interstate Highway System provides advantageous transportation of goods for the 4 ports to locations throughout the country. I-10, stretching from the Atlantic Ocean to the Pacific Ocean, connects the east coast of the United States with the west coast. I-55 is a north-south route and connects the Great Lakes with the Gulf of Mexico. I-59 and I-49 are also easily accessible and provide further entrance to southern/midwestern markets.

As described above, the 4 Louisiana ports truly are in a unique position to act as a direct link between the states in the Mississippi valley as well as nearly any other part of the United States through its combination of waterway, rail, and highway access (Figure D-5).

Figure D-5 Freight Flows by Highway, Railroad, and Waterway

Source: U.S. Department of Transportation

D-2.0 EXISTING CONDITIONS

D-2.1 Socioeconomic

The socioeconomics of the community area along the Mississippi River are summarized in this section. The study area includes eleven contiguous parish communities that may be directly impacted by the deepening and expansion of the Ports in question.[2] 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 and age distribution, and poverty are examined.

[2] The eleven (11) parishes contiguous to the Mississippi River below Baton Rouge: West Baton Rouge, East Baton Rouge, Iberville, Ascension, St. James St. John the Baptist, St. Charles, Jefferson, St. Bernard, Orleans, and Plaquemines.

D-2.1.1 Population

Louisiana is ranked as the 25th largest state in the Union in terms of resident population as of July 1, 2015, with 4.7 million residents.[3] Between the years of 1990 and 2015, Louisiana's population increased by 11 percent, from 4.2 million to 4.7 million persons, as shown below in Table D-4. Across the eleven parishes a 6 percent growth was observed from 1.55 million to 1.64 million persons. This is significantly lower than the observed national growth of 29% over the same historical period. Six of the parishes within the immediate economic region of the study area have seen a growth in population from 1990, while 5 parishes have seen a decrease in population. The Ascension Parish experienced the highest increase in population from 1990 to 2015 (+75%), while the St. Bernard Parish experienced the greatest decrease in population (-32%) over the same time period.

Table D-4 Population Trends for Selected Louisiana Parishes - 1990 to 2015

Parish	Population				Percentage Change			
	1990[4]	2000[5]	2010	2015[6]	1990 to 2000	2000 to 2010	2010 to 2015	1990 to 2015
Ascension	68,214	76,627	107,215	119,455	12%	40%	11%	75%
East Baton Rouge	285,167	412,852	440,171	446,753	45%	7%	1%	57%
Iberville	31,049	33,320	33,387	33,095	7%	0%	-1%	7%
Jefferson	448,306	455,466	432,552	436,275	2%	-5%	1%	-3%
Orleans	496,938	484,674	343,829	389,617	-2%	-29%	13%	-22%
Plaquemines	25,575	26,757	23,042	23,495	5%	-14%	2%	-8%
St. Bernard	66,631	67,229	35,897	45,408	1%	-47%	26%	-32%
St. Charles	42,437	48,072	52,780	52,812	13%	10%	0%	24%
St. James	25,575	21,216	22,102	21,567	-17%	4%	-2%	-16%
St. John the Baptist	39,996	43,044	45,924	43,626	8%	7%	-5%	9%
West Baton Rouge	19,419	21,601	23,788	25,490	11%	10%	7%	31%
Louisiana	4,219,973	4,468,976	4,533,372	4,670,724	6%	1%	3%	11%
United States	248,709,873	281,421,906	308,745,538	321,418,820	13%	10%	4%	29%

[3] Bureau of the Census, American Community Survey
[4] Bureau of the Census, http://www.census.gov/population/www/censusdata/cencounts/files/la190090.txt
[5] Bureau of the Census, http://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t
[6] Bureau of the Census, American Community Survey, Quick Facts

D-2.1.2 Employment

Louisiana employment in 2014 totaled two million as show in Table D-5. Of the major industry sectors within the State, the health care and social assistance sector employs the most persons at 283,000. This industry is followed by retail trade (234,000), educational services (184,000), construction (161,000), manufacturing (160,000) and accommodation and food services (156,000). The parishes in the study region yield fairly similar proportions of workers per sector (all within 5 percent) compared to what was observed at the state level. The one industry exception was manufacturing in St. James Parish and West Baton Rouge Parish. Respectively, twenty three percent and sixteen percent of workers participated in the manufacturing industry compared to eight percent at the state level.

D-2.1.3 Earnings by Sector

Median earnings across all sectors averaged $36.7 thousand in the state in 2014 (Table D-6). Comparatively, in the study area Jefferson Parish was at the low end with $28.8 thousand while Ascension Parish was at the high end with $44.1 thousand. At both the state and parish level, the mining, utilities, manufacturing, transportation and warehouses and professional and technical services generally provided the highest median earnings while the sectors for accommodation and food services, arts entertainment and recreation, administrative and waste services, retail trade and agriculture, forestry, fishing, hunting observed the lowest median earnings.

Table D-5 Sector Employment for Selected Louisiana Parishes - 2014[7]

	NAICS Industry Sector	Louisiana	Ascension	East Baton Rouge	Iberville	Jefferson	Orleans	Plaque-mines	St. Bernard	St. Charles	St. James	St. John the Baptist	West Baton Rouge
11	Agriculture, forestry, fishing, hunting	22,946	313	818	289	291	573	558	287	84	203	97	16
21	Mining	72,324	321	1,799	167	13	1,816	643	222	105	64	206	143
22	Utilities	22,071	265	1,779	346	122	1,313	158	166	586	144	294	230
23	Construction	161,201	5,844	15,686	1,427	757	9,117	773	2,217	2,309	730	1,993	951
31-33	Manufacturing	160,428	7,132	15,571	1,716	883	6,817	824	1,662	2,932	2,050	2,623	1,816
42	Wholesale Trade	52,342	2,009	5,049	189	137	2,966	311	485	1,097	200	518	146
44-45	Retail Trade	233,981	5,826	26,628	1,435	1,522	15,005	888	1,671	2,595	1,058	2,335	1,160
48-49	Transportation and Warehousing	83,192	2,423	6,691	569	564	6,785	684	1,043	1,369	427	1,179	408
51	Information	31,077	984	3,937	184	304	3,290	63	160	328	22	352	152
52	Finance and Insurance	70,100	2,277	8,508	572	200	4,782	234	563	775	292	587	257
53	Real Estate and Rental and Leasing	33,708	884	3,869	95	333	3,444	217	262	416	50	253	188
54	Professional and Technical Services	103,455	3,304	14,303	367	653	12,819	470	875	1,030	242	684	762
55	Management of companies and Enterprises	627	52	81	-	11	35	-	4	-	6	15	-
56	Administrative and Waste Services	68,100	1,878	7,567	514	323	6,698	284	901	910	430	840	297
61	Educational Services	184,232	4,295	25,211	864	815	20,055	669	1,007	2,488	672	1,364	949
62	Health Care and Social Assistance	283,388	7,342	29,228	1,541	1,599	23,602	920	2,000	3,207	1,079	2,724	1,696

[7] Source: Bureau of the Census, 2010-2014 American Community Survey 5-Year Estimates
S2403: Industry by sex and median earnings in the past 12 months (in 2014 inflation-adjusted dollars) for the civilian employed population 16 years and over

	NAICS Industry Sector	Louisiana	Ascension	East Baton Rouge	Iberville	Jefferson	Orleans	Plaque-mines	St. Bernard	St. Charles	St. James	St. John the Baptist	West Baton Rouge
71	**Arts, Entertainment and Recreation**	47,286	488	4,376	133	211	6,850	165	308	635	41	283	235
72	**Accommodation and Food Service**	155,969	3,407	18,900	838	816	21,788	551	1,209	1,536	544	1,819	668
81	**Other Services (except Public Administration)**	103,477	2,308	11,724	542	894	7,779	496	942	1,261	348	757	539
92	**Public Administration**	112,506	2,934	13,179	1,222	727	8,585	1,096	1,077	1,247	455	715	877
	Total, Private and Government	2,002,410	54,286	214,904	13,010	11,175	164,119	10,004	17,061	24,910	9,057	19,638	11,490

Table D-6 Median Annual Wage Earnings for Selected Louisiana Parishes - 2014[8]

	NAICS Industry Sector	Louisiana	Ascension	East Baton Rouge	Iberville	Jefferson	Orleans	Plaque mines	St. Bernard	St. Charles	St. James	St. John the Baptist	West Baton Rouge
11	**Agriculture, forestry, fishing, hunting**	$26,806	$23,884	$21,467	$32,686	$40,195	$25,492	$31,083	$22,476	$28,431	$25,398	$21,908	-
21	**Mining**	$63,866	$69,395	$53,135	$61,157	-	$74,375	$64,292	$60,435	$52,148	$120,640	$46,250	$61,169
22	**Utilities**	$49,023	$80,417	$51,365	$41,929	$50,300	$39,219	$54,242	$50,833	$71,852	$40,556	$103,438	$46,075
23	**Construction**	$36,035	$46,552	$34,739	$33,775	$27,708	$31,848	$39,464	$31,787	$40,719	$46,746	$36,755	$32,625
31-33	**Manufacturing**	$47,593	$71,350	$54,240	$54,554	$43,713	$40,394	$72,292	$46,176	$61,037	$72,100	$53,578	$62,045
42	**Wholesale Trade**	$41,910	$62,750	$44,337	$39,485	$25,481	$44,491	$45,583	$39,612	$53,113	$49,091	$39,554	$45,694
44-45	**Retail Trade**	$20,121	$20,352	$20,135	$22,022	$21,980	$19,956	$25,341	$24,067	$23,042	$17,048	$19,221	$19,081
48-49	**Transportation and Warehousing**	$44,026	$55,934	$40,733	$53,542	$31,207	$37,221	$50,385	$34,676	$43,363	$46,921	$56,349	$60,285
51	**Information**	$37,316	$43,387	$33,230	$35,758	$5,556	$41,404	$81,875	$41,944	$46,029	-	$33,750	$26,959
52	**Finance and Insurance**	$38,311	$47,375	$42,985	$26,587	$42,888	$45,804	$45,536	$36,445	$38,633	$35,938	$34,913	$41,344
53	**Real Estate and Rental and Leasing**	$32,949	$40,156	$30,426	$33,750	$14,261	$33,036	$58,750	$41,250	$32,500	$65,750	$32,083	$19,310
54	**Professional and Technical Services**	$48,440	$51,640	$51,144	$44,107	$40,651	$54,101	$38,869	$46,840	$46,886	$60,469	$48,523	$49,098
55	**Management of companies and Enterprises**	$61,563	-	$118,365	-	-	$128,309	-	-	-	-	-	-
56	**Administrative and Waste Services**	$22,117	$23,750	$24,461	$34,375	$13,862	$22,305	$30,469	$21,645	$22,692	$18,750	$21,017	$21,908
61	**Educational Services**	$35,985	$41,016	$35,427	$34,593	$25,978	$40,423	$42,384	$33,094	$34,367	$37,772	$27,225	$30,295
62	**Health Care and Social Assistance**	$30,091	$35,972	$31,567	$22,188	$31,738	$32,271	$31,885	$33,256	$35,735	$26,658	$35,647	$30,185

[8] Source: Bureau of the Census, 2010-2014 American Community Survey 5-Year Estimates
S2403: Industry by sex and median earnings in the past 12 months (in 2014 inflation-adjusted dollars) for the civilian employed population 16 years and over

	NAICS Industry Sector	Louisiana	Ascension	East Baton Rouge	Iberville	Jefferson	Orleans	Plaque mines	St. Bernard	St. Charles	St. James	St. John the Baptist	West Baton Rouge
71	**Arts, Entertainment and Recreation**	$20,750	$30,323	$14,599	$11,080	$19,570	$23,275	$22,202	$24,403	$17,281	$20,662	$19,201	$20,677
72	**Accommodation and Food Service**	$13,538	$10,750	$12,493	$12,416	$11,451	$18,716	$13,114	$15,599	$9,626	$16,121	$13,243	$9,600
81	**Other Services (except Public Administration)**	$21,614	$33,006	$21,889	$23,321	$18,750	$21,664	$26,250	$25,451	$21,814	$15,086	$31,875	$17,260
99	**Public Administration**	$41,960	$48,982	$46,722	$36,696	$53,098	$49,069	$41,280	$47,675	$47,083	$42,188	$50,436	$44,583
	Average, Private and Government	$36,701	$44,052	$39,173	$34,422	$28,799	$41,169	$42,910	$35,667	$38,229	$42,105	$38,156	$35,455

D-2.1.4 Median Household Income for Selected Parishes

Median household incomes for selected parishes in 2014 are shown in Table D-7. The average median household income across all parishes was $50.9 thousand, which is greater than the State median of $45k but less than the National median of $53.5 thousand. Ascension Parish has the highest median household income of $70.2 thousand which is 56 percent greater than the state median, 31 percent greater than the national median, and 20 percent greater than the next closest parish, St. Charles. Ascension Parish's comparatively high income status can be traced to the utilities, manufacturing and wholesale trade sectors and the respectively high earnings of these employees, as well as a slightly higher number of persons per household and a lower unemployment rate compared to most of the other parishes in the study area. Median household income for all the parishes excluding Orleans and St. Bernard are higher than the state median. Ascension, Plaquemines and St. Charles are the only parishes that have a higher median household income than the national median.

Table D-7 Median Household Income for Selected Louisiana Parishes - 2014

Geography	Median Household Income	% of State Median Household Income	% of National Median Household Income
Ascension	$70,207	156%	131%
East Baton Rouge	$48,535	108%	91%
Iberville	$45,692	102%	85%
Jefferson	$47,871	106%	90%
Orleans	$36,964	82%	69%
Plaquemines	$54,835	122%	103%
St. Bernard	$44,706	99%	84%
St. Charles	$57,785	128%	108%
St. James	$53,259	118%	100%
St. John the Baptist	$50,716	113%	95%
West Baton Rouge	$49,202	109%	92%
Louisiana	$44,991	-	84%
United States	$53,482	119%	-

Source: Bureau of the Census, Small Area Income and Poverty Estimates Program

As shown in Table D-8, the unemployment rate ranges 5 percent (Ascension) to 8.3 percent (St. James). The average rate of 6.4 percent across the parishes is slightly higher than the rate of 6.3 percent for the state, and one full percent higher than the national rate of 5.3 percent. Louisiana was ranked 45th out of the 50 states in 2015.

Table D-8 Unemployment Rate for Selected Louisiana Parishes - 2015 Annual Average

Geography	Unemployment Rate
Ascension	5.0%
East Baton Rouge	6.8%
Iberville	7.1%
Jefferson	5.7%
Orleans	6.5%
Plaquemines	5.5%
St. Bernard	6.6%
St. Charles	5.7%
St. James	8.3%
St. John the Baptist	7.3%
West Baton Rouge	5.6%
Louisiana	6.3%
United States	5.30%

Source: Bureau of Labor Statistics, Local Area Unemployment Statistics (LAUS)

Parish Data, http://www.bls.gov/lau/laucnty15.xlsx; State Data, http://www.bls.gov/lau/lastrk15.htm

D-2.1.5 Social Characteristics

This section describes social characteristics of the parishes in the study region. The social characteristics that are assessed in this section include race, age, education, income, poverty, and unemployment.

D-2.1.6 Race

As shown in Table D-9 and D-10, in 2014 the State and most of the parishes in the study region have similar percentage of total minority populations compared to the national level. However, both the State and the parishes have significantly higher percentages of the Black or African American persons, and significantly lower percentages of Asian and Hispanic or Latino persons. On average across the parishes there are 37 percent Black or African American compared to 32 percent at the State and 12 percent at the National level. Both the Orleans Parish and the St. John the Baptist Parish have majority Black or African American populations, at 59 percent and 54 percent respectively. For Asian populations, the average across the parishes is 1.7 percent compared 1.6 percent at the State and 4.9 percent at the national level. For Hispanic or Latino populations, the average across the parishes is 5.4 percent compared to 4.6 percent at the State and 16.9 percent at the National level.

Table D-9 Racial Composition (Number) of Selected Louisiana Parishes - 2014

Race	United States	Louisiana	Ascension	East Baton Rouge	Iberville	Jefferson	Orleans	Plaque-mines	St. Bernard	St. Charles	St. James	St. John the Baptist	West Baton Rouge
White	197,159,492	2,748,538	78,806	204,838	15,970	238,538	113,105	15,772	27,143	34,603	10,423	17,295	14,032
Black or African American	38,460,598	1,468,208	25,012	200,711	16,206	112,733	217,983	4,934	8,270	13,755	10,906	23,900	9,066
American Indian & Alaska Native	2,082,768	25,498	203	576	43	1,643	536	301	193	107	12	24	77
Asian	15,536,209	74,878	1,242	13,654	21	17,624	10,737	778	806	512	71	267	129
Native Hawaiian & Other Pacific Islander	493,155	1,604	-	103	-	154	105	-	-	11	-	99	-
Some other race	611,881	7,158	221	600	16	1,246	1,074	22	11	78	-	77	107
Two or more races	6,692,885	64,641	1,295	6,318	346	5,255	5,020	409	808	690	55	647	308
Hispanic or Latino	53,070,096	210,524	5,529	16,798	773	57,335	19,911	1,329	3,883	2,860	315	2,261	628
Total	314,107,084	4,601,049	112,308	443,598	33,375	434,528	368,471	23,545	41,114	52,616	21,782	44,570	24,347

Table D-10

Race	United States	Louisiana	Ascension	East Baton Rouge	Iberville	Jefferson	Orleans	Plaque-mines	St. Bernard	St. Charles	St. James	St. John the Baptist	West Baton Rouge
White	62.8%	59.7%	70.2%	46.2%	47.9%	54.9%	30.7%	67.0%	66.0%	65.8%	47.9%	38.8%	57.6%
Black or African American	12.2%	31.9%	22.3%	45.2%	48.6%	25.9%	59.2%	21.0%	20.1%	26.1%	50.1%	53.6%	37.2%
American Indian and Alaska Native	0.7%	0.6%	0.2%	0.1%	0.1%	0.4%	0.1%	1.3%	0.5%	0.2%	0.1%	0.1%	0.3%
Asian	4.9%	1.6%	1.1%	3.1%	0.1%	4.1%	2.9%	3.3%	2.0%	1.0%	0.3%	0.6%	0.5%
Native Hawaiian and Other Pacific Islander	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%

Race	United States	Louisiana	Ascension	East Baton Rouge	Iberville	Jefferson	Orleans	Plaque-mines	St. Bernard	St. Charles	St. James	St. John the Baptist	West Baton Rouge
Some other race	0.2%	0.2%	0.2%	0.1%	0.0%	0.3%	0.3%	0.1%	0.0%	0.1%	0.0%	0.2%	0.4%
Two or more races	2.1%	1.4%	1.2%	1.4%	1.0%	1.2%	1.4%	1.7%	2.0%	1.3%	0.3%	1.5%	1.3%
Hispanic or Latino	16.9%	4.6%	4.9%	3.8%	2.3%	13.2%	5.4%	5.6%	9.4%	5.4%	1.4%	5.1%	2.6%

Source: Bureau of the Census, DPO5: ACS DEMOGRAPHIC AND HOUSING ESTIMATES; 2010-2014 American community survey 5-Year Estimate

D-2.1.7 Age Distribution

The age characteristics of the study are and the parishes are shown in Table D-11 and D-12. The average median age across all the parishes in the study region of 36.2 years is nearly identical to the State median of 36.3 years. These values are slightly lower than the National median of 37.7 years. The lower median age averaged across all the parishes and at the State level compared to the National number can be contributed to the greater percentage of persons under the age of 18.

Table D- 11 Age Characteristics (Number) of Selected Louisiana Parishes - 2014

Race	United States	Louisiana	Ascension	East Baton Rouge	Iberville	Jefferson
Under 18	73,583,618	1,113,493	32,277	101,880	7,246	95,369
18-64	199,030,227	2,903,289	72,818	288,827	21,560	274,667
65 and above	46,243,211	632,894	11,934	55,335	4,521	65,680
Median Age	37.7	36.3	34.9	33.3	38.1	38.9
Total Population	318,857,056	4,649,676	117,029	446,042	33,327	435,716

Race	Orleans	Plaque-mines	St. Bernard	St. Charles	St. James	St. John the Baptist	West Baton Rouge
Under 18	78,503	6,250	11,928	13,409	5,145	11,024	6,038
18-64	259,304	14,337	28,110	33,241	13,232	27,202	16,030
65 and above	46,513	2,860	4,371	6,095	3,261	5,519	3,017
Median Age	35.5	36.1	33.1	37.3	38.8	37.0	35.6
Total Population	384,320	23,447	44,409	52,745	21,638	43,745	25,085

Source: Bureau of the Census, PEPAGESEX: Annual Estimates of the Resident Population for Selected Age Groups by Sex for the United States, States, Counties, and Puerto Rico Commonwealth and Municipios: April 1, 2010 to July 1, 2014 - 2014 Population Estimates

Table D-12 Age Characteristics (Percent) of Selected Louisiana Parishes - 2014

Race	United States	Louisiana	Ascension	East Baton Rouge	Iberville	Jefferson
Under 18	23.1%	23.9%	27.6%	22.8%	21.7%	21.9%
18-64	62.4%	62.5%	62.2%	64.8%	64.7%	63.0%
65 and above	14.5%	13.6%	10.2%	12.4%	13.6%	15.1%

Race	Orleans	Plaque-mines	St. Bernard	St. Charles	St. James	St. John the Baptist	West Baton Rouge
Under 18	20.4%	26.7%	26.9%	25.4%	23.8%	25.2%	24.1%
18-64	67.5%	61.1%	63.3%	63.0%	61.1%	62.2%	63.9%
65 and above	12.1%	12.2%	9.8%	11.6%	15.1%	12.6%	12.0%

Source: Bureau of the Census, PEPAGESEX: Annual Estimates of the Resident Population for Selected Age Groups by Sex for the United States, States, Counties, and Puerto Rico Commonwealth and Municipios: April 1, 2010 to July 1, 2014 - 2014 Population Estimates

D-2.1.8 Income and Poverty

Income and poverty data for the eleven parishes, the State and the Nation in 2014 are summarized in Table D-13. On average across the parishes in the study region the median household income ($50.9 thousand), per capita income ($25.4 thousand) and poverty rate (18.1 percent) falls between the State and National statistics, with the trend for the Nation to posts higher income and a smaller percentage of persons in poverty. The Orleans Parish has the highest level of persons below the poverty level at nearly 28 percent and the lowest median household income at $37 thousand, which could be contributed to the lower number of persons per household relative to the other parishes.

Table D-13 Income and Poverty Data for Selected Louisiana Parishes - 2014

Income and Poverty	United States	Louisiana	Ascension	East Baton Rouge	Iberville	Jefferson
Persons per Household	2.63	2.6	2.83	2.57	2.62	2.57
Median Household Income	$53,482	$44,991	$70,207	$48,535	$45,692	$47,871
Per Capital Income	$28,555	$24,775	$28,834	$27,558	$21,576	$27,067
Persons Below Poverty Level	14.8%	19.8%	13.7%	18.4%	19.9%	15.8%

Income and Poverty	Orleans	Plaque-mines	St. Bernard	St. Charles	St. James	St. John the Baptist	West Baton Rouge
Persons per Household	2.37	2.65	2.9	2.83	2.72	2.84	2.63
Median Household Income	$36,964	$54,835	$44,706	$57,785	$53,259	$50,716	$49,202
Per Capital Income	$27,255	$26,672	$21,079	$26,623	$24,757	$22,785	$25,296
Persons Below Poverty Level	27.9%	16%	17.9%	12.1%	16.1%	20.8%	20.5%

Source: Bureau of the Census, S1703 Selected Characteristics of People at Specified Levels of Poverty in the Past 12 months, 2010-2014 American Community Survey 5-Year Estimates

D-2.1.9 Education

The educational attainment levels for the eleven parishes, the State and the Nation in 2014 are presented in Table D-14. On average across the parishes in the study region, 83.7 percent of persons age 25 years and older had completed high school, while 20.5 percent had a bachelor's degree. These values are higher than State's high school graduate rate at 82.8 percent, but lower than the State's rate of 22.1 percent with a bachelor's degree. The National statistics for both high school and college graduates are greater than those at the State and parish level at 86.3 percent and 29.3 percent, respectively. The Iberville Parish had the lowest percentage of persons with either or high school or bachelor's degree, at 76.7 percent and 12.7 percent respectively. East Baton Rouge had the highest percentage of high school graduates at 88.8 percent and the Orleans Parish had the highest rate of college graduates at 34.4%.

Table D-14 Educational Attainment (Percent) for Persons 25 Years of Age or Older - 2014

Education	United States	Louisiana	Ascension	East Baton Rouge	Iberville	Jefferson
High School Graduate or Higher	86.3%	82.8%	88.7%	88.8%	76.7%	84%
Bachelor's Degree or Higher	29.3%	22.1%	25.8%	34.1%	12.7%	23.8%

Education	Orleans	Plaque-mines	St. Bernard	St. Charles	St. James	St. John the Baptist	West Baton Rouge
High School Graduate or Higher	84.8%	79.7%	81.9%	86.6%	83.8%	81%	84.3%
Bachelor's Degree or Higher	34.4%	15.4%	12.5%	20.1%	13.4%	15.2%	18%

Source: Bureau of the Census. 2010-2014 American Community Survey 5-Year Estimates

D-2.2 Facilities and Infrastructure

The following is a discussion of port facilities for the Port of New Orleans, Port of South Louisiana, Port of Baton Rouge, Port of St. Bernard, and Port of Plaquemines that includes, but is not limited to port facility location, facility capacity and facility berths. Description and discussion of port facilities are combined in some cases due to the volume of facilities, especially if the cargo handled is similar or other similarities warrants the ability to combine.

D-2.2.1 Port of New Orleans

The Port of New Orleans hosts both cruise and cargo terminals and facilities, an industrial park, and a number of other service providers. Located on Louisiana's Lower Mississippi River, the Port has connections to six Class One railroads and the interstate highway system. The main project depth of the Mississippi River is 47 feet while the Inner Harbor Navigation Canal has a depth of 30 ft. Primary inbound cargoes include steel, rubber, plywood, coffee, non-ferrous metals, and project cargo. Forest products, steel, foodstuff, chemicals, frozen poultry represent the primary outbound cargoes.

On top of the Port's cargo handling capacity, there is an industrial park of more than 1,000 acres under short and long-term leases that support a wide range of heavy and light industrial services as well as commercial services. Heavy and light industrial uses include: shipbuilding and repair; Truck and container depots; Steel distribution; Warehouse and distribution; Basic materials handling; Refrigerated warehousing; Truck and container depots; Cement handling; Manufacturing and Packaging.

Other services include: Bunkers/Fuel; Chandlery; Cold Storage; Crane Maintenance and Repair; Dry Dock; Environmental/Waste Services; Marine Equipment and Supplies; Oil Spill Response; Shipyard/Ship Repair; Towing & Tug Services; Warehousing - Bonded; SILO-CAF: bulk coffee storage & blending facility; bagging & drumming; container & chassis repair; heavy lift pilots; ship cleaning & fumigation; inland cruising.

D-2.2.1.1 Cruise Terminals

Julia Street Cruise Ship Terminal

Operated by the Port of New Orleans, Cruise & Tourism Division, this terminal located at river mile 95.3 has one berth that is 1,250 feet long and a project depth of 35 feet. There is an air-conditioned gangway, covered drive-in, drop-off and pick-up areas and a secured passenger parking lot. Additional features include a 23,000 square foot embarkation deck and 23,000 square feet of luggage laydown area.

Erato Street Cruise Terminal and Parking Garage

Operated by the Port of New Orleans, this terminal located at river mile 95.6 has one berth that is 1,250 feet long and a project depth of 30 feet. Special features include a 60,000 square foot embarkation deck a raised, passenger gangway and 28,000 square feet of luggage laydown area, a 1,000 vehicle-parking garage and an air-conditioned articulated passenger gangway.

D-2.2.1.2 Uptown River Cargo Terminals and Facilities

Henry Clay Avenue Wharf

Operated by New Orleans Cold Storage, this terminal located at river mile 101.1 has two berths of 1,441 feet in length and a project depth of 38 feet. Primary cargoes are refrigerated goods. Facilities include a 95,020 square foot refrigerated warehouse that includes a blast freezing system. Both highway and railroad services are available.

Nashville Avenue Wharf "A"

Operated by Ports America, this terminal located at river mile 100.8 has four berths that total 2,159 feet in length and a project depth of 35 feet. Primary cargoes include palletized, containerized and breakbulk. Facilities include a 756,000 square foot shed with close proximity to 2,673,924 square feet of open storage as well as a 62-foot apron. Both highway and railroad services are available.

Nashville Avenue Wharf "B"

Operated by Ports America, this terminal located at river mile 100.1 has three berths that total 1,785 feet in length and a project depth of 40 feet. Facilities include a 141,000 square foot shed with close proximity to 2,673,924 square feet of open storage and access to four multipurpose cranes with 40/70-ton capacity. There are also 50-foot gauge cranes and a 100-foot wide front apron. Both highway and railroad services are available.

Nashville Avenue Wharf "C"

Operated by Ports America, this terminal located at river mile 99.8 has three berths that total 1,658 feet in length and a project depth of 40 to 45 feet. Facilities include a 179,500 square foot shed with close proximity to 2,673,924 square feet of open storage as well as access to four multipurpose cranes with 40/70-ton capacity and a 100-foot wide front apron. Both highway and railroad services are available.

Napoleon Avenue Container Terminal Operators

Operated by Ports America, Inc. and New Orleans Terminal, LLC; this terminal located at river mile 99.5 has a berth with a length of 2,000 feet and a project depth of 45 feet. Primary cargoes

are containers. The terminal has six gantry cranes and a 640,000 annual TEU capacity and 1,000 psf live load. Both highway and railroad services are available.

Milan Street Wharf

Operated by New Orleans Terminal LLC, this wharf located at river mile 99.1 has two berths, one 772 feet in length and the other 1,263 feet in length with a project depth of 35 feet. Container freight is the primary cargo. Facilities and services include a 107,081 square feet of shed area, 232 foot wide front apron, 65,000 square feet of paved open area and 269,352 square feet of open wharf area. Both highway and railroad services are available.

Louisiana Avenue Wharf

Operated by Coastal Cargo Co., this wharf at river mile 98.3 has two berths with a total length of 1,590 feet and a project depth of 35 feet. Primary cargoes include palletized, containerized & breakbulk. Additional facilities include 178,360 square feet of covered area and 1,581,291 square feet of paved back-up area. Both highway and railroad services are available.

Harmony Street Wharf

Operated by Coastal Cargo Co., this wharf located at river mile 98.1 has two berths with a total length of 1,231 feet and a project depth of 35 feet. Steel is the primary cargo. Facilities include a 125,653 square foot shed a 49 foot wide front apron and 114,380 square feet of open area. Both highway and railroad services are available.

Seventh Street Wharf

Operated by Coastal Cargo Co., this wharf located at river mile 97.8 has two berths with a total length of 1,196 feet and a project depth of 35 feet. Primary cargoes include steel, palletized, and breakbulk. Facilities include 119,280 square foot shed a 50 foot wide front apron and 134,911 square feet of open area. Both highway and railroad services are available.

First Street Wharf

Operated by Empire Stevedoring, this wharf located at river mile 97.3 has two berths with a total length of 1,275 feet and a project depth of 35 feet. Primary cargoes include palletized, containerized and breakbulk. Facilities include 140,655 square foot shed a 50 foot wide front apron and 99,440 square feet of open area. Both highway and railroad services are available.

D-2.2.1.3 Downtown River Cargo Terminals and Facilities

Poland Avenue Wharf

This unassigned wharf located at river mile 93.1 has two berths with a total length of 932 feet and a project depth of 35 feet. Conventional and general containerized are the primary cargoes. Facilities include 84,328 square foot shed a 35 foot wide front apron and 96,257 square feet of open area. Both highway and railroad services are available.

Alabo Street Wharf

Operated by Seaonus, this wharf located at river mile 92.0 has two berths with a total length of 1,732 feet and a project depth of 38 feet. Conventional and breakbulk are the primary cargoes. Facilities include 126,178 square feet of covered storage, 81 foot wide front apron, 182,821 square feet of open area and 207,849 square feet of marshalling area. Both highway and railroad services are available.

Perry Street Wharf

This unassigned wharf located at river mile 95.9 has two berths with a total length of 1,009 feet and a project depth of 50 feet. Facilities include 160,000 square foot shed a 40 foot wide front apron and 33,368 square feet of open area. The wharf is currently being used as a Railroad services are available.

Governor Nicholls Street Wharf

Operated by TCI, this wharf located at river mile 94.6 has two berths with a total length of 1,210 feet and a project depth of 35 feet. Conventional and general containerized are the primary cargoes. Facilities include 156,617 square foot shed, 30 foot wide front apron and 37,694 square feet of open area. Both highway and railroad services are available.

D-2.2.1.4 Inner Harbor Cargo Terminals and Facilities

France Road Container Terminal

This unassigned wharf located at the industrial canal has one 830 foot berth and a project depth of 30 feet. Facilities include a 67,019 square foot shed, 2.6 million square feet of marshalling area and a 147 foot wide wharf. Both highway and railroad services are available.

Jourdan Road Terminal

Operated by New Orleans Cold Storage, this wharf located at the inner harbor has two berths with a total length of 1,400 feet and a project depth of 29 feet. Facilities and services include 160,000 square foot refrigerated warehouse with a 55 million pound capacity and a blast freezing system. Railroad

D-2.2.2 Port of Baton Rouge

The Port jurisdiction includes the parishes of Ascension, East Baton Rouge, Iberville and West Baton Rouge. It stretches 85 miles of the Mississippi River and hosts both deep-draft and shallow-draft terminals with access to both rail and highway infrastructure. Main project depth at the Port is 45 feet. Primary inbound cargoes include grain, petroleum, molasses, rail, steel coils, pipe, steel products, chemicals, and building and construction materials. Grain, molasses, chemicals, liquid bulk chemicals, coal, petroleum coke, petroleum products, pipe, sugar and containerized cargo encompass the primary outbound cargoes. The Port also provides a range of other services and warehouse facilities and hosts a number of large chemical companies like BAF, ExxonMobil and the Dow Chemical Company. The Port has Foreign Trade Zone services available.

D-2.2.2.1 Cargo Terminals and Facilities

The Port of Baton Rouge has two general cargo docks and a 5 berths that total 3,000 feet in length. The depth of the main project is 45 feet. Rail services are available at both of the cargo docks and there is a 525,000 square foot transit shed. Two cranes are available for use with up to 150 ton capacity. All of the cargo terminals and facilities are owned by the Port.

Inland Rivers Marine Terminal (IRMT)

This domestic barge terminal located on the Gulf Intracoastal Waterway has one berth of 250 feet in length and has a depth of 12 feet (similar to the Gulf Intracoastal Waterway). Primary cargoes include, short sea shipping containers, bulk products, agricultural products, bagged goods, steel coils, polypropylene and polyethylene pellets, newsprint, and project cargo. There is a 10-acre private container marshalling yard and a 4-acre public container marshaling terminal onsite. Rail service is available at this terminal. Value added services at IRMT include packaging by Katoen Natie and heavy lift and project cargo facilities operated by Mammoet.

Baton Rouge Barge Terminal

Two bulk terminals operate at this 985 foot long berth with a depth of 12 feet. Kinder Morgan operates one bulk terminal that services domestic, bulk products aggregate, coke and woodchip cargoes. Kanorado Corporation operates the other bulk terminal that supports coal handling. Rail service is available at this terminal.

Petroleum Fuel & Terminal

The Petroleum Fuel & Terminal Company operates this berth with a length of 864 feet and a project depth of 45 feet. Storage capacity for petroleum products can exceed 17 million gallons or 1,215,000 barrels. Rail services are available.

Public Grain Elevator

The Louis Dreyfus Commodities Port Allen Export Grain Elevator has an 800 foot long berth with a 4 foot project depth. Primary cargoes include soybeans, soft red wheat, oats, corn and other grain products. The facility supports storage for up to 9.5 million bushels and has the capacity to facilitate five to seven million tons on an annual basis. Rail services are available.

Export Biomass Facility

Baton Rouge Transit, LLC (subsidiary of Drax Biomass International, Inc.) operates this 80,000 ton storage and loading facility for the export of wood pellets. The ship loader can transport and load pellets at a rate of 1,200 MTPH, and travel on rail at a rate of 50 feet a minute. This allows the loading of Panamax vessels averaging 65,000 short tons capacity in 3 days. Rail and truck access is available.

Bulk Flour Mill

The flour mill is operated by Ardent Mills, Inc., and ships to domestic & international markets.

Mid-Stream Buoys

This dry bulk public terminal has one berth with a length of 990 feet and a project depth of 45 feet. It is located opposite of the Port's main cargo terminal. The pile anchor system at the midstream buoys support cargo-to-barge transfer all year at low and high water levels and can accommodate Panamax size vessels and allow for 1,000 feet of clearance between the buoys. There is an unlimited turning basin and barge fleet services are available.

Molasses Terminal

The molasses terminal has one berth with a length of 800 feet and a project depth of 45 feet. Westway Terminal Company operates this cargo terminal that supports liquid bulk, molasses, and high-fructose corn syrup, specialty chemicals including acids, caustics and glycol-based products. Storage capacity of this terminal exceeds 22 million gallons. Rail services are available.

Sugar Distribution & Warehouse Complex

Louisiana Sugar Cane Cooperative operates this 80,000 square foot warehouse that has an underground hopper system to convey to general cargo dock for loading.

D-2.2.3 Port of South Louisiana

The Port of South Louisiana is the largest tonnage port in the Western Hemisphere, handling over 250 million tons annually by vessel, barge, rail and truck across 54 miles of the Mississippi River.

The main project depth is 45 feet. Primary inbound cargoes include crude oil, chemicals, fertilizers, petrochemicals, steel products, concrete/stone products, ores/phosphate rock, wood/wood chips, coal/lignite/ coke and edible oils. Animal feed, wheat, soybeans, coal/lignite/coke, maize, milo, petrochemicals, rice, chemicals, fertilizers, edible oils and crude oil makeup the primary outbound cargoes.

D-2.2.3.1 Cargo Terminals and Facilities

Globalplex Intermodal Terminal (Port Terminal #8)

The Globalplex Intermodal Terminal has a project depth of 50 feet and is located at river mile 138. The Globalplex terminal has a 135,000 square feet general cargo dock, 25,000 square foot bulk handling dock and a 45,500 square foot finger pier that can support Panamax vessels. There is 300,000 square feet of covered storage facilities and 200 acres available for open storage. Rail services are accessible, and Foreign Trade Zone services are available.

ADM/GROWMARK/RESERVE (Port Terminal #1):

At river mile 139.2 there is a reserve grain elevator berth and a project depth of 50 feet. At river mile 150.5 there is the St. Elmo berth with a length of 984 feet. Rail services are accessible at both berths.

ADM/Growmark/Destrehan (Port Terminal #3)

At river mile 120.6 there is a berth with a length of 800 feet and a project depth of 40 feet. At river mile 144.9 is the Canadian National Kinder Morgan Marine Gramercy that hosts a barge dock berth with the length of 850 feet and a depth of 15 feet. Rail services are accessible at both berths.

ADM/Growmark/AMA

At river mile 117 there is a berth with a length of 585 feet and a project depth of 50 feet. Rail services are available.

Mosaic Chemical Co.

At river mile 160.3 there is one ship dock with a length of 625 feet and two barge docks each 300 feet in length. At mile 167 another berth with a length of 880 feet. At both locations project depth is 40 feet and rail services are available.

Arcelor Mittal

At river mile 132.5 there is a berth with a length of 300 feet with dolphin and a project depth of 40 feet. Rail services are available.

Bunge Corp.

At river mile 120 there is a berth of 470 feet and a project depth of 45 feet. Rail services are available.

Cargill Terre Haute

At river mile 139.4 there are two berths, one 735 feet in length and the other 892 feet in length. Project depth is 48 feet. Rail services are available.

Colonial Sugars Inc.

At river mile 147 there are two berths with a length of 363 feet. Project depth is 42 feet. Rail services are available.

Noranda Aluminum

At river mile 145.3 there are three berths, one with 150 feet in length, the second at 875 feet in length with dolphins and the third at 118 feet in length with plats. Project depth is 60 feet. Rail services are available.

Valero Asphat

At river mile 167.9 there is one berth with a length of 500 feet. Project depth is 30 feet.

St. James Stevedoring

At river mile 166 there are two berths with a total length of 1,800 feet midstream.

Weber Marine Inc.

Midstream operation at river mile 167 with accessible rail services.

ZEN/NOH Grain Corp.

At river mile 163.7 there is one berth with a length of 1,189 feet. Project depth is 50 feet. Rail service is available.

Occidental Chemical Corp. (Port Terminal #4)

At river mile 161.4 there is one berth with a length of 740 feet. Project depth is 40 feet. Rail service is available.

Occidental Chemical Corp. (Port Terminal #5)

At river mile 128.8 there is one berth with a length of 410 feet with dolphins. Project depth is 50 feet. Rail service is available.

Capline Terminal

At river mile 159.9 there are four berths. Two berths are 1,100 feet in length, another berth is 800 feet in length and there is one floating barge. Project depth is 40 feet.

American Styrenics: Berths

At river mile 166.5 there is one berth with a length of 200 feet for barges.

E.I. Dupont De Nemours

At river mile 135.7 there are two berths, one 825 feet in length and the other 400 feet in length. Project depth is 40 feet.

Ergon/St. James Inc.

At river mile 160.7 there are two berths with a length of 1,225 feet. Project depth is 40 feet. Berths: 2.

International Matex Tank Terminals

At river mile 118 there are 11 berths with lengths up to 900 feet. Project depth is 45 feet. Rail service is available.

NuStar

At river mile 159.8 there are three berths, two at 760 feet in length and another at 320 feet in length. Project depth is 35 feet.

Marathon Oil Co.

At river mile 140 there are 5 berths each at a length of 1,000 feet. Project depth is 45 feet. Rail service is available.

Monsanto Co.

At river mile 120 there are 3 berths with a length of 1,202. Project depth is 25/30 feet. Rail service is available.

Petroleum Fuel & Terminal Co.

At river mile 144.6 there are three berths. Two of the berths are 50 feet by 300 feet and the third berth is 940 feet for barges and ships. Project depth is 50 feet.

Motiva Enterprises:

At river mile 126 there are three berths, two at 750 feet in length and the third is 900 feet in length. Project depth is 45/90 feet. At river mile 168.1 there are two berths with a length of 1,710 feet. Project depth is 40 feet. Rail service is available at both locations.

Valero Refining

At river mile 125 there are two berths, one 423 feet in length and the other 480 feet in length. Project depth is 25 feet. Rail service is available.

DOW Chemical Co. — St. Charles Operations

At river mile 127.3 there is one berth with a length of 725 feet. Project depth is 30 feet. Rail service is available.

U.S. Department of Energy Strategic Petroleum Reserve:

At river mile 158.7 there are two berths each with a length of 940 feet. Project depth is 57 feet.

D-2.2.4 Port of St. Bernard

The Port of St. Bernard, a landlord port, provides a strategic location for expanding logistics and manufacturing operations. Located at the convergence of two major maritime corridors (the Mississippi River and the U.S. Gulf Intracoastal Waterway), the port is located on the east bank of the Mississippi River between mile markers 81.5 and 91.5, and includes a 216-acre marine terminal located in Arabi, Louisiana. Primary inbound cargoes include ferro alloys, fertilizers (potash), zinc concentrates, limenite sand, coke, fluorspar, bauxite, limestone, steel and plywood. Outbound cargoes include ferro alloys, fertilizers (potash), zinc concentrates, limenite sand, petroleum, coal, coke, fluorspar, bauxite and limestone.

D-2.2.4.1 Cargo Terminals and Facilities

The Port of Chalmette has two industrial terminals consisting three general cargo docks, marine mooring dolphins and two mid-stream mooring facilities. The depth of the slip is 36 feet and river mooring re 45+ feet.

The Arabi Terminal

The Arabi Terminal is a 40,000 sq. foot transit shed with 4 acres of hard surface laydown. A 40,000 sq. ft. dry bulk storage and transfer facility along with the installation of 2 state-of-the-art truck weigh scales, roadway and security enhancements were completed in 2007. There are two docks. Dock #1 has three berths, with a length of 1,300 feet and a minimum depth of 36 feet. Dock #2 has three berths, with a length of 1,500 feet and a minimum depth of 36 feet. Rail service is available. The Marine Terminal is protected by the Mississippi River Levee System and consists of hard surface laydown surface, dockside rail service and warehousing.

The Chalmette Terminal

The Chalmette Terminal is located one mile downriver from the Arabi Terminal (mile 89.5 AHP). Chalmette Terminal encompasses 216 acres of land with 300,000 square feet of building space, 100 acres of open land partially available for office space leasing. Recently, several buildings have been redesigned and rehabilitated for leasing to major clients. The site is fully equipped with all necessary utilities including electricity, gas, water, and sewerage. Almost any requirement for water and power can be met. High pressure natural gas crosses the site. Rail service is available.

Mooring Dolphins

Upriver from the Arabi Terminal Slip entrance. Capable of handling vessels up to 750 feet. Maintained depth is 44 plus feet alongside a steel and concrete in street platform.

Chalmette Mid-Stream Mooring Facility

The Chalmette Mid-Stream Mooring Facility is a deep draft buoy system at mile marker 89.5 on the Mississippi River. This facility handles bulk and breakbulk commodities.

Meraux Mid-Stream Mooring Facility

The Meraux Mid-Stream Mooring Facility is two deep draft buoy system at mile marker 86.5 on the Mississippi River. This facility handles bulk and breakbulk commodities.

Other Port Area Services

Other port area services include 60 acres undeveloped on the Mississippi River; 1,000 acres undeveloped on the Mississippi River Gulf Outlet (MRGO). Bunkers/Fuel; Truck Crane; Waste and Environmental Services; Oil Spill Response; Launch Bot Service; Towing/Tug Services; Bagging operation; Heavy-lift; dry bulk storage, 24/7 Security.

D-2.2.5 Port of Plaquemines

Located at the mouth of the Mississippi River, the Port of Plaquemines provides water access to 33 states – allowing businesses to benefit from barge, rail and interstate highway access across much of the United States. Plaquemines Port is positioned to serve the expanding global markets for oil & gas, grain, coal, chemicals and more. In addition, the port offers 14 major anchorages and thousands of acres of properties available for development of container ports, bulk & break bulk operations, docks and much more.

D-2.2.5.1 Cargo Terminals and Facilities

The Port of Plaquemines Chalmette has twenty public and private port terminals and facilities. Inbound cargo includes coke, carbon black feed stock, crude, fuel oil, IC 4, gasoline, heating oil, naphtha, natural gas, cobalt, petroleum products, and phosphate. Outbound cargo includes cola, grain-corn, soybean and wheat. The main channel depth is a 47 feet draft stretching from the Gulf of Mexico to mile 81.7 above the Head of Passes.

Bass Enterprises Production Co.

Private; Cargo Crude oil; Berths 2 - (1) Loading Dock, Point a la Hache; Length 200 ft.; Depth 25-30 ft.; (2)

Cox Bay

Length 500 ft.; Depth 12-15 ft.

Chevron Pipe Line Co. (Cal-Ky Div.)

Private; Cargo Landing for crew-boat, receipt of supplies such as diesel, lubricating oil & water for station consumption; Length 60 ft.; Depth 10 ft.; One 2-ton electric mast & boom derrick/20 ft.

Chevron Pipe Line Co. (Empire Barge Wharf)

Private; Cargo Crude Oil; Length 500 ft.; Depth 25 ft.; Two 6" swivel-jointed pipeline loading arms.

Chevron Oak Point

Cargo Crude and petroleum products; Berths 1; Length 250 ft.; Depth 40 ft.; Rail service; Product handled over wharf, organic chemical compounds used in the blending of lubricating oils for transportation & industrial related equipment; Loading/unloading facilities for tank cars, tank trucks, container trucks, drums; Product storage 8 to 10 million gallons. 44 ft. x 110 ft. structure

with 5-8 ft. marine loading arms. Handles barges from 180 ft. to 250 ft. long. Can handle 5 separate materials at one time.

Conoco, Inc.

Private; Cargo Oil and gas drilling & production materials and equipment; Slip #1 on Tiger Pass; Length 900 ft.; Depth 10-18 ft.; Highway and trucking access; 20 ft. by 40 ft. storage warehouse.

Freeport Sulphur Company

Vacant Cargo Sulphur; Berths 2; Length 600 ft.; Depth 40 ft.

Halliburton Services

Private; Cargo Drilling mud, chemicals, portable water; Length 400 ft. in Tiger Pass and 400 ft. inside slip; 40-ton crane alongside Halliburton-McDermott Slip side.

CHS, Inc.

Cargo Grain; Berths 1; Length 540 ft. to 982 ft.; Depth 50 ft.; Rail Service; Storage of 6.1 million bushels.

International Marine Terminal

Berths 2 for ships, 1 for gulf barge; Storage 750,000 sq. ft. open ground storage.

Marathon Oil Co.

Private; Cargo Coordination and supply point for off-shore drilling and production areas; Length 500 ft. along Canal #2; Depth 17-24 ft.; 15-ton hydraulic crane.

Marathon Petroleum Co. (Venice Terminal)

Private; Cargo Crude oil by tanker; Length 1,000 ft.; Depth 40 ft.; Three 12" swivel-jointed pipeline loading arms.

Shell Offshore, Inc.

Private; Cargo Oilfield supplies and equipment for offshore drilling and production operations; Length 1,000 ft.; Depth 9 ft.- 15 ft.; Heliport area of 3.97 acres with 5 landing pads, 8 helicopter capacity.

Stolthaven Braithwaite Terminal

Cargo Breakbulk; Truck Racks 6; Rail Racks 4, Docks Ships (2), Length 576 ft. Depth 40 ft. each; Barge (1), 300 ft. Depth 14 ft.; Storage Tanks 80; Capacity 1,626,000 barrels.

United Bulk Terminal

Cargo coal, phosphate; Berths 3;

Length 3,000 ft. of continuous dock; Depth 55-80 ft.; Annual throughput capacity of more than 25 million tons, first major terminal on the river, operating 24 hrs. per day, 7 days per week, 360 days per year; Fleeting available for 450 river barges. Full-service terminal for cargo transfer, ground storage, blending, sizing, crushing and sampling of coal and coke. Provides discharge of ocean vessels & transfer to river barges; and direct transfer for bulk commodities from barge to ships.

Texaco Pipeline Co. (Pilottown crew boat dock)

Private; Landing for crew, supplies & equipment; Length 80 ft.; Depth 8 ft.; Two 2-ton hand operated traveling hoists/15 ft. reach; one on wharf extending to building at rear, one on upper pier.

Phillips 66, Alliance Refinery

Cargo Petroleum products, crude, etc.; Berths 2; Length 1,205 ft.; Depth 40+ft.; Rail Service; Berth from 280 ft. to 1,205 ft. Can accommodate one tanker and one L.P.G.; 51 storage tanks with total capacity of 6.8 million barrels; 11 pressure spheres with total capacity of 400,000 barrels.

Rescue/Patrol/Fire Boats

M/V AUTHORITY I located Mile 75.6

RDB: M/V AUTHORITY II is located at Mile 10.5 RDB. M/V AUTHORITY III is located at Mile 75.6. Communications: VHF Channels 12, 16, 22, 67; all other port services provided by private industry.

Anchorages

12 Mile: 79.0-80.8 RDB; Augusta: 72.0-71.4 RDB; Wills Point: 67.5-66.4 LDB; Davant: 54.5-53.5 LDB; Port Sulphur: 39.7-37.5 LDB; Boothville: 18.4-12.2 RDB; Belle Chasse: 75.2-73.1 RDB; Cedar Grove 71.2-70.6 RDB; Alliance: 65.8-63.2 RDB; Magnolia: 47.5-45.8 RDB; Ostrica: 24.4-23.5 RDB; Pilottown: 6.7-1.5 RDB.

Coal Facilities Dockside (Midstream)

72.7 RDB; Fleeting Area 73.0-71.5 RDB; International Marine Terminal (Landside) 57.0 RDB; International Marine Terminal (Fleeting Area) 58.0-56.0 RDB; United Bulk Terminal (Landside) 55.2 LDB; Electro-Coal Transfer (Fleeting Area) 56.0-55.2 LDB; 55.0-52.5 LDB.

D-2.3 Historical Commerce

The Port of Plaquemines, the Port of New Orleans, the Port of South LA, and the Port of Baton Rouge are all in the top 15 ranking of 2014 annual tonnage for U.S. ports. Based on WCSC data, these 4 ports handled a total of 464.2 million tons[9] of commerce in 2014, including 209.5 million tons of foreign commerce and 254.7 million tons of domestic commerce. Except for slight bumps in 2008, 2009, and 2013, total tonnage has trended upward from 374.6 million tons in 2005 to 464.2 million tons in 2014 (Figure D-6). Figures D-7 through D-10 show historic total tonnage individually for the ports of Plaquemines, New Orleans, South LA, and Baton Rouge.

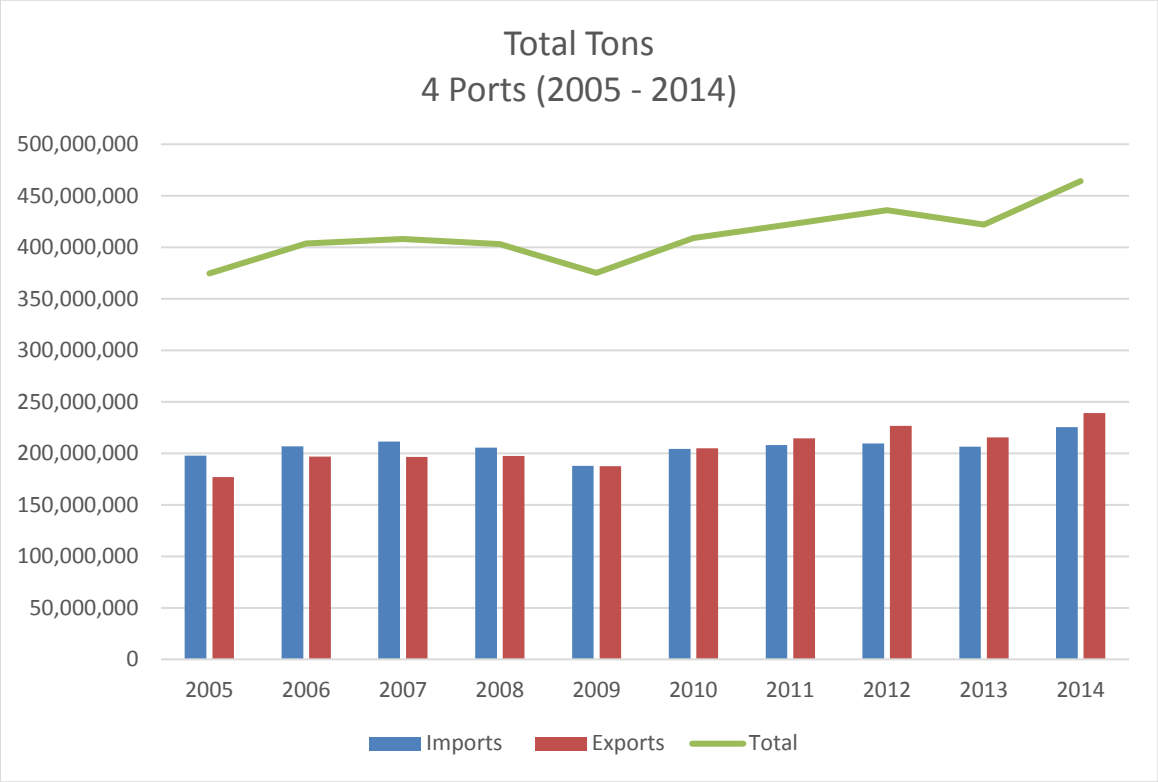

Figure D-6 Total Tons 4 Ports

Source: WCSC

[9] All references to commodity shipments in "tons" refer to "short tons" of 2,000 pounds.

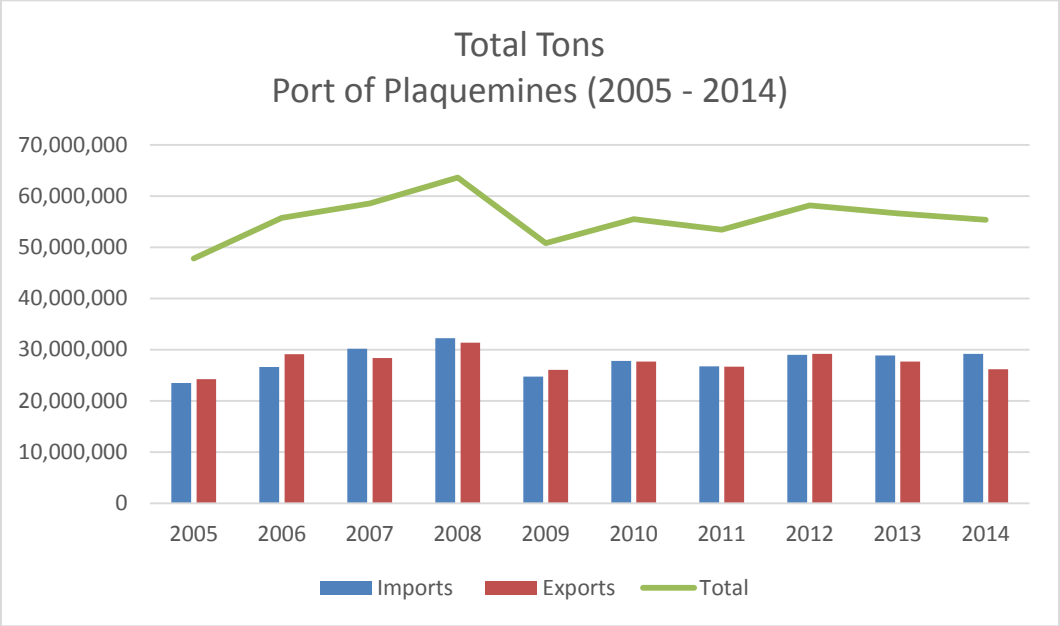

Figure D-7 Total Tons Plaquemines

Source: WCSC

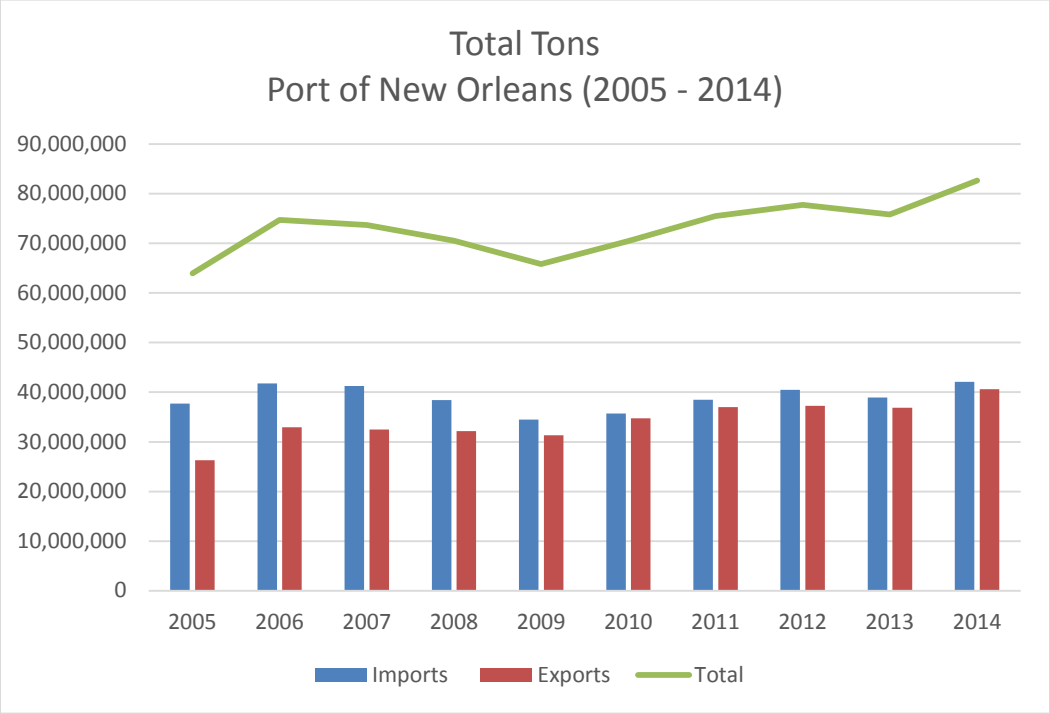

Figure D-8 Total Tons Plaquemines

Source: WCSC

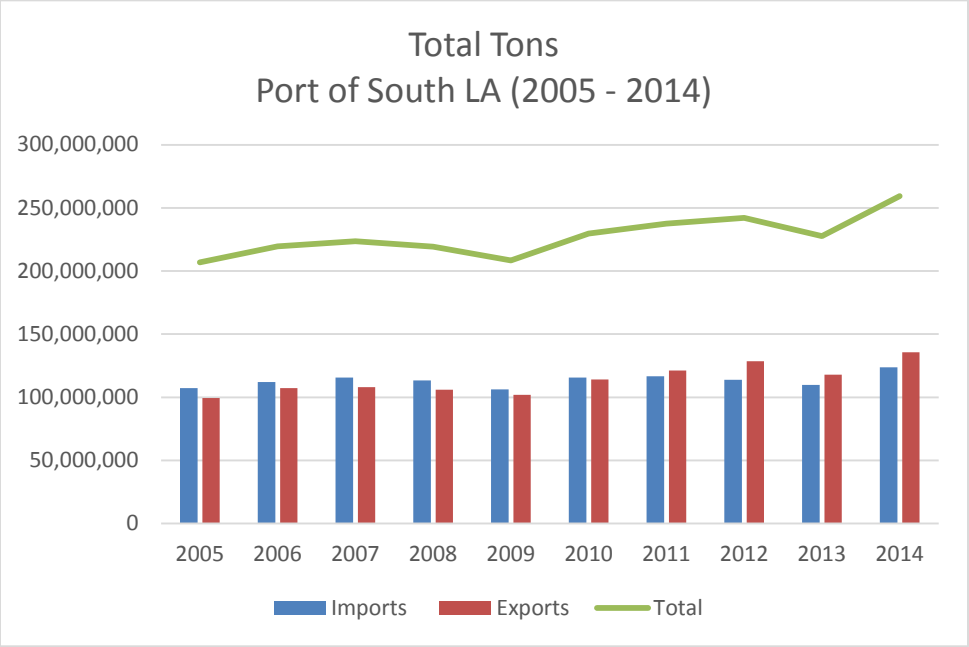

Figure D-9 Total Tons South LA

Source: WCSC

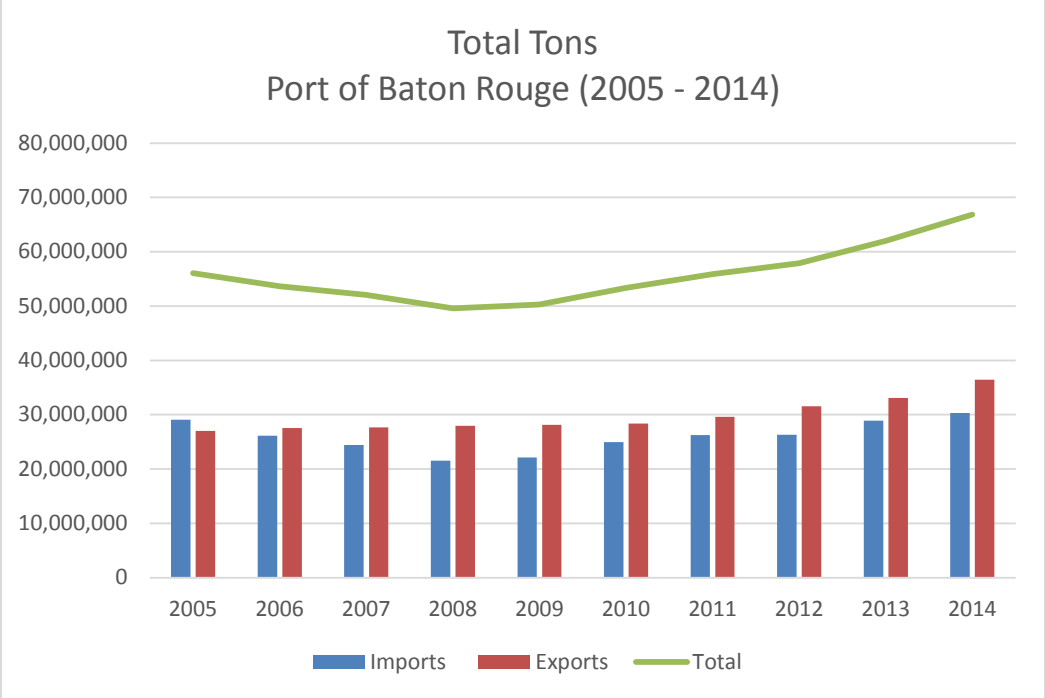

Figure D-10 Total Tons Baton Rouge

Source: WCSC

As mentioned previously, food and farm products and petroleum and petroleum products dominate the commodity mix in terms of total tonnage passing through the 4 ports. A total of 1.38 billion

tons of food and farm products moved through the ports from 2005 – 2014 followed by 1.37 billion tons of petroleum and petroleum products. The next highest commodity group is chemicals and related products at 455 million tons; manufactured equipment and machinery round out the bottom at 11 million tons. For the most part, commodities seem to be trending upward or holding steady except for coal which began to decrease rather sharply in 2012, likely due to the significant transformation from coal to natural gas and renewables for electricity generation in the US (Figure D-11).

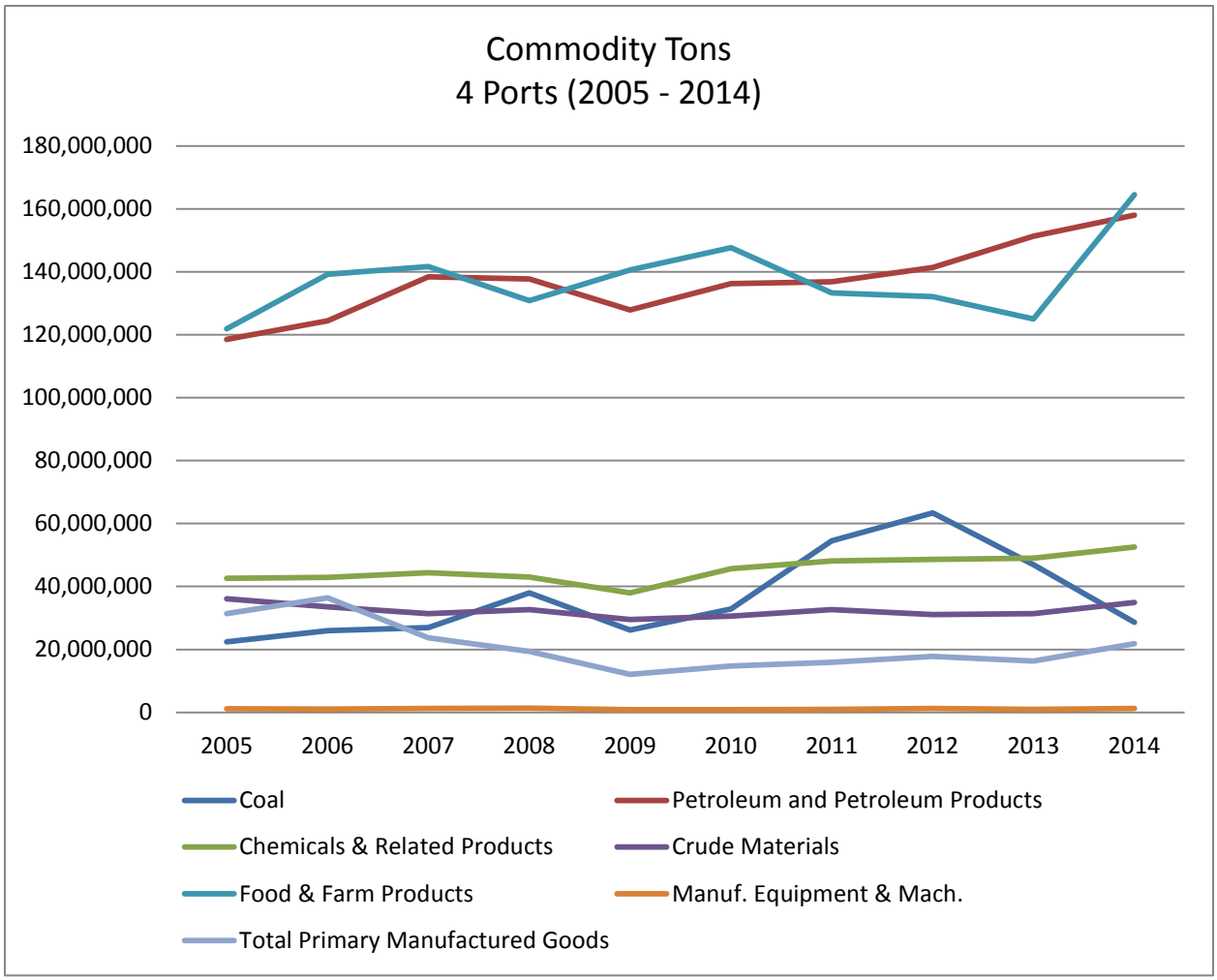

Figure D-11 Commodity Tons 4 Ports

Source: WCSC

In terms of commodity distribution, food and farm products make up the highest percentage at 34%; petroleum and petroleum products are just slightly less at 33% (closely resembling the commodity percentages moved from Minneapolis, MN, to Mouth of Passes as shown in Table 1). The remaining commodity group breakouts are chemical and related products at 11%, coal at 9%,

crude materials at 8%, primary manufactured goods at 5%, and manufactured equipment and machinery at <1% (Figure D-12).

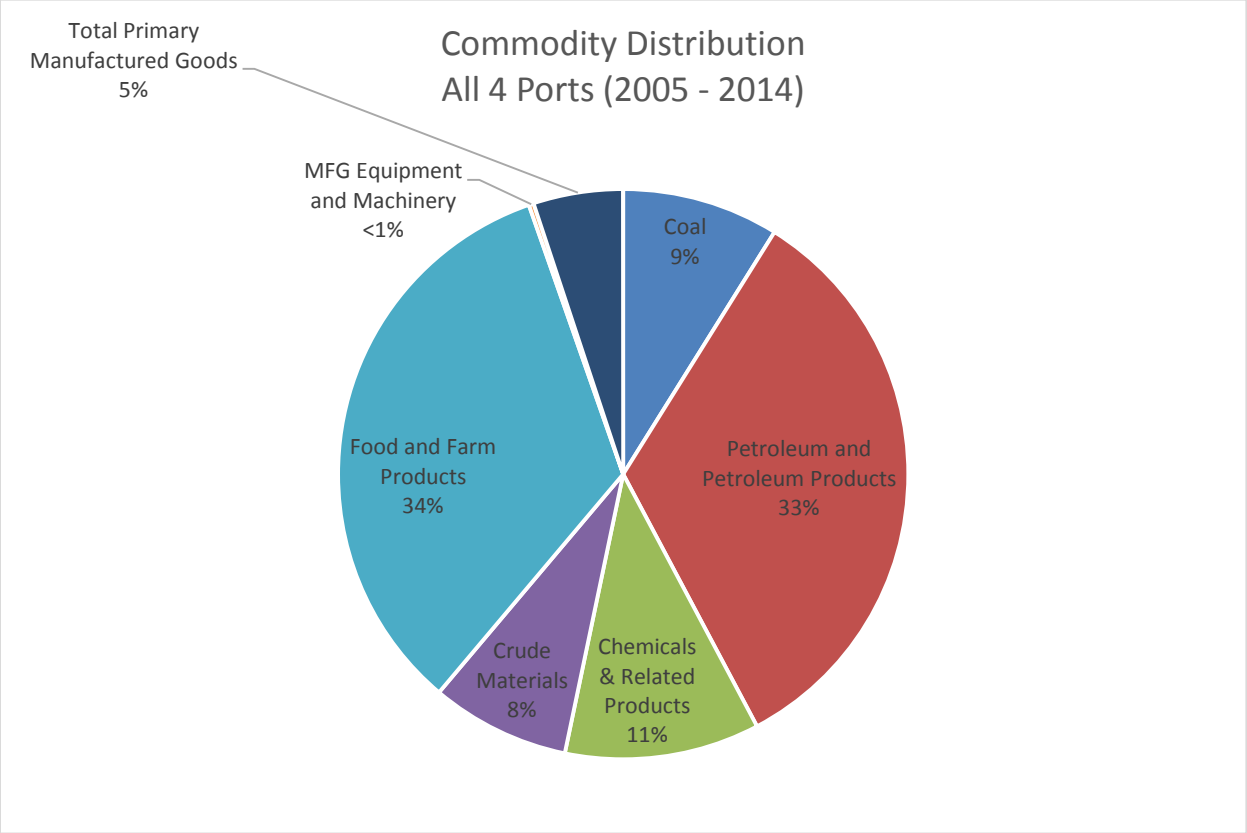

Figure D-12 Commodity Distribution 4 Ports

Source: WCSC

Foreign tonnage has consistently lagged behind domestic tonnage for the past 10 years for both the ports of Plaquemines and Baton Rouge. Over this time period foreign tonnage for Plaquemines has comprised an average of 38% of the total tonnage with food and farm products being the largest. Baton Rouge foreign tonnage has also constituted an average of 38% of the port's total tonnage with petroleum and petroleum products being the most numerous commodity. For the Port of New Orleans, the percent of foreign tonnage during this 10-year time period has averaged 49%, or nearly half of all port tonnage. In the years 2005, 2006, 2007, 2008, and 2011, foreign tonnage actually surpassed domestic tonnage at an average of 51% of total tonnage. Food and farm products followed closely by petroleum and petroleum products is the dominant foreign commodity. Foreign tonnage at the Port of South LA likewise makes up nearly half of all port tonnage over this time period at, namely, 49%. In the years 2008, 2010, and 2011, however, foreign tonnage surpassed domestic tonnage by nearly 1%. Food and farm products topped all foreign commodities for the port of South LA. Overall, foreign tonnage comprises about 46% of all tonnage passing through the 4 ports when taking an average of the years 2005 – 2014 (Figure

D-13). Fueled largely by the high volume of the Port of South LA, food and farm products and petroleum and petroleum products have consistently been the drivers of most foreign commodity movements for the 4 ports.

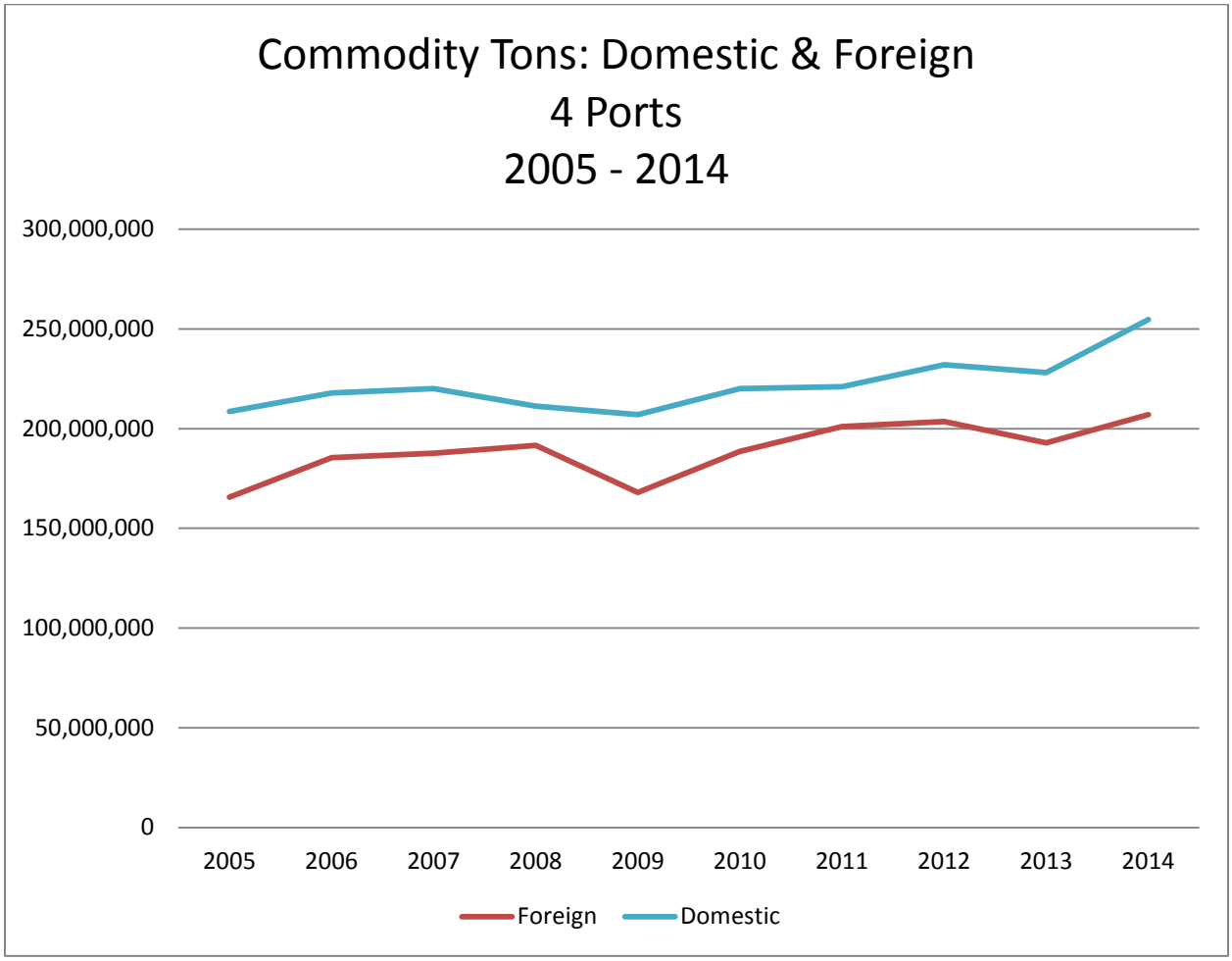

Figure D-13 Commodity Tons: Domestic & Foreign 4 Ports

Source: WCSC

Cargo information is used to provide the basis for commodity flows and projections. This study tried to identify (through both interviews with the ports and historic data) which commodities would benefit from a deepening of the channel. For the Port of Plaquemines, these commodities were determined to be foreign exports of coal, food and farm products, and petroleum and petroleum products; together they accounted for 29% of all Plaquemines port tonnage from 2005 – 2014. For the Port of New Orleans, foreign movements of food and farm products (both exports and imports), petroleum and petroleum products (both exports and imports), chemicals (both exports and imports), crude materials (exports), and primary manufactured goods (imports) were broken out; together they accounted for 41% of all New Orleans port tonnage from 2005 – 2014. The benefiting commodities for the Port of South LA were determined to be foreign movements

of coal (exports), food and farm products (exports), petroleum and petroleum products (both exports and imports), chemicals (both exports and imports), crude materials (imports), and primary manufactured goods (imports); together they accounted for 48% of all South LA port tonnage from 2005 – 2014. Finally, the commodities for the port of Baton Rouge believed to benefit the most from a deepening of the channel are foreign movements of food and farm products (exports), petroleum and petroleum products (both exports and imports), chemicals (both exports and imports), coal (exports), crude materials (imports), and primary manufactured goods (imports); together they accounted for 34% of all Baton Rouge port tonnage from 2005 – 2014. Table D-15 identifies these commodities by port.

Table D-15 Foreign Commodities Benefitting from a Deeper Channel

	Plaquemines		New Orleans		South LA		Baton Rouge	
	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports
Coal	X				X		X	
Food Products	X		X	X	X		X	
Petroleum Products	X		X	X	X	X	X	X
Chemicals			X	X	X	X	X	X
Crude Materials			X			X		X
Primary MFG Goods				X		X		X

D-2.4 Fleet Characteristics

Data for fleet characteristics was obtained from the Waterborne Commerce Statistics Center, Crescent River Port Pilots' Association and Associated Branch Pilots. A variety of different vessel types called on the Ports of the Mississippi River including tankers, containerships, bulk carriers and general cargo vessels. Based on data contained in the Waterborne Commerce of the United States, there were approximately 10,900 foreign vessel transits on the Lower Mississippi River between Port of Plaquemines and Baton Rouge in 2014. This is a 3% increase in the number of transits from 2010. Of the 2014 total, 8% of transits were vessels with draft of 20 feet or less, 39% of transits drafted 21-29 feet, 45% of transits drafted 30-40 feet and 8% of vessel transits drafted 41-48 feet.

Figure D-14 shows the distribution of vessel types calling the Lower Mississippi River Ship channel. The distribution of vessel transits by sailing draft for the period of 2010-2014 is presented in Figure D-15. There was a total of 10,843 vessel transits drafting greater than 14 feet in 2014. The total number of transits from vessels drafting greater than 14 feet has varied over the period 2010 to 2014 from a high of 10,922 transits in 2012 to a low of 10,353 transits in 2010. In 2014, there were a total of 381 vessel transits that drafted 45 feet or more, a 5% increase from 2010. The data suggests vessels fully utilize the existing channel depth on the Lower Mississippi River.

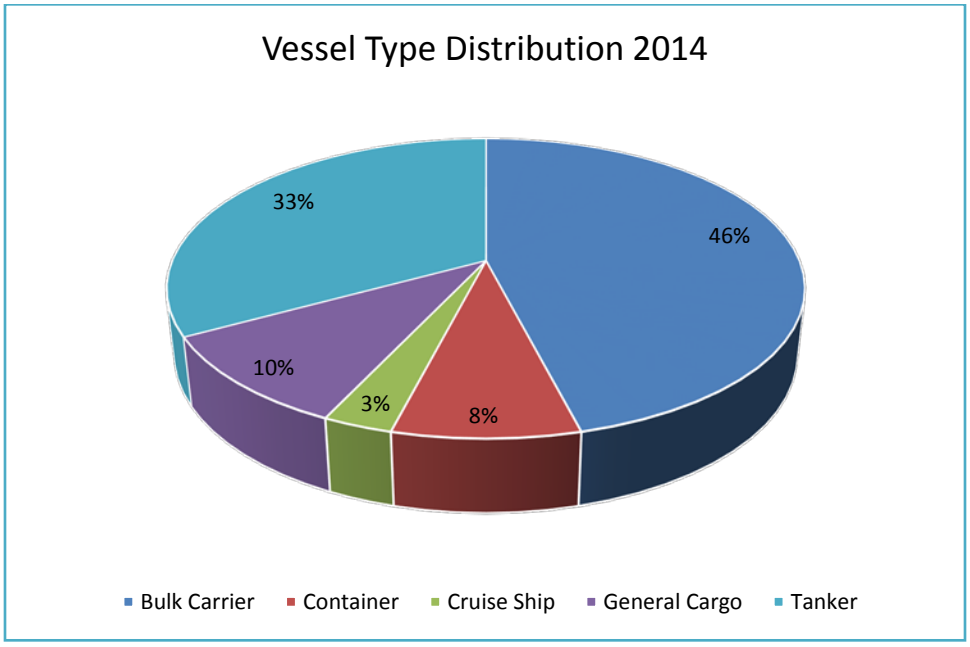

Figure D-14 Vessel Type Distribution

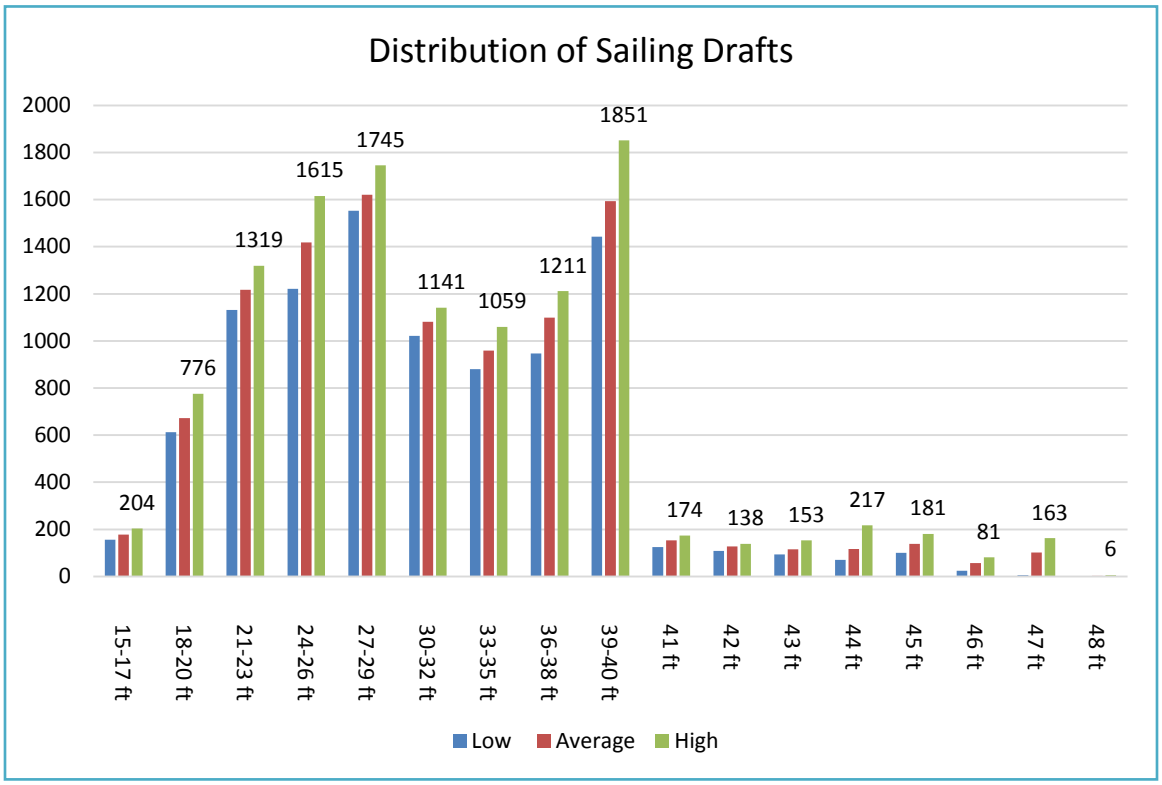

Figure D-15 Distribution of Sailing Drafts

An analysis of the existing fleet data for vessels calling the Ports on the Lower Mississippi River revealed five typical vessel types: (1) containerships, (2) bulk carriers, (3) general cargo, (4)

tankers, and (5) cruise ships. Based on the existing fleet, the vessel classes were further categorized into representative sub-classes based on vessel size as measured by deadweight tonnage (DWT). Table D-16 shows the breakdown of the sub classes. Vessel classes that have a broad range of DWTs did not have many foreign vessel calls relative to other categories.

Table D-16

Vessel Type	Description	DWT	
		Min	Max
Bulk Carrier	Handysize	5,000	35,000
	Handymax	35,001	60,000
	Panamax	60,001	80,000
	Capesize	80,001	200,000
Products Tanker	Medium	34,000	60,000
	Panamax	60,001	80,000
	Aframax	80,001	120,000
	Suezmax	120,001	200,000
Chemical Tanker	Tanker	4,500	50,000
Containership	Subpanamax	8,000	42,000
	Panamax	42,001	60,000
	Post Panamax Generation 1	60,001	90,000
	Post Panamax Generation 2	90,001	110,000
General Cargo	General Cargo	3,000	55,000
LPG Tanker	LPG Tanker	2,000	45,000
Cruise	Cruise	6,000	12,000

Bulk Carriers made up 46% of the deep draft vessel calls on the lower Mississippi River in 2014. According to the Pilot logs, the largest cargo vessel to call the channel is a bulk carrier of 168,968 deadweight tons (DWT), tankers were the next largest category. Figure D-15 shows the distribution of sailing drafts for years 2010 through 2014. The numbers shown above the bars is the number of transits that was the highest for the draft range for a given year in the five year period. The distribution shows minimum, average and maximum number of transits taken from the five year period.

D-2.5 Shipping Operations

The measure of underkeel clearance (UKC) for economic studies is applied according to planning guidance. According to this guidance, UKC is evaluated based on actual operator and pilot practice within a harbor and subject to present conditions, with adjustment as appropriate or practical for with-project conditions. Generally, practices for UKC are determined through review of written pilotage rules and guidelines, interviews with pilots and vessel operators and analysis of actual past and present practices based on relevant data for vessel movements. Typically, UKC is measured relative to immersed vessel draft in the static condition. Evaluation of when the vessel is moved or initiates transit relative to immersed draft, tide state and commensurate water depth allows reasonable evaluation of clearance throughout the time of vessel transit.

The Pilots indicated that there are no hard and fast rules for UKC. The data shows the bulkers are using the authorized depth and tankers typically have a rule of 10% of draft of two to three feet. The Pilots make the necessary arrangements for meeting, passing and overtaking vessels.

D-2.6 Trade Routes

Trade routes were divided into 13 groups according to historic traffic patterns (Figure D-16). Because some countries may be assigned to more than 1 route group due to their bordering more than 1 body of water, it was necessary to identify all the relevant foreign ports for each country. Data from WCSC for the year 2013 was used to identify foreign ports of origin and destination for each vessel trip that took place within the 4 Louisiana ports.

Figure D-16 Trade Routes

Australia-New Zealand
Caribbean-South America (North)
Central America (West Coast)
Far East
Mediterranean-North Africa
Middle East
North America East Coast
North America West Coast
North Atlantic-Europe-Baltic States
South America (East)
South America (West)
US Gulf of Mexico
West Africa

Once these foreign ports were identified, the website http://www.sea-distances.org/ was used to calculate the distance between the foreign port and the 4 Louisiana ports (for simplification purposes, New Orleans was used to represent all 4 Louisiana ports) in nautical miles. An average was then taken to represent the most likely distance a vessel would travel along each trade route; minimum and maximum distances were also calculated. This data would be used to develop vessel call lists for each port for without-project and with-project conditions.

Although there is no specific tracking of how much tonnage comes through the Panama Canal en route to/from the 4 ports, it is possible to study WCSC data and estimate this tonnage by looking at which vessels likely used which trade routes. In 2013 it is estimated that between 36 – 54 million foreign tons passed through the Panama Canal when traveling to or from the 4 ports. Of this amount, it is estimated that between 3 – 5 million tons were transported on vessels drafting 45 feet or more. This translates to about 9% of all foreign tons passing thru the Panama Canal on their way to or from the 4 ports. Finally, these 3 – 5 million tons roughly account for 2% of all foreign tons and almost 1% of all domestic and foreign tons handled by the 4 ports of Plaquemines, New Orleans, South LA, and Baton Rouge.

D-3.0 FUTURE CONDITIONS

D-3.1 Commodity Forecasts

An essential step when evaluating navigation improvements is to analyze the types and volumes of cargo moving through the ports. Trends in cargo history can offer insights into a port's long-term trade forecasts and thus the estimated cargo volume upon which future vessel calls are based. Under future without and future with project conditions, the same volume of cargo is assumed to move through the Port of Plaquemines, the Port of New Orleans, the Port of South LA, and the Port of Baton Rouge. However, a deepening project will allow shippers to load their vessels more efficiently or take advantage of larger vessels. This efficiency translates to transportation cost savings and is the main driver of NED benefits.

To minimize the impact of potential anomalies in trade volumes on long-term forecast, 5 years of data were employed to establish the baseline for the commodity forecast. Historic data from 2009 to 2013 (2013 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 2025, the task becomes even more difficult. The *Annual Energy Outlook 2015 (AEO2015)*, prepared by the U.S. Energy Information Administration (EIA), is the source of information used to project growth for the commodities of coal, petroleum and petroleum products, and chemicals. Its forecasts extend to the year 2040. 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 until year 2050 (25 years after the base year), after which no growth is assumed until the end of the study's scope in 2075. *USDA Agricultural Projections to 2025* by the United States Department of Agriculture and *Fertilizer Outlook 2015-2019* by the International Fertilizer Industry Association (IFA) were likewise used to make commodity projections for food and farm products and chemicals,

respectively. Finally, the study *A Container Trade Forecast for the Port of New Orleans 2015 – 2065* by R.K. Johns & Associates (July 22, 2015) was used for the purpose of projecting crude materials and primary manufactured goods. Despite its title emphasizing container trade, the report also makes projections for breakbulk and other cargo. Annual growth rates from the base year are shown in Table D-17; tonnage projections for the 4 major ports are shown in Figures D-17 through D-23.

Table D-17 Growth Rate (annual)

	Baton Rouge		South LA		New Orleans		Plaquemines	
	Exports	**Imports**	**Exports**	**Imports**	**Exports**	**Imports**	**Exports**	**Imports**
Food & Farm[1]	0.5%	-	1.0%	-	1.1%	-0.4%	1.3%	-
Petroleum[2]	0.3%	0.4%	0.8%	0.4%	0.6%	0.3%	0.7%	-
Chemicals[2]	1.1%	0.9%	1.0%	1.4%	0.9%	1.4%[3]	-	-
Coal[2]	0.7%	-	0.7%	-	-	-	0.7%	-
Crude Materials[4]	-	2.5%	-	2.5%	0.0%	-	-	-
Primary MFG Goods[4]	-	5.0%	-	5.0%	-	5.0%	-	-

Note: Growth rates for the same commodity category can vary by port due to the varying compositional makeup of those commodities within each port. No growth rates are shown for Plaquemines Imports because these commodities were determined not to be significantly impacted by a deeper channel.

[1] Source is USDA Agricultural Projections to 2025 Feb 2016.

[2] Source is Annual Energy Outlook 2015 with Projections to 2040.

[3] Source is International Fertilizer Industry Association's (IFA) Fertilizer Outlook 2015-2019.

[4] Source is "A Container Trade Forecast for the Port of New Orleans 2015 - 2065" by R. K. Johns & Associates Inc., 2015 final report

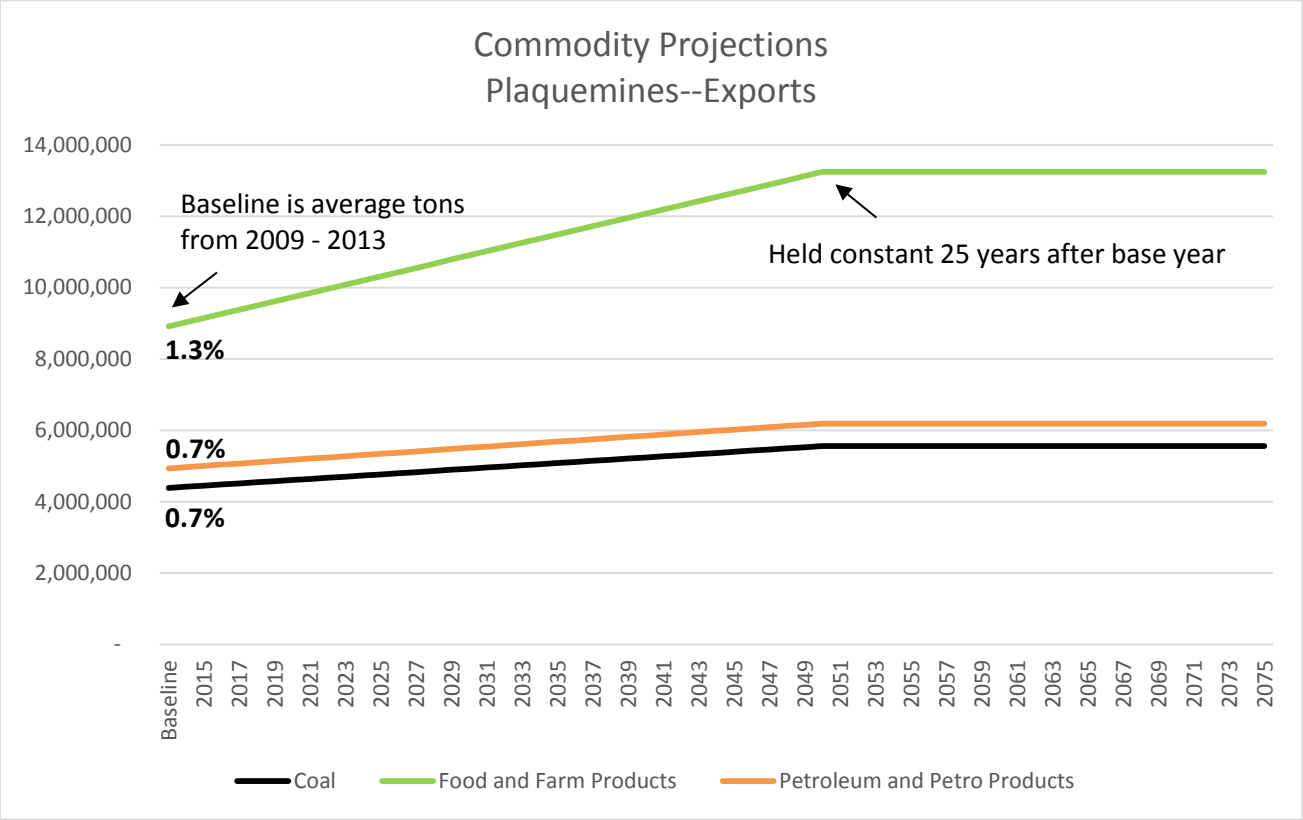

Figure D-17 Commodity Projections Plaquemines

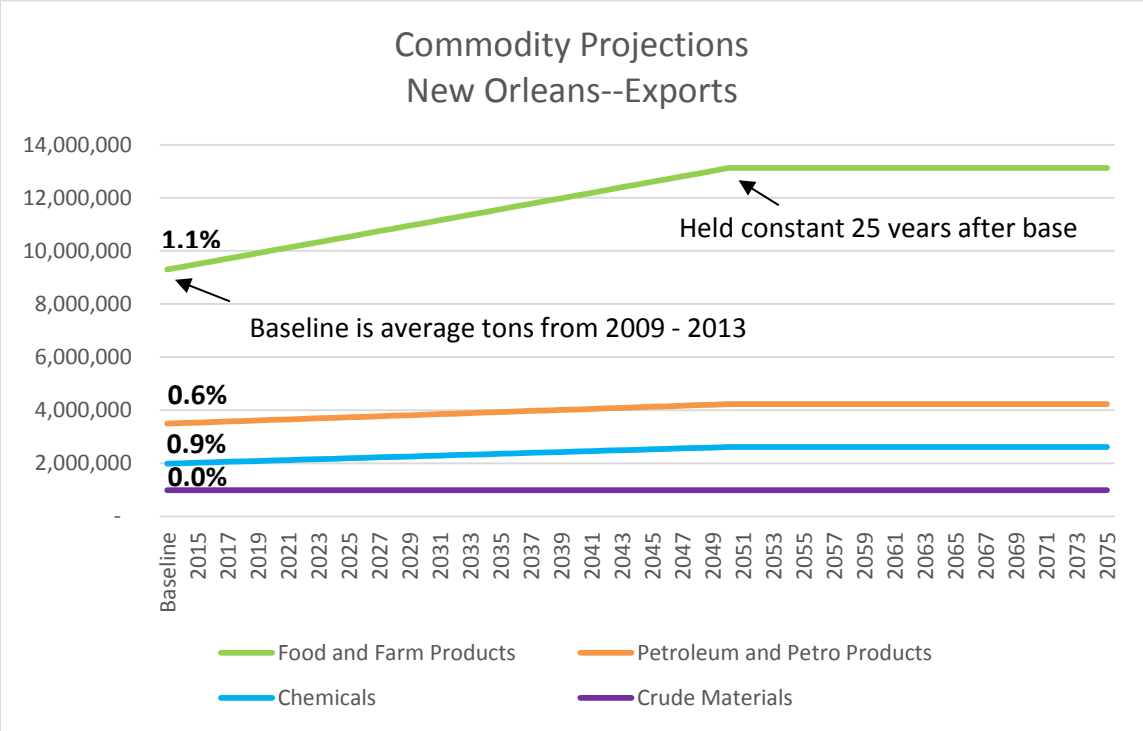

Figure D-18 Commodity Projections New Orleans Exports

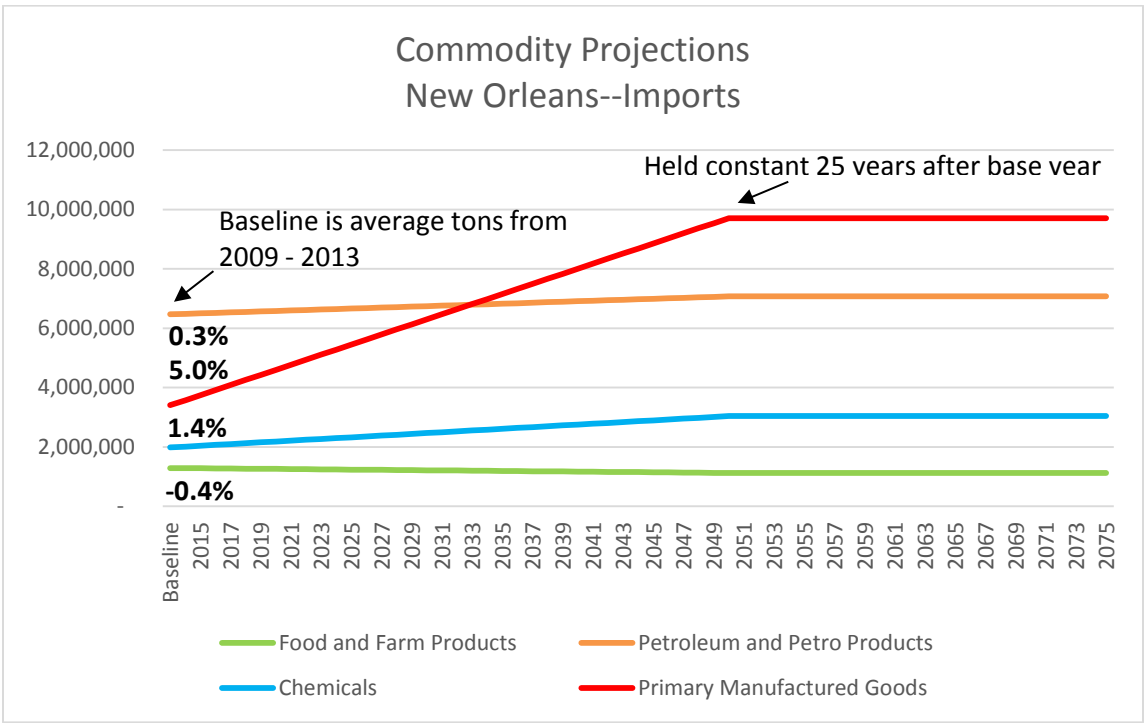

Figure D-19 Commodity Projections New Orleans Imports

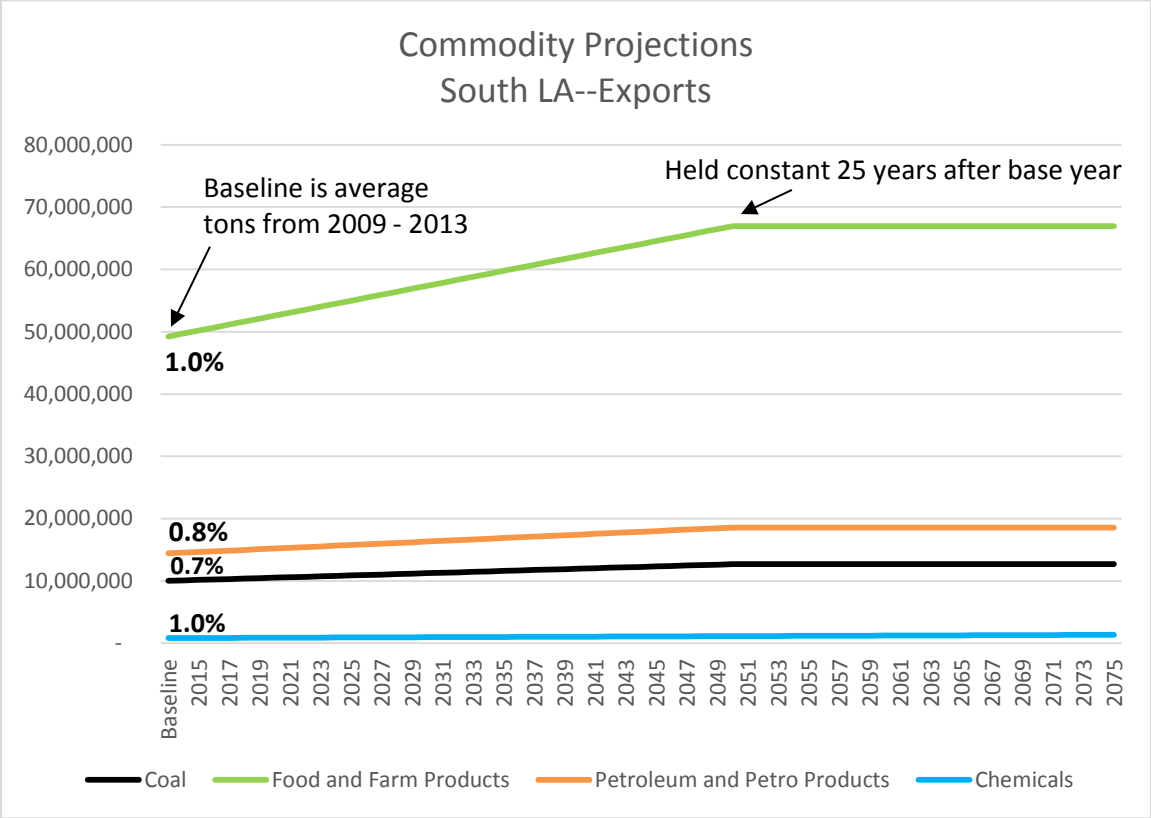

Figure D-20 Commodity Projections South LA Exports

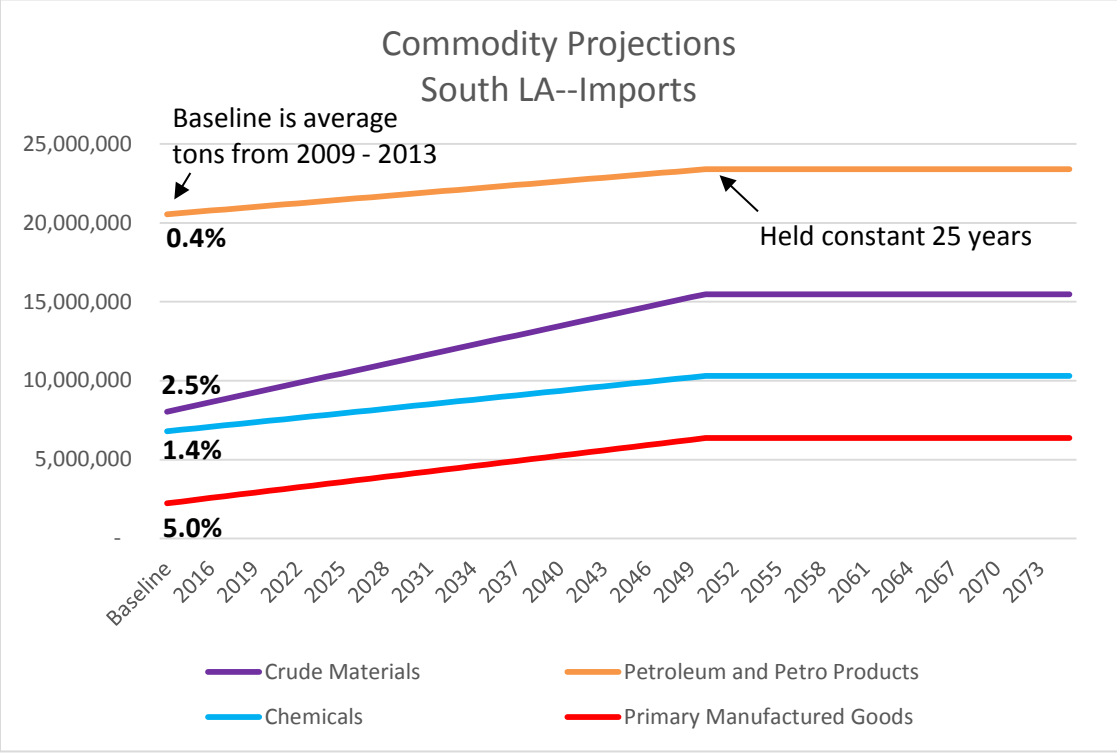

Figure D-21 Commodity Projections South LA Imports

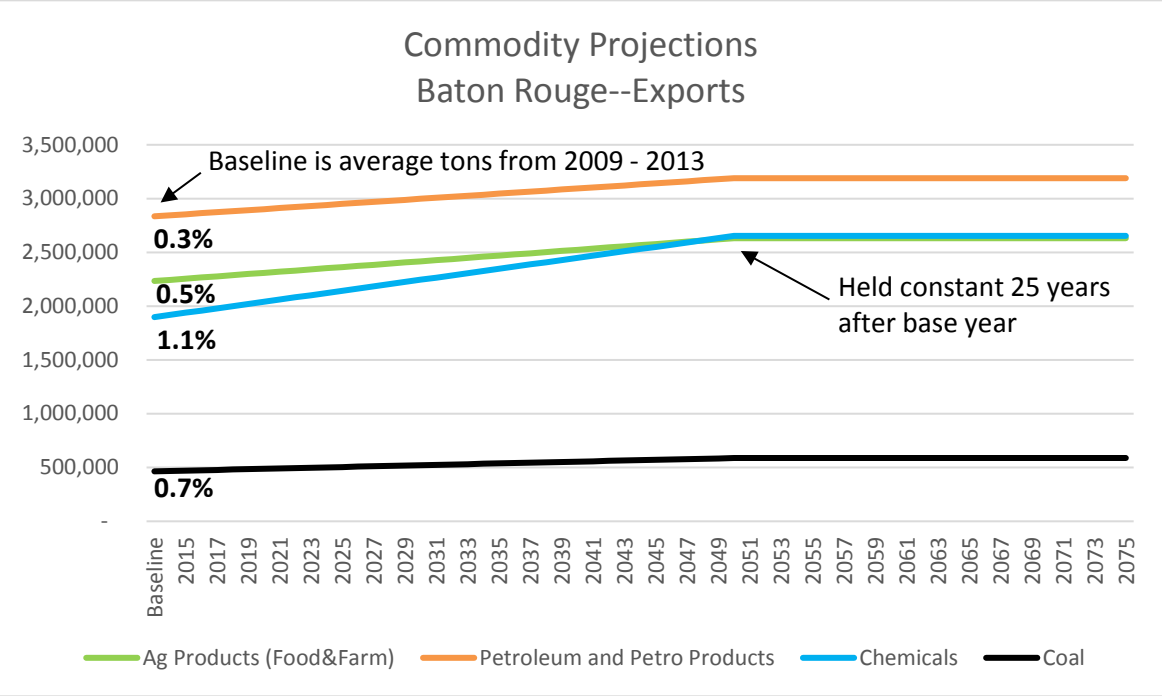

Figure D-22 Commodity Projections Baton Rouge Exports

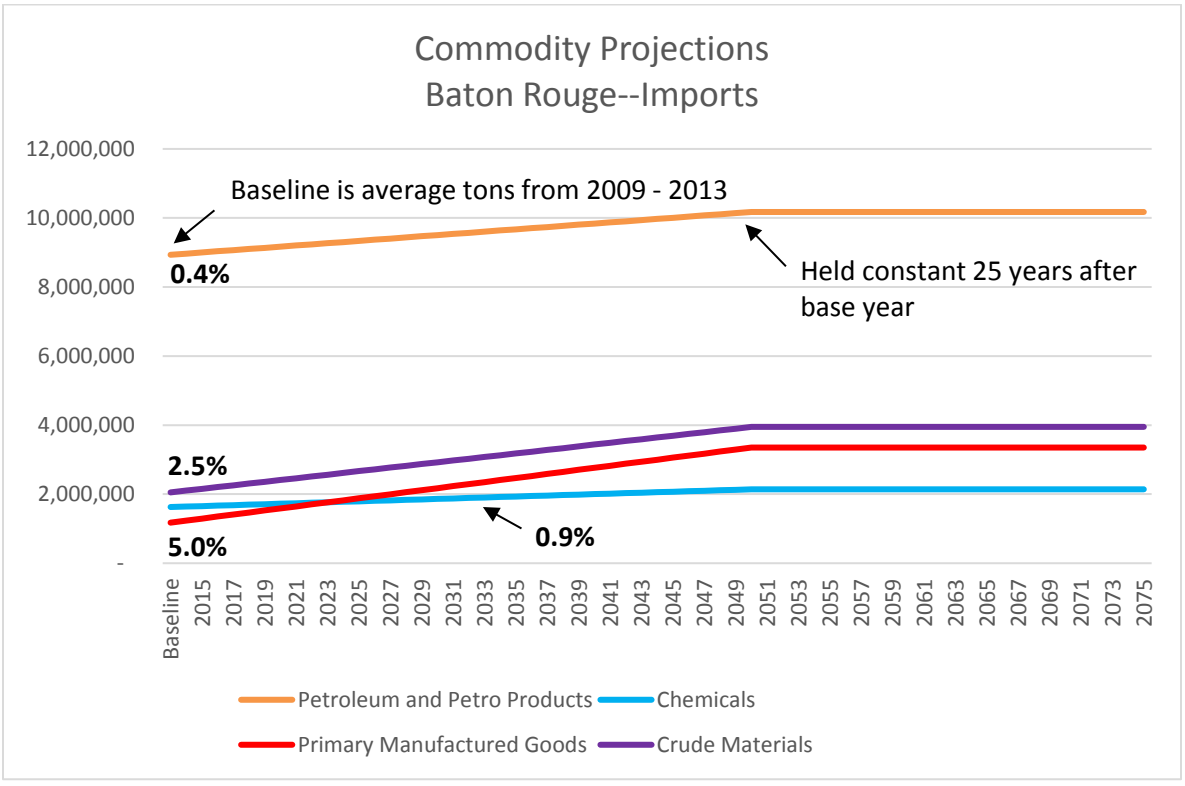

Figure D-23 Commodity Projections Baton Rouge Imports

D-3.2 Vessel Fleet

Based upon data from WCSC for the year 2014, there were a total of 414,961 vessel transits for the 4 ports of Plaquemines (136,977), New Orleans (61,527), South LA (131,831), and Baton Rouge (84,626). From this total, 328,417 transits (79%) were vessels with drafts of less than 10 feet. On the other end of the spectrum, a total of 668 (0.2%) vessel transits occurred when the draft of the vessel was 42 feet or greater. When looking specifically at 45 feet or greater, this number drops to 206 (0.05%) vessel transits. Breaking it down by port for transits of vessels drafting greater than 45 feet, Plaquemines had a total of 44 transits, New Orleans 17 transits, South LA 137 transits, and Baton Rouge 8 transits.

The vast majority of these transits with a draft greater than 45 feet are from bulk carriers transporting grain. Of the 206 transits in 2014 with a draft greater than 45 feet, 190 were from bulk carriers (92%). Oil tankers and chemical tankers followed at 6% and 1%, respectively.

Numbers are similar when looking at data for years 2012 and 2013. In 2012 a total of 347,050 transits (78%) occurred in which the vessel drafted less than 10 feet; the year 2013 saw 345,237 such transits (87%). For vessels drafting 42 feet or greater, 718 vessel transits (0.2%) occurred in 2012 compared to 632 (0.2%) in 2013. For vessels drafting 45 feet or greater, the 4 ports saw a total of 171 transits (0.04%) in 2012 and 200 such transits (0.05%) in 2013.

Again, bulk carriers dominated the list of vessels types that drafted greater than 45 feet. In 2012 bulk carriers made up 91% of this number followed by oil tankers and general cargo vessels at 8% and 1%, respectively. Bulk carriers in 2013 made up 89% of vessels drafting greater than 45 feet; oil tankers and chemical tankers rounded out the rest at 8% and 2%, respectively (Table D-18).

Table D-18 Number of Vessels Drafting > 45'

Port	2014	2013	2012
Plaquemines			
Bulk Carrier	43	40	28
Oil Tanker	-	-	-
Chemical Tanker	1	1	-
General Cargo	-	-	2
New Orleans			
Bulk Carrier	12	26	12
Oil Tanker	5	11	6
Chemical Tanker	-	1	-
General Cargo	-	-	-
South LA			

Bulk Carrier	129	106	110
Oil Tanker	7	7	5
Chemical Tanker	1	1	-
General Cargo	-	1	-
Baton Rouge			
Bulk Carrier	6	6	6
Oil Tanker	1	-	2
Chemical Tanker	1	-	-
General Cargo	-	-	-
Total	206	200	171

Source: WCSC

As the data indicates, vessels drafting greater than the authorized depth of the channel are already calling on the ports of Plaquemines, New Orleans, South LA, and Baton Rouge (probably due to a combination of high water events and over-dredging). The vast majority of these vessels are bulk carriers and, to a lesser extent, oil tankers. Considering the commodity makeup of cargo that is handled by the ports, this isn't too surprising. Data from WCSC showing excess capacity for these vessels as well as conversations with the ports also point to bulk carriers and oil tankers as vessels that will be able to utilize the extra depth of a deeper channel.

Vessels that could utilize extra depth are likely already calling on the 4 ports and are having to light-load to safely traverse the channel. With a greater depth, these vessels will be able to more fully utilize their capacity by loading more cargo which will, in effect, generate efficiencies in cost savings. Thus, a future fleet mostly comprised of larger and deeper-drafting vessels is not expected; rather, ships' abilities to load closer to their capacities are anticipated to reduce light-loading inefficiencies. Approximately 0.5% of the vessels calling have design drafts 50 feet or greater.

D-4.0 TRANSPORTATION COST SAVINGS BENEFIT ANALYSIS

D-4.1 Methodology

The purpose of this analysis is to describe the benefits associated with the deepening of the Mississippi River Ship Channel. Project benefits were estimated by calculating the reduction in transportation cost for each project depth using the HarborSym Modeling Suite of Tools (HMST) which is a certified model developed by IWR. The HMST reflects USACE guidance on transportation cost savings analysis. HarborSym model runs were completed to determine the origin to destination transportation costs to estimate deepening benefits.

Channel improvement modifications result in reduced transportation cost by allowing a more efficient use of vessels. The primary effect from channel deepening that can induce changes in vessel utilization is an increase in a vessel's loading capacity. Channel restrictions can limit a vessel's capacity by limiting its ability to load to its design draft. Deepening the channel can reduce this constraint and the vessel's capacity can increase towards its design capacity if commodities are available to transit, vessel loading practices allow and the weight of the commodity on the vessel will lower it deeper in the water. This increase in vessel capacity utilization can result in fewer trips being required to transport forecasted cargo.

HarborSym was set up with the basic required variables. To estimate origin to destination cost savings benefits, the Bulk Loading Tool (BLT), a module within the HMST was used to generate a vessel call list based on the commodity forecast for the MRSC for a given year. The resulting vessel traffic was simulated using HarborSym, producing average annual vessel origin to destination transportation costs. The transportation costs savings benefits were then calculated from the existing 45 and 48 foot depth and for each additional project depth. The Tentatively Selected Plan (TSP) was identified by considering the highest net benefits based on the transportation model.

D-4.1.1 HarborSym Model

The Institute for Water Resources (IWR) developed HarborSym as a planning level, general-purpose model to analyze the transportation costs of various waterway modifications within a harbor. HarborSym is a Monte Carlo simulation model of vessel movements at a port for use in economic analyses. HarborSym concentrates on specific vessel movements and transit rules on the waterway, fleet and loading changes as well as incorporating calculations for both within harbor costs and costs associated with the ocean voyage.

HarborSym represents a port as a tree-structured network of reaches, dock, anchorages and turning areas. Vessel movements are simulated along the reaches, moving from the entrance to one of more docks and then exiting the port. The driving parameter for the HarborSym model is a vessel call at the port.

HarborSym is an event driven model. Vessel calls are processed individually and the interactions with other vessels are taken into account. For each iteration, the vessel calls that fall within the simulation period are accumulated and placed in a queue based on arrival time. When a vessel arrives at the port, the route to all of the docks in the vessel call is determined. This route is comprised of discrete legs (contiguous sets of reaches, from the entry to the dock, from a dock to another dock and from the final dock to the exit). The vessel attempts to move along the initial leg of the route. Potential conflicts with other vessels that have previously entered the system are evaluated according to the user-defined set of rules for each reach within the current leg, based on information maintained by the simulations to the current and projected future state of each reach.

If a rule activation occurs, such as no passing allowed in a given reach, the arriving vessel must either delay entry or proceed as far as possible to an available anchorage, waiting there until it can attempt to continue the journey. Vessels move from reach to reach, eventually arriving at the dock that is the terminus of the leg.

After the cargo exchange calculations are completed and the time the vessel spends at the dock has been determined, the vessel attempts to exit the dock, starting a new leg of the vessel call; rules for moving to the next destination (another dock or an exit of the harbor) are checked in a similar manner to the rule checking on arrival, before it is determined that the vessel can proceed on the next leg. As with the entry into the system, the vessel may need to delay departure and retry at a later time to avoid rule violations and the waiting time at the dock is recorded.

Each vessel call has a calculated associated cost, based on time spent in the harbor and ocean voyage and cost per hour. Also for each vessel call, the total quantity of commodity transferred to the port (both import and export) is known, in terms of commodity category, quantity, tonnage and value. The basic problem is to allocate the total cost of the call to the various commodity transfers that are made. Each vessel call may have multiple dock visits and multiple commodity transfers at each visit, but each commodity transfer record refers to a single commodity and specifies the import and export tonnage. Also, at the commodity level, the "tons per unit" for the commodity is known, so that each commodity transfer can be associated with an export and import tonnage. As noted above, the process is greatly simplified if all commodity transfers within a call are for categories that are measured in the same unit, but that need not be the case.

When a vessel leaves the system, the total tonnage, export and import transferred by the call are available, as is the total cost of the call. Each commodity transfer for a call is associated with a single vessel class and unit of measure. Multiplying the tons or value in the transfer by the appropriate per ton cost, the cost totals by class and unit for the iteration can be incremented. In this fashion, the total cost of each vessel call is allocated proportionately to the units of measure that are carried by the call, both on a tonnage and value basis. Note that this approach does not require that each class or call carry only a commensurate unit of measure.

The model calculates import and export tons, import and export value, and import and export allocated cost. This information allows for the calculation of total tons and total cost, allowing for the derivation of the desired metrics at the class and total level. The model can thus deliver a high level of detail on individual vessel, class, and commodity level totals and costs.

D-4.2 Methodology for Preparing Future Vessel Call Lists

Historic calls from 2013 were used to determine the breakdown of commodity tonnage by dock for each of the 4 ports. After forecasts were applied to the calculated baseline (average of years

2009 – 2013) to project tonnage for the years 2025, 2035, and 2045, the same commodity percentages found in 2013 were applied to assign projected tonnage to those same docks.

For the Port of Plaquemines, as an example, the appropriate docks were determined to be CHS, International Marine Terminal, and Teco Bulk Terminal. Coal, food and farm products, and petroleum products are handled at CHS and Teco, while food and farm products and petroleum products are handled at International Marine Terminal (In the case of Plaquemines, the focus was only on exports as it was determined from historic tonnage of foreign imports that these commodities did not number enough to trigger a significant benefit for the port from a deeper channel). Using historic call data from 2013 as described above, forecasted commodity tonnages for the years 2025, 2035, and 2045 were distributed by dock according to these percentages in the amounts shown in Table D-19. The projected tonnages reflect both without-project and with-project future conditions.

Table D-19 Port of Plaquemines Commodity Distribution by Dock[1]

Dock	Commodity	% of Total Commodity	Commodity Tonnage 2025	2035	2045
CHS, Inc.	Coal	5%	243,493	259,670	275,846
	Food and Farm	50%	5,188,411	5,776,997	6,365,583
	Petroleum Products	74%	3,938,536	4,188,310	4,438,084
Int. Marine Terminal	Food and Farm	14%	1,471,416	1,638,337	1,805,258
	Petroleum Products	16%	846,900	900,608	954,317
Teco Bulk Terminal	Coal	95%	4,522,398	4,822,846	5,123,292
	Food and Farm	35%	3,654,920	4,069,543	4,484,166
	Petroleum Products	10%	557,192	592,528	627,864

[1]Exports only.

Likewise, historic calls from 2013 were used to determine the types of vessel classes calling on each dock, the number of each vessel class calling on that dock, and the total commodity tonnage moved by each vessel class per dock. Average tons per vessel were then calculated for each vessel class by dock. Using the average tons per vessel numbers with the new commodity tonnages for the years 2025, 2035, and 2045, it was possible to determine how many vessels by class were needed to move the forecasted tonnage for each dock (Table D-20).

Table D-20 Port of Plaquemines Number of Vessels Projected by Dock

Dock	Commodity	Vessel Class	Avg. Tons per Vessel	# of Vessels Projected 2025	2035	2045
CHS, Inc.	Coal	BC[1] Handymax	57,870	4	4	5
	Food and Farm	BC Handymax	30,298	102	114	126
		BC Handysize	15,972	128	142	156
		BC Panamax	20,591	2	3	3
	Petroleum Products	BC Handymax	45,333	73	78	83
		BC Handysize	25,820	17	18	19
		BC Panamax	47,515	4	4	4
Int. Marine Terminal	Food and Farm	BC Handymax	32,307	46	51	56
	Petroleum Products	BC Handymax	50,063	17	18	19
Teco Bulk Terminal	Coal	BC Capesize	74,618	28	29	31
		BC Panamax	63,642	39	41	44
	Food and Farm	BC Capesize	51,030	23	25	28
		BC Panamax	45,613	55	61	67
	Petroleum Products	BC Capesize	76,561	6	6	6
		BC Panamax	66,754	2	2	2

[1] Bulk Carrier

The same process was used for the ports of New Orleans, South LA, and Baton Rouge to determine the number of vessels needed to satisfy the forecasted tonnage. Additionally, due to their large number, docks for these 3 ports were consolidated into generic groupings named “Bulk/General Cargo” and “Tankers” to signify which vessel types accessed these docks (Tables D-21 through D-26).

Table D-21 Port of New Orleans Commodity Distribution by Dock

Dock	Commodity	% of Total Commodity	Commodity Tonnage 2025	2035	2045
Exports					
Bulk/General Cargo	Chemical Products	8%	169,058	182,098	195,138
	Crude Materials	100%	987,505	987,505	987,505
	Food and Farm	99%	10,419,961	11,441,466	12,462,971
	Petroleum Products	29%	1,065,209	1,121,688	1,178,168
Tankers	Chemical Products	92%	2,018,596	2,174,295	2,329,995
	Food and Farm	1%	119,398	131,103	142,808
	Petroleum Products	71%	2,665,884	2,807,235	2,948,585
Imports					
Bulk/General Cargo	Chemical Products	83%	1,937,853	2,175,189	2,412,525
	Food and Farm	30%	370,418	357,029	343,640
	Manufactured Goods	100%	5,449,107	7,151,953	8,854,799
	Petroleum Products	5%	344,044	352,470	360,896
Tankers	Chemical Products	17%	389,341	437,025	484,709
	Food and Farm	70%	867,895	836,524	805,153
	Petroleum Products	95%	6,319,291	6,474,055	6,628,819

Table D-22 Port of New Orleans Number of Vessels Projected by Dock

Dock	Commodity	Vessel Class	Avg. Tons per Vessel	# of Vessels Projected 2025	2035	2045
Exports						
Bulk/General Cargo	Chemical Products	General Cargo	3,806	44	48	51
	Crude Materials	BC Capesize	99,761	3	3	3
		BC Handysize	24,270	3	3	3
		General Cargo	11,276	54	54	54
	Food and Farm	BC Capesize	59,084	31	35	38
		BC Handymax	34,862	90	98	107
		BC Handysize	23,747	92	101	110
		BC Panamax	58,451	44	48	52
		General Cargo	11,127	62	68	74
	Petroleum Products	BC Capesize	15,608	1	1	1
		BC Handymax	40,676	12	12	13
		BC Handysize	29,746	7	7	8
		BC Panamax	35,012	5	5	5
		General Cargo	8,898	21	22	24
Tankers	Chemical Products	Chemical Tanker	12,518	148	159	171
		PT[1] Medium	44,595	4	4	4
	Food and Farm	Chemical Tanker	6,269	19	21	23
	Petroleum Products	Aframax	42,949	11	11	12
		Chemical Tanker	37,601	39	41	43
		PT Medium	35,193	8	9	9
		PT Panamax	43,478	8	9	9

Dock	Commodity	Vessel Class	Avg. Tons per Vessel	# of Vessels Projected 2025	2035	2045
		Suezmax	76,973	1	1	1
Imports						
Bulk/General Cargo	Chemical Products	BC Capesize	46,047	5	6	7
		BC Handymax	24,849	36	41	45
		BC Handysize	12,485	15	17	18
		BC Panamax	32,937	16	18	20
		General Cargo	3,301	20	23	25
	Food and Farm	BC Capesize	66,115	1	1	1
		BC Handymax	14,415	3	3	3
		BC Handysize	19,566	2	2	2
		BC Panamax	66,143	2	2	2
		General Cargo	6,496	7	7	6
	Manufactured Goods	BC Capesize	26,709	2	3	3
		BC Handymax	14,942	214	281	348
		BC Handysize	11,398	78	103	127
		BC Panamax	28,031	16	21	26
		General Cargo	5,710	150	197	243
	Petroleum Products	BC Handymax	11,512	8	9	9
		BC Handysize	18,231	8	9	9
		BC Panamax	36,377	2	2	2
		General Cargo	4,324	7	7	7
Tankers	Chemical Products	Chemical Tanker	6,009	65	73	81
		PT Panamax	340	1	2	2

Dock	Commodity	Vessel Class	Avg. Tons per Vessel	# of Vessels Projected 2025	2035	2045
	Food and Farm	Chemical Tanker	13,144	66	64	61
	Petroleum Products	Aframax	87,984	56	57	59
		Chemical Tanker	14,695	20	21	21
		PT Medium	14,685	2	2	2
		PT Panamax	44,737	20	21	21
		Suezmax	86,093	2	2	2

[1]Products Tanker

Table D-23 Port of South LA Commodity Distribution by Dock

Dock	Commodity	% of Total Commodity	Commodity Tonnage 2025	2035	2045
Exports					
Bulk/General Cargo	Chemical Products	7%	63,119	68,874	74,628
	Coal	100%	10,890,424	11,613,935	12,337,446
	Food and Farm	99%	54,353,446	59,086,749	63,820,052
	Petroleum Products	3%	551,131	590,266	629,400
Tankers	Chemical Products	93%	875,141	954,927	1,034,713
	Food and Farm	1%	635,330	690,656	745,983
	Petroleum Products	97%	15,222,925	16,303,883	17,384,839
Imports					
Bulk/General Cargo	Chemical Products	45%	3,559,707	3,984,723	4,409,738
	Crude Materials	100%	10,455,757	12,466,479	14,477,202
	Manufactured Equip.	35%	1,266,777	1,662,645	2,058,513
	Petroleum Products	1%	256,124	265,336	274,548
Tankers	Chemical Products	55%	4,375,890	4,898,355	5,420,819
	Manufactured Equip.	65%	2,310,415	3,032,419	3,754,424
	Petroleum Products	99%	21,215,100	21,978,165	22,741,232

Table 24 Port of South LA Number of Vessels Projected by Dock

Dock	Commodity	Vessel Class	Avg. Tons per Vessel	# of Vessels Projected		
				2025	2035	2045
Exports						
Bulk/General Cargo	Chemical Products	BC Handymax	41,227	1	1	1
		BC Handysize	20,874	1	1	1
		General Cargo	17,950	1	1	1
	Coal	BC Capesize	90,106	77	82	87
		BC Handymax	54,183	12	12	13
		BC Handysize	23,211	1	2	2
		BC Panamax	73,395	40	43	46
		General Cargo	34,917	10	11	11
	Food and Farm	BC Capesize	70,245	122	133	144
		BC Handymax	47,605	446	485	524
		BC Handysize	29,357	192	209	225
		BC Panamax	64,579	268	292	315
		General Cargo	23,148	68	73	79
	Petroleum Products	BC Capesize	28,881	1	1	1
		BC Handymax	44,218	4	5	5
		BC Handysize	28,826	6	6	6
		BC Panamax	12,270	9	9	10
		General Cargo	10,432	6	7	7
Tankers	Chemical Products	Chemical Tanker	17,800	44	48	52
		PT Medium	25,451	3	3	3
		PT Panamax	26,734	1	1	1

Dock	Commodity	Vessel Class	Avg. Tons per Vessel	# of Vessels Projected 2025	2035	2045
	Food and Farm	Chemical Tanker	13,482	46	50	54
		PT Medium	19,112	1	1	1
	Petroleum Products	Aframax	34,779	111	119	127
		Chemical Tanker	35,369	73	78	83
		PT Medium	37,574	94	101	107
		PT Panamax	41,000	107	114	122
		Suezmax	33,877	26	28	30
Imports						
Bulk/General Cargo	Chemical Products	BC Capesize	68,905	7	8	9
		BC Handymax	41,348	39	43	48
		BC Handysize	28,018	23	26	28
		BC Panamax	56,244	13	15	16
		General Cargo	19,017	4	5	5
	Crude Materials	BC Capesize	77,401	35	42	48
		BC Handymax	49,695	54	64	74
		BC Handysize	24,007	15	17	20
		BC Panamax	64,659	69	82	96
		General Cargo	19,272	14	16	19
	Manufactured Equip.	BC Capesize	72,753	1	1	1
		BC Handymax	36,765	9	12	15
		BC Handysize	24,007	2	2	3
		BC Panamax	62,339	13	18	22
		General Cargo	6,474	5	7	8

Dock	Commodity	Vessel Class	Avg. Tons per Vessel	# of Vessels Projected 2025	2035	2045
	Petroleum Products	Aframax	49,520	3	3	3
		BC Handymax	59,472	1	1	1
		BC Handysize	20,186	1	1	1
		General Cargo	13,612	1	1	1
Tankers	Chemical Products	Aframax	83,586	1	1	1
		Chemical Tanker	21,347	163	182	202
		PT Medium	21,274	37	41	45
		PT Panamax	22,117	3	4	4
	Manufactured Equip.	Aframax	67,572	13	18	22
		Chemical Tanker	22,121	19	25	31
		PT Medium	6,783	3	4	5
		PT Panamax	49,546	13	18	22
		Suezmax	117,095	3	3	4
	Petroleum Products	Aframax	52,587	189	196	203
		Chemical Tanker	21,085	16	17	17
		PT Medium	21,905	83	86	89
		PT Panamax	38,966	165	171	177
		Suezmax	59,384	45	47	49

Table D-25 Port of Baton Rouge Commodity Distribution by Dock

Dock	Commodity	% of Total Commodity	Commodity Tonnage 2025	2035	2045
Exports					
Bulk/General Cargo	Chemical Products	8%	178,676	195,694	212,713

Dock	Commodity	% of Total Commodity	Commodity Tonnage 2025	2035	2045
	Coal	100%	504,663	538,190	571,719
	Food and Farm	84%	1,987,171	2,077,417	2,167,663
Tankers	Chemical Products	92%	1,964,395	2,151,496	2,338,598
	Food and Farm	16%	375,955	393,029	410,103
	Petroleum Products	100%	2,950,258	3,045,940	3,141,620
Imports					
Bulk/General Cargo	Chemical Products	4%	80,226	86,414	92,602
	Crude Materials	100%	3,282,981	4,308,913	5,334,844
	Manufactured Equip.	100%	1,881,230	2,469,115	3,056,999
	Petroleum Products	1%	85,432	88,498	91,563
Tankers	Chemical Products	96%	1,714,589	1,846,841	1,979,093
	Petroleum Products	99%	9,250,964	9,582,873	9,914,780

Table D-26 Port of Baton Rouge Number of Vessels Projected by Dock

Dock	Commodity	Vessel Class	Avg. Tons per Vessel	# of Vessels Projected 2025	2035	2045
Exports						
Bulk/General Cargo	Chemical Products	BC Handymax	27,278	3	4	4
		BC Handysize	15,372	4	5	5
		General Cargo	8,057	3	4	4
	Coal	BC Handymax	35,937	5	5	5
		BC Handysize	16,832	10	11	11
		General Cargo	7,992	21	22	24
	Food and Farm	BC Handymax	44,596	27	28	29
		BC Handysize	18,293	24	25	26
		BC Panamax	60,000	3	3	3
		General Cargo	7,927	24	25	26
Tankers	Chemical Products	Chemical Tanker	11,758	157	172	187
		PT Medium	20,439	5	6	6
		PT Panamax	10,900	1	1	1
	Food and Farm	Chemical Tanker	18,139	21	22	23
	Petroleum Products	Aframax	19,818	29	30	31
		Chemical Tanker	25,289	53	55	57
		PT Medium	33,251	16	16	17
		PT Panamax	18,264	28	29	29
Imports						
Bulk/General Cargo	Chemical Products	BC Handysize	17,949	4	4	5
		General Cargo	6,043	1	1	2

Dock	Commodity	Vessel Class	Avg. Tons per Vessel	# of Vessels Projected 2025	2035	2045
	Crude Materials	BC Capesize	64,216	9	11	14
		BC Handymax	39,558	10	13	16
		BC Handysize	18,314	24	32	39
		BC Panamax	58,831	24	32	39
		General Cargo	33,640	14	19	23
	Manufactured Equip.	BC Capesize	63,193	8	11	14
		BC Handymax	50,019	6	8	10
		BC Panamax	52,007	20	26	32
	Petroleum Products	BC Handysize	16,510	1	1	1
		BC Panamax	52,417	1	1	1
Tankers	Chemical Products	Chemical Tanker	15,149	98	105	113
		PT Medium	12,436	19	20	22
	Petroleum Products	Aframax	61,267	86	89	92
		Chemical Tanker	19,761	51	53	54
		PT Medium	17,826	4	4	4
		PT Panamax	49,428	59	62	64

The Bulk Loading Tool then used this data to generate vessel call lists representing traffic for each of the 4 ports for the years 2025, 2035, and 2045. These generated vessel call lists were input back into HarborSym, and HarborSym was run to calculate the average total vessel cost for each vessel class. With this information it was possible to calculate the total annual cost for all vessels operating in each port.

Once the total annual cost was calculated for each port for the years 2025, 2035, and 2045, new vessel call lists had to be generated by the Bulk Loading Tool to take into account the extra depth being added to the channel (48 feet and 50 feet). With extra depth, vessels that previously light-

loaded are now able to load closer to their capacity and thus operate more efficiently. In the Bulk Loading Tool the user assigns a value to each vessel class indicating what percent of its capacity is being utilized. For these new vessel call lists, vessel classes that were identified as potentially being able to load more efficiently were given a higher operating capacity number correlating to the extra depth of the project (vessels traveling to the ports of Plaquemines and New Orleans were given an extra 1.5 feet for the 50-foot channel, whereas vessels traveling to the ports of South LA and Baton Rouge were given an extra 3 feet for the 48-foot channel and 5 feet for the 50-foot channel).

HarborSym runs using these new vessel call lists calculated the average total vessel cost for each vessel class which, in turn, was used to calculate the total annual cost for all vessels operating in each port. The difference in total annual transportation costs between the with- and without-project conditions are the net NED benefits of the project.

D-4.3 Transportation Cost Savings Benefit Analysis

For the Port of Plaquemines, the 2025 with-project condition of a 50-foot channel saw the annual number of vessel trips drop from a total of 457 to 454, resulting in a transportation cost savings benefit of $2,038,384. For the year 2035, the annual number of vessels was reduced from a total of 512 to 509, giving a transportation cost savings benefit of $2,165,227. Finally, vessels in the year 2045 were projected to number 551 compared to 556 in the without-project condition, yielding a transportation cost savings benefit of $5,623,534. Reduction in the amount of light-loading due to a deeper channel creates a more efficient use of vessels that translates into the above transportation cost savings benefits. These same efficiencies which generate transportation cost savings are found for the ports of New Orleans, South LA, and Plaquemines.

The Port of New Orleans saw its vessel trip total drop from 1,347 to 1,339 in 2025, from 1,545 to 1,537 in 2035, and from 1,738 to 1,729 in 2045. Transportation cost savings equaled $5,421,383 in 2025, $6,811,205 in 2035, and $8,010,740 in 2045 (Table D-27).

Table D-27 Port of Plaquemines and New Orleans Transportation Cost Savings

Port	Existing Conditions (48.5 feet)		With-Project (50 feet)		Savings
	Number of Vessels	Total Annual Cost	Number of Vessels	Total Annual Cost	
Plaquemines					
2025	457	$430,976,335	454	$428,937,951	$2,038,384

2035	512	$475,466,167	509	$473,300,940	$2,165,227
2045	556	$517,943,449	551	$512,319,915	$5,623,534
New Orleans					
2025	1,347	$1,067,907,827	1,339	$1,062,486,444	$5,421,383
2035	1,545	$1,216,406,028	1,537	$1,209,594,822	$6,811,205
2045	1,738	$1,358,439,392	1,729	$1,350,428,653	$8,010,740

For the Port of South LA, the 2025 with-project condition of a 48-foot channel saw the annual number of vessels drop from a total of 2,503 to 2,414, resulting in a transportation cost savings benefit of $73,912,430. For the year 2035, the annual number of vessels was reduced from a total of 2,726 to 2,633, giving a transportation cost savings benefit of $77,911,656. Finally, vessels in the year 2045 were projected to number 2,946 compared to 2,843 in the without-project condition, yielding a transportation cost savings benefit of $90,433,443. For the 50-foot channel scenario, vessel counts fell to 2,389, 2,607, and 2,815 in the years 2025, 2035, and 2045; transportation cost savings equaled $21,974,494, $22,947,795, and $22,939,693 respectively.

The Port of Baton Rouge saw its vessel count drop from 622 to 595 in 2025, from 668 to 635 in 2035, and from 713 to 680 in 2045. Transportation cost savings equaled $18,198,871 in 2025, $22,188,670 in 2035, and $23,334,682 in 2045. For the 50-foot channel scenario, vessel counts fell to 583, 625, and 669 in the years 2025, 2035, and 2045; transportation cost savings equaled $8,120,003, $7,822,764, and $7,993,380 respectively (Table D-28).

Table D-28 Port of South LA and Baton Rouge Transportation Cost Savings

Port	Existing Conditions (45 feet)		With-Project (48 feet)			With-Project (50 feet)		
	Number of Vessels	Total Annual Cost	Number of Vessels	Total Annual Cost	Savings	Number of Vessels	Total Annual Cost	Savings
South LA								
2025	2,503	$2,324,906,986	2,414	$2,250,994,556	$73,912,430	2,389	$2,229,020,062	$21,974,494
2035	2,726	$2,531,330,462	2,633	$2,453,418,806	$77,911,656	2,607	$2,430,471,012	$22,947,795
2045	2,946	$2,735,824,969	2,843	$2,645,391,526	$90,433,443	2,815	$2,622,451,834	$22,939,693
Baton Rouge								
2025	622	$588,062,485	595	$569,863,614	$18,198,871	583	$561,743,611	$8,120,003
2035	668	$636,611,344	635	$614,422,674	$22,188,670	625	$606,599,909	$7,822,764
2045	713	$681,115,724	680	$657,781,043	$23,334,682	669	$649,787,663	$7,993,380

Benefit streams for the 50-year period of analysis and the calculation of average annual benefits are shown for the 48-ft channel and 50-foot channel in tables D-29 and D-30, respectively. Benefits reflect 2016 price levels and were annualized at the current FY17 Federal discount rate of 2.875 percent.

Table D-29 Average Annual Benefits – 48-ft Alternative

Year	Year	Navigation Benefits	Present Value of Costs
2020	-4		
2021	-3		$0
2022	-2		$0
2023	-1		$0
2024	0		$0
2025	1	$92,111,301	$89,537,109
2026	2	$92,910,203	$87,789,730
2027	3	$93,709,106	$86,070,089
2028	4	$94,508,008	$84,377,998
2029	5	$95,306,911	$82,713,263
2030	6	$96,105,814	$81,075,674
2031	7	$96,904,716	$79,465,016
2032	8	$97,703,619	$77,881,062
2033	9	$98,502,521	$76,323,576
2034	10	$99,301,424	$74,792,318
2035	11	$100,100,326	$73,287,037
2036	12	$101,467,106	$72,211,621
2037	13	$102,833,886	$71,139,076
2038	14	$104,200,666	$70,070,081
2039	15	$105,567,446	$69,005,275
2040	16	$106,934,225	$67,945,259

Table D-29 (Continued) Average Annual Benefits – 48-ft Alternative

2041	17	$108,301,005	$66,890,596
2042	18	$109,667,785	$65,841,817
2043	19	$111,034,565	$64,799,414
2044	20	$112,401,345	$63,763,852
2045	21	$113,768,125	$62,735,561
2046	22	$113,768,125	$60,982,319
2047	23	$113,768,125	$59,278,075
2048	24	$113,768,125	$57,621,458
2049	25	$113,768,125	$56,011,138
2050	26	$113,768,125	$54,445,820
2051	27	$113,768,125	$52,924,248
2052	28	$113,768,125	$51,445,199
2053	29	$113,768,125	$50,007,484
2054	30	$113,768,125	$48,609,948
2055	31	$113,768,125	$47,251,468
2056	32	$113,768,125	$45,930,953
2057	33	$113,768,125	$44,647,342
2058	34	$113,768,125	$43,399,603
2059	35	$113,768,125	$42,186,735
2060	36	$113,768,125	$41,007,762
2061	37	$113,768,125	$39,861,737
2062	38	$113,768,125	$38,747,739
2063	39	$113,768,125	$37,664,874
2064	40	$113,768,125	$36,612,271
2065	41	$113,768,125	$35,589,085
2066	42	$113,768,125	$34,594,493
2067	43	$113,768,125	$33,627,697
2068	44	$113,768,125	$32,687,919
2069	45	$113,768,125	$31,774,405
2070	46	$113,768,125	$30,886,421
2071	47	$113,768,125	$30,023,252
2072	48	$113,768,125	$29,184,206
2073	49	$113,768,125	$28,368,609
2074	50	$113,768,125	$27,575,804
TOTAL PRESENT VALUE ==>			$2,790,663,487
AVERAGE ANNUAL BENEFIT ==>			**$105,900,338**

Federal Discount Rate	Fraction	Decimal
	2 7/8	2 7/8
0.037948	50 Yr. Amortization Factor	

Table D-30 Average Annual Benefits – 50-ft Alternative

Year	Year	Navigation Benefits	Present Value of Costs
2020	-4		
2021	-3		$0
2022	-2		$0
2023	-1		$0
2024	0		$0
2025	1	$129,665,565	$126,041,862
2026	2	$130,683,740	$123,481,489
2027	3	$131,701,915	$120,965,785
2028	4	$132,720,091	$118,494,250
2029	5	$133,738,266	$116,066,382
2030	6	$134,756,441	$113,681,669
2031	7	$135,774,616	$111,339,597
2032	8	$136,792,791	$109,039,644
2033	9	$137,810,966	$106,781,285
2034	10	$138,829,142	$104,563,992
2035	11	$139,847,317	$102,387,233
2036	12	$141,696,132	$100,841,621
2037	13	$143,544,948	$99,302,432
2038	14	$145,393,763	$97,770,515
2039	15	$147,242,578	$96,246,665
2040	16	$149,091,394	$94,731,629
2041	17	$150,940,209	$93,226,103
2042	18	$152,789,025	$91,730,739
2043	19	$154,637,840	$90,246,145
2044	20	$156,486,656	$88,772,887
2045	21	$158,335,471	$87,311,491
2046	22	$158,335,471	$84,871,437
2047	23	$158,335,471	$82,499,575
2048	24	$158,335,471	$80,193,997
2049	25	$158,335,471	$77,952,853
2050	26	$158,335,471	$75,774,340
2051	27	$158,335,471	$73,656,710
2052	28	$158,335,471	$71,598,260
2053	29	$158,335,471	$69,597,337
2054	30	$158,335,471	$67,652,332
2055	31	$158,335,471	$65,761,684
2056	32	$158,335,471	$63,923,872
2057	33	$158,335,471	$62,137,421
2058	34	$158,335,471	$60,400,896
2059	35	$158,335,471	$58,712,900

Table D-30 (Continued) Average Annual Benefits – 50-ft Alternative

2060	36	$158,335,471	$57,072,078
2061	37	$158,335,471	$55,477,111
2062	38	$158,335,471	$53,926,718
2063	39	$158,335,471	$52,419,653
2064	40	$158,335,471	$50,954,705
2065	41	$158,335,471	$49,530,697
2066	42	$158,335,471	$48,146,486
2067	43	$158,335,471	$46,800,958
2068	44	$158,335,471	$45,493,034
2069	45	$158,335,471	$44,221,661
2070	46	$158,335,471	$42,985,818
2071	47	$158,335,471	$41,784,514
2072	48	$158,335,471	$40,616,781
2073	49	$158,335,471	$39,481,683
2074	50	$158,335,471	$38,378,307
TOTAL PRESENT VALUE ==>			$3,895,047,231
AVERAGE ANNUAL BENEFIT ==>			**$147,809,587**

Federal	Fraction	Decimal
Discount Rate	2 7/8	2.875
0.037948	50 Yr. Amortization Factor	

D-5.0 NED BENEFITS AND COSTS

D-5.1 Benefit/Cost Analysis

In the evaluation and comparison of project depth alternatives, which is necessary to arrive at the selected plan, NED costs play a critical role. NED costs include both the financial and economic costs associated with a project throughout its lifecycle. Each of these types of costs and their sources are discussed in this section of the report. Additionally, the NED costs for the depth alternatives being considered in this analysis will be identified.

D-5.2 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. New Orleans District cost engineers prepared the cost estimate for each of the proposed deepening 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. The next section defines IDC and provides an explanation as to how it is calculated and included in the analysis. Together, these costs represent the estimated first cost of construction.

Another financial cost not included above 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 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.

Interest 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, 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 follows.

> 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

In this analysis, the IDC is evaluated using a flow of constant monthly construction expenditures. Calculating the hypothetical interest earned on each monthly construction payment and summing them to arrive at the total construction investment cost (CB) enables the calculation of IDC by taking the difference between CB 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.

Table D-31 contains the project costs associated with each project depth and configuration evaluated in this analysis. The costs were annualized at the FY17 discount rate of 2.875% over 50 years.

Table D-31

Channel Alternative	**50 ft. Through S. LA**	**50 ft. Full Channel**	**48 ft. Through S. LA**	**48 ft. Full Channel**	**50 ft. SWP/48 ft. Through S. LA[1]**	**50 ft. SWP/48 ft. Through BR[2]**	**50 ft. Through S. LA/48 ft. Through BR[3]**
First Cost of Construction	$88,971,120	$183,076,433	$5,551,980	$88,663,029	$87,770,010	$170,881,059	$172,082,169
Construction Duration (in months)	48	48	48	48	48	48	48
IDC	$ 3,910,948	$8,047,583	$244,051	$3,897,405	$3,858,151	$7,511,505	$7,564,303
Total Investment Cost	$92,882,068	$191,124,016	$5,796,031	$92,560,434	$91,628,160	$178,392,564	$179,646,472
Average Annual	$3,524,697	$7,252,791	$219,948	$3,512,491	$3,477,113	$6,769,656	$6,817,240

Construction Cost							
Annual Incremental O&M	$18,126,110	$131,446,950	$13,443,710	$100,007,021	$13,443,710	$100,007,021	$104,689,421
Total Average Annual Cost	$21,650,806	$138,699,741	$13,663,658	$103,519,512	$16,920,824	$106,776,677	$111,506,660

D-5.3 Net Benefits and Benefit-Cost Ratio

Having identified the benefits and costs associated with the deepening of the channel, identification of the proposed alternative requires a comparison of the average annual net benefits resulting from each project depth. Table D-32 below contains the NED annual Cost and Benefits for incremental channel depths and the resulting net benefit and benefit-cost ratios at the FY17 discount rate of 2.875%. Alternatives 2 and 3 represent deepening the entire channel from Southwest Pass to the Port of Baton Rouge to depths of 48 feet and 50 feet, respectively.

Table D-32 Project Results

	Alternative 2	Alternative 3
Average Annual Benefits	$105,900,000	$147,810,000
Average Annual Costs	$103,520,000	$138,700,000
Net Benefits	$2,380,000	$9,110,000
BCR	1.02	1.07

D-5.4 Optimization

Alternatives 2 and 3 looked at deepening the entire MRSC to a uniform depth; however, further analyses were performed by focusing specifically on the port level. It was here at the port level where there was clearly an opportunity to obtain the greatest net benefits by considering deepening the channel incrementally by port.

As shown in table D-33, the greatest net benefits with a B/C ratio of 5.47 occur at a depth of 50 feet through the Port of South LA (including the three lower crossings of Fairview, Belmont, and Rich Bend) but not through the Port of Baton Rouge. This is mainly because the greatest incremental O&M costs occur in the remaining nine crossings in which the Port of Baton Rouge is located. As shown below, the average annual incremental cost to maintain a 50 ft. channel through the Port of South LA is approximately $18.1 million; however, the average annual incremental cost to maintain a 50 ft. channel through the Port of Baton Rouge (i.e., the full channel) is approximately $131.4 million, which is a difference of $113.3 million. The same degree of difference in the incremental O&M costs is shown with the 48 ft. depth alternative. The average annual incremental cost to maintain a 48 ft. channel through the Port of South LA is $13.4 million as opposed to $100.0 million for maintaining the same channel depth through the Port of Baton Rouge, yielding a difference of $86.6 million. As such, in both instances, deepening the channel above the Port of South La is not economically justified as the incremental benefits simply do not outweigh the incremental cost of doing so. Three other scenarios were studied and included in table D-31, but none produced the greatest net benefits. Deepening the channel both at Southwest Pass to 50 feet and through the Port of South LA to 48 feet actually produced the highest B/C ratio at 5.62. However, average annual net benefits totaled only $78.1 million compared to that of the NED plan at $96.8 million. The two other scenarios (50 feet at Southwest Pass, 48 feet through Baton Rouge; 50 feet through South LA, 48 feet through Baton Rouge) also did not produce the greatest net benefits.

Table D-33 Average Annual Costs and Benefits

Channel Alternative	50 ft. Through S. LA	50 ft. Full Channel	48 ft. Through S. LA	48 ft. Full Channel
First Cost of Construction	$ 88,971,120	$ 183,076,433	$ 5,551,980	$ 88,663,029
Interest During Construction	$ 3,910,948	$ 8,047,583	$ 244,051	$ 3,897,405
Total Investment	$ 92,882,068	$ 191,124,016	$ 5,796,031	$ 92,560,434
Average Annual Const. Cost	$ 3,524,697	$ 7,252,791	$ 219,948	$ 3,512,491
Average Annual Increm. O&M	$ 18,126,110	$ 131,446,950	$ 13,443,710	$ 100,007,021
Total Average Annual Cost	$ 21,650,806	$ 138,699,741	$ 13,663,658	$ 103,519,512
Total Average Annual Benefits	$ 118,436,481	$ 147,809,587	$ 84,519,999	$ 105,900,338
Net Excess Benefits	**$ 96,785,675**	**$ 9,109,847**	**$ 70,856,340**	**$ 2,380,826**
B/C Ratio	**5.47**	**1.07**	**6.19**	**1.02**

Channel Alternative	50 ft. SWP/48 ft. Through S. LA[1]	50 ft. SWP/48 ft. Through BR[2]	50 ft. Through S. LA/48 ft. Through BR[3]
First Cost of Construction	$ 87,770,010	$ 170,881,059	$ 172,082,169
Interest During Construction	$ 3,858,151	$ 7,511,505	$ 7,564,303
Total Investment	$ 91,628,160	$ 178,392,564	$ 179,646,472
Average Annual Const. Cost	$ 3,477,113	$ 6,769,656	$ 6,817,240
Average Annual Increm. O&M	$ 13,443,710	$ 100,007,021	$ 104,689,421
Total Average Annual Cost	$ 16,920,824	$ 106,776,677	$ 111,506,660
Total Average Annual Benefits	$ 95,023,734	$ 117,078,601	$ 139,816,821
Net Excess Benefits	**$ 78,102,911**	**$ 10,301,924**	**$ 28,310,160**
B/C Ratio	**5.62**	**1.10**	**1.25**

Note: Costs and benefits reflect 2016 price levels and were annualized at the current FY17 Federal discount rate of 2.875 percent.
[1] 50 feet through Plaquemines and New Orleans, 48 feet through South LA.
[2] 50 feet through Plaquemines and New Orleans, 48 feet through Baton Rouge.

D-5.5 NED Plan

Although the project is authorized to 55 feet for the full channel (i.e., through the Port of Baton Rouge), the economic analysis indicates that the greatest net excess benefits are achieved by deepening the channel to a depth of 50 feet through the Port of South LA and not through the Port of Baton Rouge. The nine crossings in which the Port of Baton Rouge is located simply incur incremental O&M costs that are prohibitive when compared to the incremental benefits. Deepening the channel through the Port of Baton Rouge may be implemented in a future construction phase; however, this would require a facility by facility analysis for each crossing to determine if these additional increments are in fact economically justified.

For the NED plan, average annual costs are $21.7 million and average annual benefits are $118.4 million. Total average annual benefits minus total average annual costs equals the average annual net benefits of the project which in this scenario comes to $96.8 million. The benefit cost ratio is accordingly 5.47 to 1 (Table D-34).

Table D-34 Tentatively Selected Plan

Investment Cost	
Total Project Construction Cost	$ 88,971,120
Interest During Construction	$ 3,910,948
Total Investment Cost	$ 92,882,068
Average Annual Cost	
Interest and Amortization of Initial Investment	$ 3,524,697
Average Annual Incremental OMRR&R	$ 18,126,110
Total Average Annual Cost	$ 21,650,806
Average Annual Benefits	$118,436,481
Net Annual Benefits	$ 96,785,675
Benefit Cost Ratio (computed at 2.875%)	5.47

7 percent OMB rate: At this discount rate, the NED plan average annual costs are $25.3 million and average annual benefits are $114.5 million. Average annual net benefits are $89.2 million, and the benefit cost ratio is 4.53 to 1.