October 2017

Port of South Louisiana

Benefit Cost Analysis

Globalplex Intermodal Efficiency Improvements Project

TIGER IX Grant

Cost-Benefit Analysis
in Support of the
Globalplex Intermodal Efficiency Improvements Project
"TIGER Discretionary Grants" Application

October 2017

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TECHNICAL MEMORANDUM

This memorandum presents the Benefit-Cost Analysis (BCA) to be referenced in the Port of South Louisiana's U.S. Department of Transportation "TIGER IX Discretionary Grants" application. The Globalplex Intermodal Efficiency Project (Project) is located in St. John the Baptist Parish in the state of Louisiana (LA). The Project will enhance cargo operations at the POSL. The Project will consist of the construction of a new high capacity dock access bridge, two new dock mobile harbor cranes, and dock reinforcement.

Significant monetary benefits have been estimated as the project will promote environmental sustainability by reducing the carbon footprint of regional and national transportation systems, quality of life by reducing noise pollution, economic competitiveness by reducing fuel costs and incurring travel time savings, and safety through reduced truck vehicle miles traveled. This venture is of national significance as it will facilitate the movement of marine cargo, stimulate international commerce, and create short-term and long-term jobs at America's largest tonnage port.

The methodology used for the BCA follows precisely the guidelines of the Notice of Funding Opportunity (NOFO) for the Department of Transportation's National Infrastructure Investments Under the Consolidated Appropriations Act, 2017, the TIGER Benefit-Cost Analysis (BCA) Analysis Analyses Guidance for TIGER Applicants, and the BCA Resource Guide 2017, updated July 2017. Estimates of the expected benefits for each of the five long-term outcomes specified in the NOFO are presented for the full completion of the Project 'alternative case' against a baseline which has been defined as a 'base case.' In this document, net benefits are estimated as the difference between the total costs in the 'base case' and the 'alternative case.' All costs and benefits were discounted using a 7% discount rate as suggested by the additional BCA Resource Guide document. Net benefits are presented in a tabular form showing benefits in each year for the useful life of the Project. To compute the final BCA score, benefits of the whole Project are compared to the costs of the whole Project, including costs paid for by state, local, private partners, and the Federal government.

The BCA score is **2.8** following the implementation of the Project. A 30-year life cycle of the project was used to calculate the BCA score. O&M costs were not considered as the POSL has a long-term lease agreement with a terminal operating company that requires the tenant to perform maintenance at no cost to the Port.

The second section of this memorandum presents the summary results and the values of the parameters that were used to perform the estimations. In the following section, the methodology used to derive net benefits for each of the long-term outcomes is presented.

I Impact and Summary Table

Table 1 presents the Impact Matrix as specified in the NOFO. The Impact Matrix describes the project and what it changes**.**

Table 1
Impact Matrix

Current Status / Baseline & Problem to Be Addressed	Change to Baseline / Alternatives	Type of Impacts	Population Affected by Impacts	Economic Benefits	Summary of Results	Page Reference in BCA
Existing dilapidated gantry cranes require maintenance and induce 24 hours of downtime approximately 1-2 times monthly. Existing gantry cranes load minimal tons per hour.	Crane efficiency and reliability increases.	Throughput can be loaded and unloaded faster. Vessel idling and delay is reduced. Cargo throughput is reliable.	Residents immediately adjacent to Globalplex experience cleaner air due to reduced emissions. Adjacent US Census Tracts have a total population of: 8,415. See **Tables 27-29** for additional socioeconomic details. Vessel crews, crane operators, and truck drivers experience reduced travel time.	State of Good Repair, Economic Competitiveness, Quality of Life, Sustainability, and Safety	$74.6 million in benefits	Page 3 - 27
Small trucks transporting cargo from the dock to warehouses and staging facilities are loaded only partially full due to the low capacity of the existing dock access bridge. In the event of maintenance, there is no other access to the dock.	A second dock access bridge is constructed with the ability to withstand heavier hauls, such as large, fully loaded trucks.	Reduced VMT due to more efficiently loaded trucks. Reduced loading and unloading delay.	Residents immediately adjacent to Globalplex experience cleaner air due to reduced emissions. Adjacent US Census Tracts have a total population of: 8,415. See **Tables 27-29** for additional socioeconomic details. Vessel crews, crane operators, and truck drivers experience reduced travel time.	State of Good Repair, Economic Competitiveness, and Sustainability	$12.6 million in benefits	Page 3 - 27

Table 2 presents the BCA scores for the Project. The BCA scores are computed using the present value of benefits and costs over a life-cycle of 30 years. The Project life of 30 years was chosen as the project component with the shortest life span, the mobile harbor cranes, has a life-cycle of approximately 30 years. The dock reinforcement and dock access bridge have useful lives that exceed 30 years. The mobile harbor cranes may have reduced reliability towards the end of their life, just as the existing cranes are increasingly unreliable. To account for this within the BCA, a decreased reliability of the cranes after 20 years is implemented. Operations and Maintenance is assumed to be maintained at the highest quality based upon leases with POSL tenants; the tenants bore all maintenance for these facilities. A detailed year by year description of the cost is presented in **Table 19** at the end of this document.

Table 2
Globalplex Intermodal Efficiency Improvements Project Benefit Cost Analysis

Benefit Cost Summary		Total
State of Good Repairs		**$1,059,263**
	Access Bridge Reduced Maintenance	$104,574
	Residual Value	$954,689
Economic Competitiveness		**$69,407,005**
	Reduced Surface Transportation Fuel Consumption	$890,847
	Reduced Bunker Fuel Consumption	$1,884,823
	Vessel Crew Travel Times Savings (Crane Reliability)	$4,676,771
	Truck Driver Travel Times Savings (Bridge Improvements)	$10,701,407
	Vessel Crew & Crane Operator Travel Time Savings (Crane Efficiency)	$51,253,158
Quality of Life		**$60,363**
	Reduced Noise Pollution	$60,363
Sustainability		**$17,183,481**
	Reduced Surface Transportation Emission Costs	$368,121
	Reduced Vessel Idling Emission Costs	$16,815,360
Safety		**$430,390**
	Access Bridge Safety Improvements	$430,390
Total Benefits		**$88,140,501**
Total Cost		**$31,443,417**
	Project Costs	$31,443,417
BCA Score		**2.80**

II Methodology

Net benefits are computed over a 30-year period and discounted using a 7% discount rate as recommended in the NOFO. Net benefits are computed as the difference in costs between a base case (no-build) and the alternative case (full completion of the Project). In the base case, it is assumed that tonnage traffic will continue to be shipped by small trucks, and that vessels will continue to idle during crane downtime.

Under the alternative case, operations will utilize large, "off-road" trucks that are fully loaded to transport cargo in a seamless traffic pattern from the dock to the staging areas within Globalplex. This will reduce travel time savings and truck vehicle miles traveled (VMT). The alternative case also realizes the travel time savings and reduced vessel idling associated with reduced crane downtime and improved crane efficiencies.

Net benefits are computed and monetized using the assumption that all the improvements and upgrades proposed will allow cargo to be transported with reduced truck VMT, reduced travel time, and reduced vessel idling. The **avoided truck vehicle miles traveled** and **reduced travel time** will generate a reduction in bridge maintenance costs, roadway noise, fuel consumption, probability of traffic accidents, and emissions. Additionally, other benefits are derived from reduced vessel idling due to decreased crane downtime.

Table 3 presents the list of all parameters that have been used in this analysis. Prices were expressed in 2016 US dollars using the Consumer Price Index from the Bureau of Labor Statistics (**Table 22** at the end of this document).

Table 3
Model Inputs

Parameters used to estimate the BCA Score	
Input	**Value**
Benefit Discount Rate (Percent)	7.00%
Project Life Cycle (years)	30
Average tons per truck - Current (short tons)	17
Average tons per truck - New Access bridge (short tons)	50
Average Miles per Gallon Heavy Duty Trucks a/	7
Distance Trucks Travel loading/unloading (Existing)	3.0
Distance Trucks Travel loading/unloading (New Access Bridge)	2.9
Time to Load 1 Truck (Existing, in Minutes)	25
Time to Load 1 Truck (New Access Bridge, in Minutes)	19
Highway Marginal Pavement Maintenance Cost (1997 US$ per truck mile) b/	$0.031
Highway Marginal Pavement Maintenance Cost (2016 US$ per truck mile) b/	$0.05
Average price of gallon of diesel fuel c/	$2.78
Truck VOC emissions (grams per mile)- Existing (VIIIa) d/	$0.46
Truck THC emissions (grams per mile) - Existing (VIIIa)d/	$0.46
Truck CO emissions (grams per mile) - Existing (VIIIa)d/	$2.40
Truck NOx emissions (grams per mile) - Existing (VIIIa)d/	$9.19
Truck PM2.5 emissions (grams per mile) - Existing (VIIIa)d/	$0.22
Truck VOC emissions (grams per mile) - New Access Bridge (VIIIb)d/	0.55
Truck THC emissions (grams per mile)- New Access Bridge (VIIIb)d/	0.55
Truck CO emissions (grams per mile)- New Access Bridge (VIIIb)d/	3.11
Truck NOx emissions (grams per mile)- New Access Bridge (VIIIb)d/	10.99
Truck PM2.5 emissions (grams per mile) - New Access Bridge (VIIIb)d/	0.24
Truck Marginal Noise Pollution Cost (1997 US$ per truck-mile)e/	$0.02
Truck Marginal Noise Pollution Cost (2016 US$ per truck-mile)e/	$0.03
Hotel Loading Hourly Fuel Consumption of ocean going vessels (g/kwh) f/	206
Hotel Loading Hourly NOx Emissions of ocean going vessels (g/kwh) f/	17
Hotel Loading Hourly SOx Emissions of ocean going vessels (g/kwh) f/	10
Hotel Loading Hourly CO2 Emissions of ocean going vessels (g/kwh) f/	655
Hotel Loading Hourly PM Emissions of ocean going vessels (g/kwh) f/	1.25
Average KW per Hour g/	3000
Bunker Fuel (MGO) Cost for New Orleans, LA h/	$535
Average Vessel Crew Size i/	24
BLS "Captains, Mates, and Pilots of Water Vessels" j/	$39.19
BLS "Motorboat Operators" j/	$20.84
BLS "Ship Engineers" j/	$35.64
BLS "Ship and Boat Captains and Operators" (Combined average) j/	$37.68
Gottwald, Maintenance Cost per Ton k/	$0.19
Manitowoc, Maintenance Cost per Ton k/	$1.15
Gottwald, Energy Cost per Ton k/	$0.15
Manitowoc, Energy Cost per Ton k/	$0.47
Gottwald, Tons per Working Hour k/	454
Manitowoc, Tons per Working Hour k/	195
BLS " Crane and Tower Operators" j/	$26.58
2015 Large Truck Fatal Crashes l/	4,050
2015 Large Truck Injury Crashes l/	87,000
2015 Large Truck Miles Traveled l/	279,844,000,000
MAIS 1 m/	$28,800
MAIS 2 m/	$451,200
MAIS 3 m/	$1,008,000
MAIS 4 m/	$2,553,600
MAIS 5 m/	$5,692,800
MAIS 6 m/	$9,600,000

a/ US DOT RITA Table 4-13
b/from the US. DOT, FHWA. May 2000 Addendum to the Federal Highway Cost Allocation Study Final Report, May 2000 (available at http://www.fhwa.dot.gov/policy/hcas/addendum.htm)
c/ U.S. average price of gallon of diesel from the Energy Information Agency (as of October 9, 2017)
d/https://nepis.epa.gov/Exe/ZyNET.exe/P100EVY6.txt?ZyActionD=ZyDocument&Client=EPA&Index=2006%20Thru%202010&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&UseQField=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A%5CZYFILES%5CINDEX%20DATA%5C06THRU10%5CTXT%5C00000033%5CP100EVY6.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h%7C-&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=hpfr&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=5
e/ from: Forkenbrock, D.J., 1999. External costs of intercity truck freight transportation. Transportation Research A 33 (7/8), p. 505-526
f/ Emission rates for transport vessels http://onlinelibrary.wiley.com/doi/10.1029/2003JD003751/pdf
g/ The typical vessel hotel load is 3,000 KW per hour. MARAD http://infohouse.p2ric.org/ref/46/45783.pdf
h/ Assumes vessel fuel is equal to the index for Bunker Fuel MGO in New Orleans on April 6, 2016
http://www.bunkerindex.com/prices/gulfmexico.php
I/ The average crew size for Panamax vessels or bulkers
j/ https://www.bls.gov/oes/current/oes_nat.htm#53-0000
k/ Associated Terminals feasibility analysis
L/ https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812373
m/ from Notice of Funding Availability for the Department of Transportation's National Infrastructure Investments Under the Full-Year Continuing Appropriations, 2015

Within the POSL jurisdiction, Globalplex is the only public port facility. Since the development of the facility in 2002, growth has been exponential. In the last 10 years, Globalplex tonnage increased by 9.6%. In 2015, the facility experienced throughput of 2,199,900 short tons – a record for the facility. The decrease from 2015 to 2016 was not due to lack of demand, but instead due to crane reliability. In 2015, the Port's stevedores, Associated Terminals, brought in temporary cranes on barge to facilitate the increased cargo movement. These temporary cranes can only be available to Globalplex when they are not in use elsewhere. These cranes were not available in 2016, and the existing cranes at the Globalplex facility cannot keep up with demand. The facilities' tenants have expressed their need to increase cargo throughput; however, without support for the Project, further increases are likely not possible.

Table 4
Globalplex Cargo

Year	Project Year	Total Inbound (Short Tons)	Total Outbound (Short Tons)	Grand Total (Short Tons)
2007	-12	185,000	306,000	491,000
2008	-11	287,000	317,000	604,000
2009	-10	155,000	386,000	541,000
2010	-9	271,000	382,000	653,000
2011	-8	348,000	482,000	830,000
2012	-7	355,000	455,000	809,000
2013	-6	182,000	583,000	765,000
2014	-5	26,000	1,493,000	1,519,000
2015	-4	849,000	1,351,000	2,200,000
2016	-3	478,000	752,000	1,230,000
2017 Est.	-2	N/A	N/A	1,337,000
2018	-1	N/A	N/A	1,454,000
2019	0	N/A	N/A	1,581,000
2020	1	N/A	N/A	1,719,000
2021	2	N/A	N/A	1,869,000
2022	3	N/A	N/A	1,869,000
2023	4	N/A	N/A	1,869,000
2024	5	N/A	N/A	1,869,000
2025	6	N/A	N/A	1,869,000
2026	7	N/A	N/A	1,869,000
2027	8	N/A	N/A	1,869,000
2028	9	N/A	N/A	1,869,000
2029	10	N/A	N/A	1,869,000
2030	11	N/A	N/A	1,869,000
2031	12	N/A	N/A	1,869,000
2032	13	N/A	N/A	1,869,000
2033	14	N/A	N/A	1,869,000
2034	15	N/A	N/A	1,869,000
2035	16	N/A	N/A	1,869,000
2036	17	N/A	N/A	1,869,000
2037	18	N/A	N/A	1,869,000
2038	19	N/A	N/A	1,869,000
2039	20	N/A	N/A	1,869,000
2040	21	N/A	N/A	1,869,000
2041	22	N/A	N/A	1,869,000
2042	23	N/A	N/A	1,869,000
2043	24	N/A	N/A	1,869,000
2044	25	N/A	N/A	1,869,000
2045	26	N/A	N/A	1,869,000
2046	27	N/A	N/A	1,869,000
2047	28	N/A	N/A	1,869,000
2048	29	N/A	N/A	1,869,000
2049	30	N/A	N/A	1,869,000

Table 5 presents the reduced truck VMT due to the improved dock access bridge efficiencies.

Table 5
Reduced Truck VMT

Project Year	Year	Cargo (Short tons)	Number of Trucks (Existing)	Number of Trucks (New Access Bridge)	VMT (Existing)	VMT (New Access Bridge)	Reduced VMT
-1	2018	1,454,000	86,000	86,000	257,000	257,000	0
0	2019	1,581,000	93,000	93,000	279,000	279,000	0
1	2020	1,719,000	101,000	34,000	303,000	100,000	204,000
2	2021	1,869,000	110,000	37,000	330,000	108,000	221,000
3	2022	1,869,000	110,000	37,000	330,000	108,000	221,000
4	2023	1,869,000	110,000	37,000	330,000	108,000	221,000
5	2024	1,869,000	110,000	37,000	330,000	108,000	221,000
6	2025	1,869,000	110,000	37,000	330,000	108,000	221,000
7	2026	1,869,000	110,000	37,000	330,000	108,000	221,000
8	2027	1,869,000	110,000	37,000	330,000	108,000	221,000
9	2028	1,869,000	110,000	37,000	330,000	108,000	221,000
10	2029	1,869,000	110,000	37,000	330,000	108,000	221,000
11	2030	1,869,000	110,000	37,000	330,000	108,000	221,000
12	2031	1,869,000	110,000	37,000	330,000	108,000	221,000
13	2032	1,869,000	110,000	37,000	330,000	108,000	221,000
14	2033	1,869,000	110,000	37,000	330,000	108,000	221,000
15	2034	1,869,000	110,000	37,000	330,000	108,000	221,000
16	2035	1,869,000	110,000	37,000	330,000	108,000	221,000
17	2036	1,869,000	110,000	37,000	330,000	108,000	221,000
18	2037	1,869,000	110,000	37,000	330,000	108,000	221,000
19	2038	1,869,000	110,000	37,000	330,000	108,000	221,000
20	2039	1,869,000	110,000	37,000	330,000	108,000	221,000
21	2040	1,869,000	110,000	37,000	330,000	108,000	221,000
22	2041	1,869,000	110,000	37,000	330,000	108,000	221,000
23	2042	1,869,000	110,000	37,000	330,000	108,000	221,000
24	2043	1,869,000	110,000	37,000	330,000	108,000	221,000
25	2044	1,869,000	110,000	37,000	330,000	108,000	221,000
26	2045	1,869,000	110,000	37,000	330,000	108,000	221,000
27	2046	1,869,000	110,000	37,000	330,000	108,000	221,000
28	2047	1,869,000	110,000	37,000	330,000	108,000	221,000
29	2048	1,869,000	110,000	37,000	330,000	108,000	221,000
30	2049	1,869,000	110,000	37,000	330,000	108,000	221,000
TOTAL		**58,955,000**	**3,470,000**	**1,286,000**	**10,409,000**	**3,768,000**	**6,613,000**

Table 6 presents the computation of truck travel time savings associated with the improved traffic pattern of the new dock access bridge. Currently, only 1 truck can cross the single lane, low capacity access bridge. It must drive across the bridge, be loaded or unloaded, turn around, and cross the access bridge back towards Globalplex before a second truck can enter. Under the alternative scenario, trucks will be able to follow each other in a circular pattern; transiting loaded on the new dock access bridge, and unloaded on the existing. This traffic pattern will not require trucks to wait for others to travel. Once a truck is loaded or unloaded, the next truck can immediately pull forward into position while the first truck is transiting the bridge.

Table 6
Truck Travel Time Savings

Project Year	Year	Truck Trips (Existing)	Truck Trips (New Access Bridge)	Travel Time (Existing flow of cargo, in Minutes)	Travel Time (New Access Bridge, in Minutes)	Total Travel Time (Existing, In Minutes)	Total Travel Time (New Access bridge, In Minutes)	Travel Time Savings (Minutes)
-1	2018	86,000	86,000	25	25	2,138,000	2,138,000	0
0	2019	93,000	93,000	25	25	2,325,000	2,325,000	0
1	2020	101,000	34,000	25	19	2,528,000	645,000	1,883,000
2	2021	110,000	37,000	25	19	2,749,000	701,000	2,048,000
3	2022	110,000	37,000	25	19	2,749,000	701,000	2,048,000
4	2023	110,000	37,000	25	19	2,749,000	701,000	2,048,000
5	2024	110,000	37,000	25	19	2,749,000	701,000	2,048,000
6	2025	110,000	37,000	25	19	2,749,000	701,000	2,048,000
7	2026	110,000	37,000	25	19	2,749,000	701,000	2,048,000
8	2027	110,000	37,000	25	19	2,749,000	701,000	2,048,000
9	2028	110,000	37,000	25	19	2,749,000	701,000	2,048,000
10	2029	110,000	37,000	25	19	2,749,000	701,000	2,048,000
11	2030	110,000	37,000	25	19	2,749,000	701,000	2,048,000
12	2031	110,000	37,000	25	19	2,749,000	701,000	2,048,000
13	2032	110,000	37,000	25	19	2,749,000	701,000	2,048,000
14	2033	110,000	37,000	25	19	2,749,000	701,000	2,048,000
15	2034	110,000	37,000	25	19	2,749,000	701,000	2,048,000
16	2035	110,000	37,000	25	19	2,749,000	701,000	2,048,000
17	2036	110,000	37,000	25	19	2,749,000	701,000	2,048,000
18	2037	110,000	37,000	25	19	2,749,000	701,000	2,048,000
19	2038	110,000	37,000	25	19	2,749,000	701,000	2,048,000
20	2039	110,000	37,000	25	19	2,749,000	701,000	2,048,000
21	2040	110,000	37,000	25	19	2,749,000	701,000	2,048,000
22	2041	110,000	37,000	25	19	2,749,000	701,000	2,048,000
23	2042	110,000	37,000	25	19	2,749,000	701,000	2,048,000
24	2043	110,000	37,000	25	19	2,749,000	701,000	2,048,000
25	2044	110,000	37,000	25	19	2,749,000	701,000	2,048,000
26	2045	110,000	37,000	25	19	2,749,000	701,000	2,048,000
27	2046	110,000	37,000	25	19	2,749,000	701,000	2,048,000
28	2047	110,000	37,000	25	19	2,749,000	701,000	2,048,000
29	2048	110,000	37,000	25	19	2,749,000	701,000	2,048,000
30	2049	110,000	37,000	25	19	2,749,000	701,000	2,048,000
TOTAL:		**3,468,000**	**1,297,000**			**86,707,000**	**25,436,000**	**61,272,000**

Table 7
Truck Fuel Savings

Project Year	Year	Reduced Ton-Miles	Truck Average Ton-Mile per Gallon	Fuel Savings (Gallons)
-1	2018	0	7.4	0
0	2019	0	7.4	0
1	2020	204,000	7.4	28,000
2	2021	221,000	7.4	30,000
3	2022	221,000	7.4	30,000
4	2023	221,000	7.4	30,000
5	2024	221,000	7.4	30,000
6	2025	221,000	7.4	30,000
7	2026	221,000	7.4	30,000
8	2027	221,000	7.4	30,000
9	2028	221,000	7.4	30,000
10	2029	221,000	7.4	30,000
11	2030	221,000	7.4	30,000
12	2031	221,000	7.4	30,000
13	2032	221,000	7.4	30,000
14	2033	221,000	7.4	30,000
15	2034	221,000	7.4	30,000
16	2035	221,000	7.4	30,000
17	2036	221,000	7.4	30,000
18	2037	221,000	7.4	30,000
19	2038	221,000	7.4	30,000
20	2039	221,000	7.4	30,000
21	2040	221,000	7.4	30,000
22	2041	221,000	7.4	30,000
23	2042	221,000	7.4	30,000
24	2043	221,000	7.4	30,000
25	2044	221,000	7.4	30,000
26	2045	221,000	7.4	30,000
27	2046	221,000	7.4	30,000
28	2047	221,000	7.4	30,000
29	2048	221,000	7.4	30,000
30	2049	221,000	7.4	30,000
0	**Total**	**6,422,000**		**868,000**

Table 8
Crane Reliability

Project Year	Year	Existing Crane Downtown (Days)	New Crane Downtime (Days)	Reduction in Vessel Idling with Crane (Hours)	No Crane Reliability	Crane Reliability	Change in Reliability
-3	2016	16	16	-	95%	95%	0%
-2	2017	16	16	-	95%	95%	0%
-1	2018	16	16	-	95%	95%	0%
0	2019	16	16	-	95%	95%	0%
1	2020	17	0	400	95%	100%	5%
2	2021	17	0	408	95%	100%	5%
3	2022	17	0	416	95%	100%	5%
4	2023	18	0	424	95%	100%	5%
5	2024	18	0	432	95%	100%	5%
6	2025	18	0	441	95%	100%	5%
7	2026	19	0	450	95%	100%	5%
8	2027	19	0	459	95%	100%	5%
9	2028	20	0	468	95%	100%	5%
10	2029	20	0	477	94%	100%	6%
11	2030	20	1	475	94%	100%	6%
12	2031	21	1	472	94%	100%	6%
13	2032	21	2	469	94%	100%	6%
14	2033	22	2	467	94%	99%	5%
15	2034	22	3	465	94%	99%	5%
16	2035	22	3	463	94%	99%	5%
17	2036	23	4	462	94%	99%	5%
18	2037	23	4	460	93%	99%	5%
19	2038	24	5	459	93%	99%	5%
20	2039	24	5	458	93%	99%	5%
21	2040	25	6	457	93%	98%	5%
22	2041	25	6	457	93%	98%	5%
23	2042	26	7	456	93%	98%	5%
24	2043	26	7	456	93%	98%	5%
25	2044	27	8	457	92%	98%	5%
26	2045	27	8	457	92%	98%	5%
27	2046	28	9	458	92%	98%	5%
28	2047	28	9	459	92%	97%	5%
29	2048	29	10	460	92%	97%	5%
30	2049	30	10	461	92%	97%	5%
Total		**694**	**146**	**13,142**			

Table 9 presents the computation of the tonnage of Bunker Fuel (MGO) consumption, and **Table 10** represents the computation of the tonnage of emissions that would occur due to crane downtime over the next 30 years. A total of 9,200 tons of bunker fuel, 800 tons of NOx, 5400 tons of SOx, 30,000 tons of CO2, and 60 tons of PM can be saved due to a reduction in vessel idling over the next 30 years.

Table 9
Reduced Bunker Fuel Consumption

Project Year	Year	Reduction in Vessel Idling with Crane (Hours)	Fuel Consumption (Grams/KWHrs)	Reduction in Fuel Consumption (Grams/Year)	Reduction in Fuel Consumption (tons/year)*
-1	2018	-	206	-	-
0	2019	-	206	-	-
1	2020		206		
2	2021	408	206	251,837,000	278
3	2022	416	206	256,874,000	283
4	2023	424	206	262,012,000	289
5	2024	432	206	267,252,000	295
6	2025	441	206	272,597,000	300
7	2026	450	206	278,049,000	306
8	2027	459	206	283,610,000	313
9	2028	468	206	289,282,000	319
10	2029	477	206	295,068,000	325
11	2030	475	206	293,306,000	323
12	2031	472	206	291,662,000	322
13	2032	469	206	290,139,000	320
14	2033	467	206	288,738,000	318
15	2034	465	206	287,463,000	317
16	2035	463	206	286,315,000	316
17	2036	462	206	285,298,000	314
18	2037	460	206	284,413,000	314
19	2038	459	206	283,664,000	313
20	2039	458	206	283,054,000	312
21	2040	457	206	282,584,000	311
22	2041	457	206	282,259,000	311
23	2042	456	206	282,080,000	311
24	2043	456	206	282,051,000	311
25	2044	457	206	282,174,000	311
26	2045	457	206	282,453,000	311
27	2046	458	206	282,892,000	312
28	2047	459	206	283,492,000	312
29	2048	460	206	284,257,000	313
30	2049	461	206	285,191,000	314
Total		**14,000**		**8,406,963,000**	**9,267**

Table 10
Reduced Vessel Emissions

Project Year	Year	Reduction in Vessel Idling with Crane (Hours)	Reduction in NOx (Short Tons/year)	Reduction in Sox (Short Tons/year)	Reduction in CO2 (Short Tons/year)	Reduction in PM (Short Tons/year)
-1	2018	0	0	0	0	0
0	2019	0	0	0	0	0
1	2020	400	22	13	865	2
2	2021	408	23	13	883	2
3	2022	416	23	14	900	2
4	2023	424	24	14	918	2
5	2024	432	24	14	937	2
6	2025	441	25	15	955	2
7	2026	450	25	15	975	2
8	2027	459	26	15	994	2
9	2028	468	26	15	1,014	2
10	2029	477	27	16	1,034	2
11	2030	475	27	16	1,028	2
12	2031	472	27	16	1,022	2
13	2032	469	26	16	1,017	2
14	2033	467	26	15	1,012	2
15	2034	465	26	15	1,008	2
16	2035	463	26	15	1,004	2
17	2036	462	26	15	1,000	2
18	2037	460	26	15	997	2
19	2038	459	26	15	994	2
20	2039	458	26	15	992	2
21	2040	457	26	15	990	2
22	2041	457	26	15	989	2
23	2042	456	26	15	989	2
24	2043	456	26	15	989	2
25	2044	457	26	15	989	2
26	2045	457	26	15	990	2
27	2046	458	26	15	992	2
28	2047	459	26	15	994	2
29	2048	460	26	15	996	2
30	2049	461	26	15	1,000	2
Total		**13,603**	**765**	**450**	**29,466**	**56**

Table 11 represents the computation of the tonnage of emissions that would occur due to a reduce in truck VMT over the next 30 years. A total of 61 tons of NOx, 3 tons of VOCs, 15 tons of CO2, and 2 tons of PM can be saved due to a reduction in truck VMT over the next 30 years.

Table 11
Reduced Truck Emissions

Project Year	Year	Existing Truck VMT	New Truck VMT	Reduction in NOx (Short Tons)	Reduction in VOCs (Short Tons)	Reduction in CO (Short Tons)	Reduction in PM (Short Tons)
-1	2018	257,000	257,000	0.0	0.0	0.0	0.0
0	2019	279,000	279,000	0.0	0.0	0.0	0.0
1	2020	303,000	100,000	1.9	0.1	0.5	0.0
2	2021	330,000	108,000	2.0	0.1	0.5	0.0
3	2022	330,000	108,000	2.0	0.1	0.5	0.0
4	2023	330,000	108,000	2.0	0.1	0.5	0.0
5	2024	330,000	108,000	2.0	0.1	0.5	0.0
6	2025	330,000	108,000	2.0	0.1	0.5	0.0
7	2026	330,000	108,000	2.0	0.1	0.5	0.0
8	2027	330,000	108,000	2.0	0.1	0.5	0.0
9	2028	330,000	108,000	2.0	0.1	0.5	0.0
10	2029	330,000	108,000	2.0	0.1	0.5	0.0
11	2030	330,000	108,000	2.0	0.1	0.5	0.0
12	2031	330,000	108,000	2.0	0.1	0.5	0.0
13	2032	330,000	108,000	2.0	0.1	0.5	0.0
14	2033	330,000	108,000	2.0	0.1	0.5	0.0
15	2034	330,000	108,000	2.0	0.1	0.5	0.0
16	2035	330,000	108,000	2.0	0.1	0.5	0.0
17	2036	330,000	108,000	2.0	0.1	0.5	0.0
18	2037	330,000	108,000	2.0	0.1	0.5	0.0
19	2038	330,000	108,000	2.0	0.1	0.5	0.0
20	2039	330,000	108,000	2.0	0.1	0.5	0.0
21	2040	330,000	108,000	2.0	0.1	0.5	0.0
22	2041	330,000	108,000	2.0	0.1	0.5	0.0
23	2042	330,000	108,000	2.0	0.1	0.5	0.0
24	2043	330,000	108,000	2.0	0.1	0.5	0.0
25	2044	330,000	108,000	2.0	0.1	0.5	0.0
26	2045	330,000	108,000	2.0	0.1	0.5	0.0
27	2046	330,000	108,000	2.0	0.1	0.5	0.0
28	2047	330,000	108,000	2.0	0.1	0.5	0.0
29	2048	330,000	108,000	2.0	0.1	0.5	0.0
30	2049	330,000	108,000	2.0	0.1	0.5	0.0
Total		**10,148,000**	**3,523,000**	**60.7**	**3.0**	**14.9**	**1.5**

III Benefits

III.1 State of Good Repairs

Shifting freight from several smaller trucks to larger, fully loaded "off-road" trucks reduced both the number of trucks and truck VMT at the Globalplex facility. This reduces the number of trucks transiting the existing access bridge, allows only unloaded trucks to cross the existing access bridge, and as a result, will reduce the pavement resurfacing needs in this corridor. According to the U.S. Department of Transportation Federal Highway Administration (Addendum to the 1997 Federal Highway Cost Allocation Study Final Report, May 2000, www.fhwa.dot.gov/policy/hcas/addendum.htm), the highway marginal pavement maintenance cost per truck mile was $0.031 for 40 kip 4-axle urban interstate in 1997.

In order to compute the yearly benefits resulting from the state of good repairs, the number of trucks that would be avoided is multiplied by the number of miles they would have traveled and by the highway maintenance cost per truck mile factor expressed in 2016 US$: $0.05. The present value of these net benefits was estimated at $105,000 over the entire 30-year period using a 7% discount rate. **Table 12** presents the computational analysis of the benefits using the parameter values in **Table 3**.

In addition to the quantified State of Good Repairs benefits, the replacement of the existing, dilapidated cranes will reduce the frequent maintenance and downtime currently required. The POSL does not bore any maintenance costs as the tenant is required to complete maintenance; however, reducing crane maintenance and downtime positively affects the cargo flow at Globalplex. The replacement crane will allow for easier, more efficient maintenance. The Port's maritime operator, Associated Terminals, utilizes similar mobile harbor cranes at many ports throughout the United States, and therefore stockpiles excess parts for fast replacement. To be conservative, these estimates were not included in the benefit-cost analysis. However, the savings were estimated and are displayed in **Tables 13 and 14**. The value in reduction of maintenance savings could be as great as $18 million and the reduction in operations as great as $6 million.

Table 12
State of Good Repairs Benefits – Bridge Maintenance

Project Year	Year	Reduced Truck VMT	Pavement Maintenance Cost per Truck Mile	Reduced Bridge Maintenance Cost	Discounted Reduced Maintenance Cost
-1	2018	0	$0.047	$0	$0
0	2019	0	$0.047	$0	$0
1	2020	204,000	$0.047	$10,000	$7,000
2	2021	221,000	$0.047	$10,000	$7,000
3	2022	221,000	$0.047	$10,000	$7,000
4	2023	221,000	$0.047	$10,000	$6,000
5	2024	221,000	$0.047	$10,000	$6,000
6	2025	221,000	$0.047	$10,000	$6,000
7	2026	221,000	$0.047	$10,000	$5,000
8	2027	221,000	$0.047	$10,000	$5,000
9	2028	221,000	$0.047	$10,000	$5,000
10	2029	221,000	$0.047	$10,000	$4,000
11	2030	221,000	$0.047	$10,000	$4,000
12	2031	221,000	$0.047	$10,000	$4,000
13	2032	221,000	$0.047	$10,000	$4,000
14	2033	221,000	$0.047	$10,000	$3,000
15	2034	221,000	$0.047	$10,000	$3,000
16	2035	221,000	$0.047	$10,000	$3,000
17	2036	221,000	$0.047	$10,000	$3,000
18	2037	221,000	$0.047	$10,000	$3,000
19	2038	221,000	$0.047	$10,000	$2,000
20	2039	221,000	$0.047	$10,000	$2,000
21	2040	221,000	$0.047	$10,000	$2,000
22	2041	221,000	$0.047	$10,000	$2,000
23	2042	221,000	$0.047	$10,000	$2,000
24	2043	221,000	$0.047	$10,000	$2,000
25	2044	221,000	$0.047	$10,000	$2,000
26	2045	221,000	$0.047	$10,000	$1,000
27	2046	221,000	$0.047	$10,000	$1,000
28	2047	221,000	$0.047	$10,000	$1,000
29	2048	221,000	$0.047	$10,000	$1,000
30	2049	221,000	$0.047	$10,000	$1,000
Total		**6,626,000**		**$311,000**	**$105,000**

Table 13
State of Good Repairs Benefits – Crane Maintenance

Project Year	Year	Tonnage	Manitowoc Cranes Maintenance Cost	Gottwald Cranes Maintenance Cost	Crane Maintenance Reduction (Undiscounted)	Discounted Crane Maintenance Reduction
-1	2018	1,454,000	$1,672,000	$1,672,000	$0	$0
0	2019	1,581,000	$1,818,000	$1,818,000	$0	$0
1	2020	1,719,000	$1,977,000	$327,000	$1,650,000	$1,259,000
2	2021	1,869,000	$2,150,000	$355,000	$1,794,000	$1,279,000
3	2022	1,869,000	$2,150,000	$355,000	$1,794,000	$1,196,000
4	2023	1,869,000	$2,150,000	$355,000	$1,794,000	$1,117,000
5	2024	1,869,000	$2,150,000	$355,000	$1,794,000	$1,044,000
6	2025	1,869,000	$2,150,000	$355,000	$1,794,000	$976,000
7	2026	1,869,000	$2,150,000	$355,000	$1,794,000	$912,000
8	2027	1,869,000	$2,150,000	$355,000	$1,794,000	$853,000
9	2028	1,869,000	$2,150,000	$355,000	$1,794,000	$797,000
10	2029	1,869,000	$2,150,000	$355,000	$1,794,000	$745,000
11	2030	1,869,000	$2,150,000	$355,000	$1,794,000	$696,000
12	2031	1,869,000	$2,150,000	$355,000	$1,794,000	$650,000
13	2032	1,869,000	$2,150,000	$355,000	$1,794,000	$608,000
14	2033	1,869,000	$2,150,000	$355,000	$1,794,000	$568,000
15	2034	1,869,000	$2,150,000	$355,000	$1,794,000	$531,000
16	2035	1,869,000	$2,150,000	$355,000	$1,794,000	$496,000
17	2036	1,869,000	$2,150,000	$355,000	$1,794,000	$464,000
18	2037	1,869,000	$2,150,000	$355,000	$1,794,000	$433,000
19	2038	1,869,000	$2,150,000	$355,000	$1,794,000	$405,000
20	2039	1,869,000	$2,150,000	$355,000	$1,794,000	$379,000
21	2040	1,869,000	$2,150,000	$355,000	$1,794,000	$354,000
22	2041	1,869,000	$2,150,000	$355,000	$1,794,000	$331,000
23	2042	1,869,000	$2,150,000	$355,000	$1,794,000	$309,000
24	2043	1,869,000	$2,150,000	$355,000	$1,794,000	$289,000
25	2044	1,869,000	$2,150,000	$355,000	$1,794,000	$270,000
26	2045	1,869,000	$2,150,000	$355,000	$1,794,000	$252,000
27	2046	1,869,000	$2,150,000	$355,000	$1,794,000	$236,000
28	2047	1,869,000	$2,150,000	$355,000	$1,794,000	$220,000
29	2048	1,869,000	$2,150,000	$355,000	$1,794,000	$206,000
30	2049	1,869,000	$2,150,000	$355,000	$1,794,000	$192,000
Total		**58,961,000**	**$67,805,000**	**$14,116,000**	**$53,689,000**	**$18,067,000**

Table 14
State of Good Repairs Benefits – Crane Operations

Project Year	Year	Cargo Tonnage	Manitowoc Energy Cost	Gottwald Energy Cost	Undiscounted Energy Operation Savings	Discounted Energy Operations Savings
-1	2018	1,454,000	$683,000	$683,000	$0	$0
0	2019	1,581,000	$743,000	$743,000	$0	$0
1	2020	1,719,000	$808,000	$258,000	$550,000	$420,000
2	2021	1,869,000	$879,000	$280,000	$598,000	$426,000
3	2022	1,869,000	$879,000	$280,000	$598,000	$399,000
4	2023	1,869,000	$879,000	$280,000	$598,000	$372,000
5	2024	1,869,000	$879,000	$280,000	$598,000	$348,000
6	2025	1,869,000	$879,000	$280,000	$598,000	$325,000
7	2026	1,869,000	$879,000	$280,000	$598,000	$304,000
8	2027	1,869,000	$879,000	$280,000	$598,000	$284,000
9	2028	1,869,000	$879,000	$280,000	$598,000	$266,000
10	2029	1,869,000	$879,000	$280,000	$598,000	$248,000
11	2030	1,869,000	$879,000	$280,000	$598,000	$232,000
12	2031	1,869,000	$879,000	$280,000	$598,000	$217,000
13	2032	1,869,000	$879,000	$280,000	$598,000	$203,000
14	2033	1,869,000	$879,000	$280,000	$598,000	$189,000
15	2034	1,869,000	$879,000	$280,000	$598,000	$177,000
16	2035	1,869,000	$879,000	$280,000	$598,000	$165,000
17	2036	1,869,000	$879,000	$280,000	$598,000	$155,000
18	2037	1,869,000	$879,000	$280,000	$598,000	$144,000
19	2038	1,869,000	$879,000	$280,000	$598,000	$135,000
20	2039	1,869,000	$879,000	$280,000	$598,000	$126,000
21	2040	1,869,000	$879,000	$280,000	$598,000	$118,000
22	2041	1,869,000	$879,000	$280,000	$598,000	$110,000
23	2042	1,869,000	$879,000	$280,000	$598,000	$103,000
24	2043	1,869,000	$879,000	$280,000	$598,000	$96,000
25	2044	1,869,000	$879,000	$280,000	$598,000	$90,000
26	2045	1,869,000	$879,000	$280,000	$598,000	$84,000
27	2046	1,869,000	$879,000	$280,000	$598,000	$79,000
28	2047	1,869,000	$879,000	$280,000	$598,000	$73,000
29	2048	1,869,000	$879,000	$280,000	$598,000	$69,000
30	2049	1,869,000	$879,000	$280,000	$598,000	$64,000
Total		**58,961,000**	**$27,712,000**	**$9,815,000**	**$17,896,000**	**$6,022,000**

III.2 Economic Competitiveness

Shifting freight to larger, more efficient trucks generates significant fuel savings. According to US DOT RITA transportation statistics, large trucks have a fuel efficiency of 7.4 miles per gallon of diesel.

Fuel savings were computed by multiplying the reduction in truck VMT by the fuel efficiency of the vehicles. Net benefits are estimated by multiplying these fuel savings by the average price of gallon per diesel. Diesel price per gallon was taken from the Energy Information Administration (EIA). The present value of these net benefits was estimated at $1 million over the entire 30-year period using a 7% discount rate. **Table 15** presents the computational analysis of the benefits using the parameter values in **Table 3**.

Table 15
Avoided Truck Traffic Fuel Cost Savings

Project Year	Year	Fuel Savings (Gallons)	Diesel Cost ($ per Gallon)	Undiscounted Additional Traffic Fuel Cost Savings	Discounted Additional Traffic Fuel Cost Savings
-1	2018	$0	$2.78	$0	$0
0	2019	$0	$2.78	$0	$0
1	2020	$28,000	$2.78	$76,000	$67,000
2	2021	$30,000	$2.78	$83,000	$68,000
3	2022	$30,000	$2.78	$83,000	$63,000
4	2023	$30,000	$2.78	$83,000	$59,000
5	2024	$30,000	$2.78	$83,000	$55,000
6	2025	$30,000	$2.78	$83,000	$52,000
7	2026	$30,000	$2.78	$83,000	$48,000
8	2027	$30,000	$2.78	$83,000	$45,000
9	2028	$30,000	$2.78	$83,000	$42,000
10	2029	$30,000	$2.78	$83,000	$39,000
11	2030	$30,000	$2.78	$83,000	$37,000
12	2031	$30,000	$2.78	$83,000	$34,000
13	2032	$30,000	$2.78	$83,000	$32,000
14	2033	$30,000	$2.78	$83,000	$30,000
15	2034	$30,000	$2.78	$83,000	$28,000
16	2035	$30,000	$2.78	$83,000	$26,000
17	2036	$30,000	$2.78	$83,000	$25,000
18	2037	$30,000	$2.78	$83,000	$23,000
19	2038	$30,000	$2.78	$83,000	$21,000
20	2039	$30,000	$2.78	$83,000	$20,000
21	2040	$30,000	$2.78	$83,000	$19,000
22	2041	$30,000	$2.78	$83,000	$18,000
23	2042	$30,000	$2.78	$83,000	$16,000
24	2043	$30,000	$2.78	$83,000	$15,000
25	2044	$30,000	$2.78	$83,000	$14,000
26	2045	$30,000	$2.78	$83,000	$13,000
27	2046	$30,000	$2.78	$83,000	$12,000
28	2047	$30,000	$2.78	$83,000	$12,000
29	2048	$30,000	$2.78	$83,000	$11,000
30	2049	$30,000	$2.78	$83,000	$10,000
Total		**$868,000**		**$2,409,000**	**$891,000**

In addition to surface transportation fuel savings, reduced gantry crane downtime will decrease vessel idling at the Globalplex terminal. Decreased vessel idling incurs travel times savings for crew members and bunker fuel costs savings for vessels. Avoided bunker fuel costs, shown in **Table 16,** were determined by the October 16, 2017 index for bunker fuel (MGO) in New Orleans, LA and the average fuel consumption per hour of a container ship during hotel loading.

Table 16
Avoided Vessel Bunker Fuel Costs

Project Year	Year	Bunker Fuel Savings (Tons)	Bunker Fuel (MGO) New Orleans Cost Per Ton	Cost of Fuel Consumption**	Discounted Vessel Fuel Savings (US$ 2015)
-1	2018	$0	$535	$0	$0
0	2019	$0	$535	$0	$0
1	2020	$272	$535	$146,000	$127,000
2	2021	$278	$535	$149,000	$121,000
3	2022	$283	$535	$151,000	$116,000
4	2023	$289	$535	$155,000	$110,000
5	2024	$295	$535	$158,000	$105,000
6	2025	$300	$535	$161,000	$100,000
7	2026	$306	$535	$164,000	$95,000
8	2027	$313	$535	$167,000	$91,000
9	2028	$319	$535	$171,000	$87,000
10	2029	$325	$535	$174,000	$83,000
11	2030	$323	$535	$173,000	$77,000
12	2031	$322	$535	$172,000	$71,000
13	2032	$320	$535	$171,000	$66,000
14	2033	$318	$535	$170,000	$62,000
15	2034	$317	$535	$170,000	$57,000
16	2035	$316	$535	$169,000	$53,000
17	2036	$314	$535	$168,000	$50,000
18	2037	$314	$535	$168,000	$46,000
19	2038	$313	$535	$167,000	$43,000
20	2039	$312	$535	$167,000	$40,000
21	2040	$311	$535	$167,000	$38,000
22	2041	$311	$535	$166,000	$35,000
23	2042	$311	$535	$166,000	$33,000
24	2043	$311	$535	$166,000	$31,000
25	2044	$311	$535	$166,000	$29,000
26	2045	$311	$535	$167,000	$27,000
27	2046	$312	$535	$167,000	$25,000
28	2047	$312	$535	$167,000	$24,000
29	2048	$313	$535	$168,000	$22,000
30	2049	$314	$535	$168,000	$21,000
Total		**$9,000**		**$4,958,000**	**$1,885,000**

Shown in **Table 17**, travel time savings were determined based upon the downtime incurred during crane maintenance. The average vessel unloading at the POSL has 20 to 25 crewmembers, which is the average manpower for Panamax size bulkers or large general cargo vessels. This analysis assumes that a vessel is manned by 24 crew members, whose travel time savings are reduced as crane downtime is reduced. The assumed value of time is $37.78 in 2016 dollars. The TIGER IX BCA Guidance recommends value of time for truck and bus drivers, and other transportation professionals, but does not recommend for vessel crew members. The value used is the Bureau of Labor Statistics (BLS) median wage data for Ship and Boat Captains and Operators, a combined average for ship engineers; motorboat operators; and captains, mates, and pilots of water vessels.

Table 17
Vessel Crew Travel Times Savings – Crane Reliability

Project Year	Year	Time Savings due to Increased Crane Reliability (Hours)	Crew Size (Persons)	Value of Time Per Hour (US$)	Travel Times Savings (US$)	Discounted Travel Times Savings (US$ 2015)
-1	2018	$0	24	$38	$0	$0
0	2019	$0	24	$38	$0	$0
1	2020	$400	24	$38	$361,000	$316,000
2	2021	$408	24	$38	$369,000	$301,000
3	2022	$416	24	$38	$376,000	$287,000
4	2023	$424	24	$38	$383,000	$273,000
5	2024	$432	24	$38	$391,000	$261,000
6	2025	$441	24	$38	$399,000	$248,000
7	2026	$450	24	$38	$407,000	$237,000
8	2027	$459	24	$38	$415,000	$226,000
9	2028	$468	24	$38	$423,000	$215,000
10	2029	$477	24	$38	$432,000	$205,000
11	2030	$475	24	$38	$429,000	$191,000
12	2031	$472	24	$38	$427,000	$177,000
13	2032	$469	24	$38	$425,000	$165,000
14	2033	$467	24	$38	$423,000	$153,000
15	2034	$465	24	$38	$421,000	$142,000
16	2035	$463	24	$38	$419,000	$133,000
17	2036	$462	24	$38	$417,000	$124,000
18	2037	$460	24	$38	$416,000	$115,000
19	2038	$459	24	$38	$415,000	$107,000
20	2039	$458	24	$38	$414,000	$100,000
21	2040	$457	24	$38	$414,000	$93,000
22	2041	$457	24	$38	$413,000	$87,000
23	2042	$456	24	$38	$413,000	$81,000
24	2043	$456	24	$38	$413,000	$76,000
25	2044	$457	24	$38	$413,000	$71,000
26	2045	$457	24	$38	$413,000	$67,000
27	2046	$458	24	$38	$414,000	$62,000
28	2047	$459	24	$38	$415,000	$58,000
29	2048	$460	24	$38	$416,000	$55,000
30	2049	$461	24	$38	$417,000	$51,000
Total					**$12,302,000**	**$4,677,000**

Shown in **Table 18**, additional travel time savings occurs as a result of the new mobile harbor cranes operating more efficiently. The new cranes are able to handle 454 tons per working hour, while the existing cranes are only able to handle 195 tons per working hour. This again allows the vessel to leave the facility faster, reducing travel time for the vessel crew, and for the crane operator. The crane operator's time was valued at $26.58 – the BLS median wage for crane and tower operators.

Table 18
Vessel Crew Travel Times Savings – Crane Efficiency

Project Year	Year	Cargo Tonnage	Existing Cranes, Hours to Unload	New Cranes, Hours to Unload	Time Savings of Crane Operator & Vessel Crew (Hours)	Value of Time savings of Crane Operator	Value of Time Savings of Vessel Crew	Total Undiscounted Time Savings of Crane Efficiency Improvements	Total Discounted Time Savings of Crane Efficiency Improvements
-1	2018	1,454,000	7,000	7,000	0	$0	$0	$0	$0
0	2019	1,581,000	8,000	8,000	0	$0	$0	$0	$0
1	2020	1,719,000	9,000	4,000	5,000	$134,000	$4,548,000	$4,682,000	$3,572,000
2	2021	1,869,000	10,000	4,000	5,000	$145,000	$4,945,000	$5,091,000	$3,630,000
3	2022	1,869,000	10,000	4,000	5,000	$145,000	$4,945,000	$5,091,000	$3,392,000
4	2023	1,869,000	10,000	4,000	5,000	$145,000	$4,945,000	$5,091,000	$3,170,000
5	2024	1,869,000	10,000	4,000	5,000	$145,000	$4,945,000	$5,091,000	$2,963,000
6	2025	1,869,000	10,000	4,000	5,000	$145,000	$4,945,000	$5,091,000	$2,769,000
7	2026	1,869,000	10,000	4,000	5,000	$145,000	$4,945,000	$5,091,000	$2,588,000
8	2027	1,869,000	10,000	4,000	5,000	$145,000	$4,945,000	$5,091,000	$2,419,000
9	2028	1,869,000	10,000	4,000	5,000	$145,000	$4,945,000	$5,091,000	$2,260,000
10	2029	1,869,000	10,000	4,000	5,000	$145,000	$4,945,000	$5,091,000	$2,112,000
11	2030	1,869,000	10,000	4,000	5,000	$145,000	$4,945,000	$5,091,000	$1,974,000
12	2031	1,869,000	10,000	4,000	5,000	$145,000	$4,945,000	$5,091,000	$1,845,000
13	2032	1,869,000	10,000	4,000	5,000	$145,000	$4,945,000	$5,091,000	$1,724,000
14	2033	1,869,000	10,000	4,000	5,000	$145,000	$4,945,000	$5,091,000	$1,612,000
15	2034	1,869,000	10,000	4,000	5,000	$145,000	$4,945,000	$5,091,000	$1,506,000
16	2035	1,869,000	10,000	4,000	5,000	$145,000	$4,945,000	$5,091,000	$1,408,000
17	2036	1,869,000	10,000	4,000	5,000	$145,000	$4,945,000	$5,091,000	$1,316,000
18	2037	1,869,000	10,000	4,000	5,000	$145,000	$4,945,000	$5,091,000	$1,229,000
19	2038	1,869,000	10,000	4,000	5,000	$145,000	$4,945,000	$5,091,000	$1,149,000
20	2039	1,869,000	10,000	4,000	5,000	$145,000	$4,945,000	$5,091,000	$1,074,000
21	2040	1,869,000	10,000	4,000	5,000	$145,000	$4,945,000	$5,091,000	$1,004,000
22	2041	1,869,000	10,000	4,000	5,000	$145,000	$4,945,000	$5,091,000	$938,000
23	2042	1,869,000	10,000	4,000	5,000	$145,000	$4,945,000	$5,091,000	$877,000
24	2043	1,869,000	10,000	4,000	5,000	$145,000	$4,945,000	$5,091,000	$819,000
25	2044	1,869,000	10,000	4,000	5,000	$145,000	$4,945,000	$5,091,000	$766,000
26	2045	1,869,000	10,000	4,000	5,000	$145,000	$4,945,000	$5,091,000	$716,000
27	2046	1,869,000	10,000	4,000	5,000	$145,000	$4,945,000	$5,091,000	$669,000
28	2047	1,869,000	10,000	4,000	5,000	$145,000	$4,945,000	$5,091,000	$625,000
29	2048	1,869,000	10,000	4,000	5,000	$145,000	$4,945,000	$5,091,000	$584,000
30	2049	1,869,000	10,000	4,000	5,000	$145,000	$4,945,000	$5,091,000	$546,000
Total		**58,961,000**	**302,000**	**139,000**	**164,000**	**$4,349,00**	**$147,960,000**	**$152,309,000**	**$51,253,000**

Truck drivers also experience reduced travel time. Shown in **Table 19**, additional travel time savings occurs as a result of the new, efficient traffic pattern that allows larger, fully loaded trucks to travel in a seamless, circular pattern on and off the dock.

Table 19
Truck Driver Travel Times Savings

Project Year	Year	Time Savings in Hours due to Cargo Flow (Access Bridge)	Value of Time Per Hour (US$)	Travel Times Savings (US$)	Discounted Travel Times Savings (US$ 2016)
-1	2018	0	$27.20	$0	$0
0	2019	0	$27.20	$0	$0
1	2020	31,000	$27.20	$854,000	$746,000
2	2021	34,000	$27.20	$928,000	$758,000
3	2022	34,000	$27.20	$928,000	$708,000
4	2023	34,000	$27.20	$928,000	$662,000
5	2024	34,000	$27.20	$928,000	$619,000
6	2025	34,000	$27.20	$928,000	$578,000
7	2026	34,000	$27.20	$928,000	$540,000
8	2027	34,000	$27.20	$928,000	$505,000
9	2028	34,000	$27.20	$928,000	$472,000
10	2029	34,000	$27.20	$928,000	$441,000
11	2030	34,000	$27.20	$928,000	$412,000
12	2031	34,000	$27.20	$928,000	$385,000
13	2032	34,000	$27.20	$928,000	$360,000
14	2033	34,000	$27.20	$928,000	$336,000
15	2034	34,000	$27.20	$928,000	$314,000
16	2035	34,000	$27.20	$928,000	$294,000
17	2036	34,000	$27.20	$928,000	$275,000
18	2037	34,000	$27.20	$928,000	$257,000
19	2038	34,000	$27.20	$928,000	$240,000
20	2039	34,000	$27.20	$928,000	$224,000
21	2040	34,000	$27.20	$928,000	$210,000
22	2041	34,000	$27.20	$928,000	$196,000
23	2042	34,000	$27.20	$928,000	$183,000
24	2043	34,000	$27.20	$928,000	$171,000
25	2044	34,000	$27.20	$928,000	$160,000
26	2045	34,000	$27.20	$928,000	$149,000
27	2046	34,000	$27.20	$928,000	$140,000
28	2047	34,000	$27.20	$928,000	$130,000
29	2048	34,000	$27.20	$928,000	$122,000
30	2049	34,000	$27.20	$928,000	$114,000
Total		**1,021,000**		**$27,777,000**	**$10,701,000**

III.3 Quality of Life

Quality of Life benefits are estimated as a reduction in noise pollution. A reduction in truck VMT results in a reduction in noise for nearby residents, businesses, churches, and a school. A study by David Forkenbrock, "External Costs of Truck and Rail Freight Transportation," published by the University of Iowa, estimates the cost of noise pollution. Updated to 2016 dollars, the cost of noise pollution is $0.03 per mile. The total value of noise pollution benefits is estimated to be $60,000 over the 30 year project life, discounted at 7%.

Table 20
Quality of Life Benefits – Noise Pollution

Project Year	Year	Truck - Mile	Noise Pollution per Truck Mile (US$)	Undiscounted Noise Pollution (US$)	Discounted Annual Noise Pollution (US$ 2016)
-1	2018	$0	$0.03	$0	$0
0	2019	$0	$0.03	$0	$0
1	2020	$204,000	$0.03	$5,000	$5,000
2	2021	$221,000	$0.03	$6,000	$5,000
3	2022	$221,000	$0.03	$6,000	$4,000
4	2023	$221,000	$0.03	$6,000	$4,000
5	2024	$221,000	$0.03	$6,000	$4,000
6	2025	$221,000	$0.03	$6,000	$4,000
7	2026	$221,000	$0.03	$6,000	$3,000
8	2027	$221,000	$0.03	$6,000	$3,000
9	2028	$221,000	$0.03	$6,000	$3,000
10	2029	$221,000	$0.03	$6,000	$3,000
11	2030	$221,000	$0.03	$6,000	$2,000
12	2031	$221,000	$0.03	$6,000	$2,000
13	2032	$221,000	$0.03	$6,000	$2,000
14	2033	$221,000	$0.03	$6,000	$2,000
15	2034	$221,000	$0.03	$6,000	$2,000
16	2035	$221,000	$0.03	$6,000	$2,000
17	2036	$221,000	$0.03	$6,000	$2,000
18	2037	$221,000	$0.03	$6,000	$2,000
19	2038	$221,000	$0.03	$6,000	$1,000
20	2039	$221,000	$0.03	$6,000	$1,000
21	2040	$221,000	$0.03	$6,000	$1,000
22	2041	$221,000	$0.03	$6,000	$1,000
23	2042	$221,000	$0.03	$6,000	$1,000
24	2043	$221,000	$0.03	$6,000	$1,000
25	2044	$221,000	$0.03	$6,000	$1,000
26	2045	$221,000	$0.03	$6,000	$1,000
27	2046	$221,000	$0.03	$6,000	$1,000
28	2047	$221,000	$0.03	$6,000	$1,000
29	2048	$221,000	$0.03	$6,000	$1,000
30	2049	$221,000	$0.03	$6,000	$1,000
0	**Total**	**$6,422,000**		**$163,000**	**$60,000**

III.4 Sustainability

Shifting freight from many small trucks, to less, more efficient large trucks reduces the amount of greenhouse gas emissions. Emissions released by truck class and VMT was reported by the EPA report on Average In-Use Emissions from Heavy-Duty Trucks. Net benefits are estimated by multiplying the emissions savings by the provided cost of emissions. Over the 30 year period, the full completion of the Project would result in an avoidance of 61 tons of NOx, 3 tons of VOCs, 15 tons of CO, and 1.5 tons of PM from a reduction in truck traffic. The present value of these net benefits was estimated at $400,000 using a 7% discount rate. **Table 21** presents the computational analysis of the emission reduction benefits using the parameter values in **Table 3** and prices in **Table 26.**

Table 21
Reduced Emissions – Truck VMT

Project Year	Year	Social cost of NOx (US$)	Social Cost of VOCs (US$)	Social Cost of PM (US$)	Undiscounted Reduced Truck Emissions Costs	Discounted Reduced Truck Emissions Costs
-1	2018	$0	$0	$0	$0	$0
0	2019	$0	$0	$0	$0	$0
1	2020	$14,000	$0	$15,000	$29,000	$26,000
2	2021	$15,000	$0	$17,000	$32,000	$26,000
3	2022	$15,000	$0	$17,000	$32,000	$24,000
4	2023	$15,000	$0	$17,000	$32,000	$23,000
5	2024	$15,000	$0	$17,000	$32,000	$21,000
6	2025	$15,000	$0	$17,000	$32,000	$20,000
7	2026	$15,000	$0	$17,000	$32,000	$19,000
8	2027	$15,000	$0	$17,000	$32,000	$17,000
9	2028	$15,000	$0	$17,000	$32,000	$16,000
10	2029	$15,000	$0	$17,000	$32,000	$15,000
11	2030	$15,000	$0	$17,000	$32,000	$14,000
12	2031	$15,000	$0	$17,000	$32,000	$13,000
13	2032	$15,000	$0	$17,000	$32,000	$12,000
14	2033	$15,000	$0	$17,000	$32,000	$12,000
15	2034	$15,000	$0	$17,000	$32,000	$11,000
16	2035	$15,000	$0	$17,000	$32,000	$10,000
17	2036	$15,000	$0	$17,000	$32,000	$9,000
18	2037	$15,000	$0	$17,000	$32,000	$9,000
19	2038	$15,000	$0	$17,000	$32,000	$8,000
20	2039	$15,000	$0	$17,000	$32,000	$8,000
21	2040	$15,000	$0	$17,000	$32,000	$7,000
22	2041	$15,000	$0	$17,000	$32,000	$7,000
23	2042	$15,000	$0	$17,000	$32,000	$6,000
24	2043	$15,000	$0	$17,000	$32,000	$6,000
25	2044	$15,000	$0	$17,000	$32,000	$5,000
26	2045	$15,000	$0	$17,000	$32,000	$5,000
27	2046	$15,000	$0	$17,000	$32,000	$5,000
28	2047	$15,000	$0	$17,000	$32,000	$4,000
29	2048	$15,000	$0	$17,000	$32,000	$4,000
30	2049	$15,000	$0	$17,000	$32,000	$4,000
Total		**$448,000**	**$6,000**	**$502,000**	**$955,000**	**$368,000**

In additional to reducing surface transportation emissions, decreased vessel idling reduces emissions of NOx, SOx, CO2, and particulate matter (PM) within the immediate Port area. According to MARAD, one method to reduce emissions associated with Ports is to reduce vessel idling. Reduced vessel idling emissions were determined by downtime required for crane maintenance and the hourly emission rates for container ships during hotel loading. Hotel loading occurs when vessels are not actively moving. Operations divert to a smaller engine, which powers hotel-like amenities, such as air conditioning, galley amenities, etc.

Table 22
Emission Reduction Benefits – Vessel Idling

Project Year	Year	Social cost of NOx	Social Cost of Sox	Social Cost of PM	Undiscounted Reduced Vessel Idling Emissions Costs	Discounted Reduced Vessel Idling Emissions Costs
-1	2018	$0	$0	$0	$0	$0
0	2019	$0	$0	$0	$0	$0
1	2020	$165,700	$576,000	$557,300	$1,299,000	$1,134,600
2	2021	$169,000	$587,500	$568,400	$1,325,000	$1,081,600
3	2022	$172,400	$599,300	$579,800	$1,351,500	$1,031,000
4	2023	$175,800	$611,300	$591,400	$1,378,500	$982,900
5	2024	$179,300	$623,500	$603,200	$1,406,100	$936,900
6	2025	$182,900	$636,000	$615,300	$1,434,200	$893,200
7	2026	$186,600	$648,700	$627,600	$1,462,900	$851,400
8	2027	$190,300	$661,700	$640,200	$1,492,200	$811,600
9	2028	$194,100	$674,900	$653,000	$1,522,000	$773,700
10	2029	$198,000	$688,400	$666,000	$1,552,400	$737,600
11	2030	$196,800	$684,300	$662,000	$1,543,200	$685,200
12	2031	$195,700	$680,500	$658,300	$1,534,500	$636,800
13	2032	$194,700	$676,900	$654,900	$1,526,500	$592,000
14	2033	$193,800	$673,600	$651,700	$1,519,100	$550,600
15	2034	$192,900	$670,700	$648,900	$1,512,400	$512,300
16	2035	$192,100	$668,000	$646,300	$1,506,400	$476,900
17	2036	$191,500	$665,600	$644,000	$1,501,000	$444,100
18	2037	$190,900	$663,500	$642,000	$1,496,400	$413,800
19	2038	$190,400	$661,800	$640,300	$1,492,400	$385,700
20	2039	$189,900	$660,400	$638,900	$1,489,200	$359,700
21	2040	$189,600	$659,300	$637,800	$1,486,800	$335,600
22	2041	$189,400	$658,500	$637,100	$1,485,100	$313,300
23	2042	$189,300	$658,100	$636,700	$1,484,100	$292,600
24	2043	$189,300	$658,000	$636,600	$1,484,000	$273,400
25	2044	$189,400	$658,300	$636,900	$1,484,600	$255,600
26	2045	$189,500	$659,000	$637,600	$1,486,100	$239,200
27	2046	$189,800	$660,000	$638,500	$1,488,400	$223,900
28	2047	$190,200	$661,400	$639,900	$1,491,500	$209,700
29	2048	$190,800	$663,200	$641,600	$1,495,600	$196,500
30	2049	$191,400	$665,400	$643,700	$1,500,500	$184,200
	Total	**$5,641,600**	**$19,613,900**	**$18,976,100**	**$44,231,600**	**$16,815,400**

III.5 Safety

Reducing truck VMT reduces the probability of truck crash costs within the facility. According to the National Highway Traffic Safety Administration (NHSTA), there were 4,050 fatal crashes and 87,000 injury crashes over 279,844 million vehicle miles traveled by large trucks in 2015. Using the recommended values of statistical life from the BCA guidance, this translates to a crash cost of approximately $0.19 per mile. The crash costs are monetized by multiplying this cost per mile by the reduced truck VMT produced by the project. The present value of these net benefits was estimated at $430,000 over the entire 30-year period using a 7% discount rate. **Table 23** presents the computational analysis of the benefits using the parameter values in **Table 3.**

Table 23
Safety Benefits

Year	Train Ton-Miles	Truck Ton-Miles	Accident Cost Per Truck Ton-Mile	Accident Cost per Train Ton-Mile	Undiscounted Truck Accident Cost	Undiscounted Rail Accident	Undiscounted Annual Accident Cost Savings	Discounted Annual Accident Cost Savings
2019	59,940,000	50,785,000	$0.009	$0.003	$443,000	$151,000	$292,000	$239,000
2020	119,880,000	101,570,000	$0.009	$0.003	$886,000	$301,000	$585,000	$446,000
2021	179,820,000	152,355,000	$0.009	$0.003	$1,329,000	$452,000	$877,000	$625,000
2022	239,760,000	203,140,000	$0.009	$0.003	$1,772,000	$603,000	$1,169,000	$779,000
2023	299,700,000	253,925,000	$0.009	$0.003	$2,215,000	$753,000	$1,462,000	$910,000
2024	359,640,000	304,710,000	$0.009	$0.003	$2,658,000	$904,000	$1,754,000	$1,021,000
2025	419,580,000	355,495,000	$0.009	$0.003	$3,101,000	$1,055,000	$2,046,000	$1,113,000
2026	479,520,000	406,280,000	$0.009	$0.003	$3,544,000	$1,205,000	$2,339,000	$1,189,000
2027	539,460,000	457,065,000	$0.009	$0.003	$3,987,000	$1,356,000	$2,631,000	$1,250,000
2028	599,400,000	507,850,000	$0.009	$0.003	$4,430,000	$1,506,000	$2,923,000	$1,298,000
2029	599,400,000	507,850,000	$0.009	$0.003	$4,430,000	$1,506,000	$2,923,000	$1,213,000
2030	598,528,000	507,111,000	$0.009	$0.003	$4,423,000	$1,504,000	$2,919,000	$1,132,000
2031	597,655,000	506,372,000	$0.009	$0.003	$4,417,000	$1,502,000	$2,915,000	$1,056,000
2032	596,783,000	505,633,000	$0.009	$0.003	$4,410,000	$1,500,000	$2,911,000	$986,000
2033	595,911,000	504,894,000	$0.009	$0.003	$4,404,000	$1,498,000	$2,906,000	$920,000
2034	595,038,000	504,154,000	$0.009	$0.003	$4,398,000	$1,496,000	$2,902,000	$859,000
2035	594,166,000	503,415,000	$0.009	$0.003	$4,391,000	$1,493,000	$2,898,000	$801,000
2036	593,293,000	502,676,000	$0.009	$0.003	$4,385,000	$1,491,000	$2,894,000	$748,000
2037	592,421,000	501,937,000	$0.009	$0.003	$4,378,000	$1,489,000	$2,889,000	$698,000
2038	591,549,000	501,198,000	$0.009	$0.003	$4,372,000	$1,487,000	$2,885,000	$651,000
2039	590,676,000	500,459,000	$0.009	$0.003	$4,365,000	$1,485,000	$2,881,000	$608,000
2040	589,804,000	499,720,000	$0.009	$0.003	$4,359,000	$1,482,000	$2,877,000	$567,000
2041	588,932,000	498,981,000	$0.009	$0.003	$4,352,000	$1,480,000	$2,872,000	$529,000
2042	588,059,000	498,241,000	$0.009	$0.003	$4,346,000	$1,478,000	$2,868,000	$494,000
2043	587,187,000	497,502,000	$0.009	$0.003	$4,340,000	$1,476,000	$2,864,000	$461,000
2044	586,315,000	496,763,000	$0.009	$0.003	$4,333,000	$1,474,000	$2,859,000	$430,000
2045	585,442,000	496,024,000	$0.009	$0.003	$4,327,000	$1,471,000	$2,855,000	$401,000
2046	584,570,000	495,285,000	$0.009	$0.003	$4,320,000	$1,469,000	$2,851,000	$375,000
2047	583,697,000	494,546,000	$0.009	$0.003	$4,314,000	$1,467,000	$2,847,000	$350,000
2048	582,825,000	493,807,000	$0.009	$0.003	$4,307,000	$1,465,000	$2,842,000	$326,000
Total					**$111,734,000**	**$37,998,000**	**$73,736,000**	**$22,474,000**

Cost Estimates

Table 24
Costs

Project Year	Year	Design (Undiscounted)		Construction (Undiscounted)		Total Discounted		
		Access Bridge	Dock & Cranes	Access Bridge	Dock & Cranes	Access Bridge	Dock & Cranes	Grand Total
-2	2017	$0	$823,000	$0	$0	$0	$769,000	$769,000
-1	2018	$644,000	$1,219,000	$0	$9,079,000	$563,000	$8,995,000	$9,557,000
0	2019	$429,000	$0	$11,957,000	$13,483,000	$10,111,000	$11,006,000	$21,117,000
1	2020	$0	$0	$0	$0	$0	$0	$0
2	2021	$0	$0	$0	$0	$0	$0	$0
3	2022	$0	$0	$0	$0	$0	$0	$0
4	2023	$0	$0	$0	$0	$0	$0	$0
5	2024	$0	$0	$0	$0	$0	$0	$0
6	2025	$0	$0	$0	$0	$0	$0	$0
7	2026	$0	$0	$0	$0	$0	$0	$0
8	2027	$0	$0	$0	$0	$0	$0	$0
9	2028	$0	$0	$0	$0	$0	$0	$0
10	2029	$0	$0	$0	$0	$0	$0	$0
11	2030	$0	$0	$0	$0	$0	$0	$0
12	2031	$0	$0	$0	$0	$0	$0	$0
13	2032	$0	$0	$0	$0	$0	$0	$0
14	2033	$0	$0	$0	$0	$0	$0	$0
15	2034	$0	$0	$0	$0	$0	$0	$0
16	2035	$0	$0	$0	$0	$0	$0	$0
17	2036	$0	$0	$0	$0	$0	$0	$0
18	2037	$0	$0	$0	$0	$0	$0	$0
19	2038	$0	$0	$0	$0	$0	$0	$0
20	2039	$0	$0	$0	$0	$0	$0	$0
21	2040	$0	$0	$0	$0	$0	$0	$0
22	2041	$0	$0	$0	$0	$0	$0	$0
23	2042	$0	$0	$0	$0	$0	$0	$0
24	2043	$0	$0	$0	$0	$0	$0	$0
25	2044	$0	$0	$0	$0	$0	$0	$0
26	2045	$0	$0	$0	$0	$0	$0	$0
27	2046	$0	$0	$0	$0	$0	$0	$0
28	2047	$0	$0	$0	$0	$0	$0	$0
29	2048	$0	$0	$0	$0	$0	$0	$0
30	2049	$0	$0	$0	$0	$0	$0	$0
Total		**$1,073,000**	**$2,042,000**	**$11,957,000**	**$22,562,000**	**$10,673,000**	**$20,770,000**	**$31,443,000**

Table 25
Cost Estimates

Detailed Cost Estimate				
Item Description	**Quantity**	**Unit of Measure**	**Unit Cost**	**Item Total**
Access Bridge & Inter-facility Heavy-Load Access Road				
Railing	1	Lump	$238,853	$239,000
120' Long Piles	160	Each	$13,812	$2,210,000
Bents	1	Each	$724,060	$724,000
8" Slabs	15	Each	$103,217	$1,548,000
70' Girders	1	Each	$1,445,422	$1,445,000
Incidentals	1	Lump	$568,126	$568,000
Rehabilitation of Bridge	1	Lump	$3,000,000	$3,000,000
Contingency (10%)	1	Lump		$973,000
			Subtotal – Access Bridge Construction	**$10,707,000**
			Subtotal – Access Bridge Design	**$973,400**
			Subtotal- Access Bridge	**$11,680,400**
Access Road with Ramp	1	Lump	$1,000,000	$1,000,000
Contingency (25%)	1	Lump		$250,000
			Subtotal – Inter-facility Access Road Construction	**$1,250,000**
			Subtotal – Inter-facility Access Road Design	**$100,000**
			Subtotal - Access Road	**$1,350,000**
			TOTAL – Access Bridge & Road Construction	**$11,957,000**
			TOTAL – Access Bridge & Road Design	**$1,073,400**
			TOTAL- Access Bridge & Road	**$13,030,400**
Dock Reinforcement				
Dock Modifications	1	Lump	$8,500,000	$10,500,000
Contingency	10%	Lump	$1,050,000	$1,050,000
			Subtotal – Dock Reinforcement Construction	**$11,550,000**
			Subtotal – Dock Reinforcement Design	**$1,050,000**
			TOTAL – Dock Reinforcement	**$12,600,000**
Cranes				
Terex-Gottwald 6407 Series Crane	2	Each	$3,900,000.00	$7,800,000
Installation	1	Lump	$1,560,000.00	$1,560,000
Dock Modifications	1	Lump	$560,000.00	$560,000
Contingency (25%)	1	Lump	$1,092,000.00	$1,092,000
			Subtotal – Cranes Construction	**$11,012,000**
			Subtotal – Cranes Design	**$992,000**
			TOTAL - Cranes	**$12,004,000**
			PROJECT TOTAL:	**$37,634,400**

Inputs

Table 26
Annual Emissions Costs

Social Cost per Metric Ton					
Project Year	**Year**	**NOx (2016$)**	**VOCs (2016$)**	**PM - 2.5 (2016$)**	**SOx (2016$)**
-3	**2016**	7,377	1,872	337,459	43,600
-2	**2017**	7,377	1,872	337,459	43,600
-1	**2018**	7,377	1,872	337,459	43,600
0	**2019**	7,377	1,872	337,459	43,600
1	**2020**	7,377	1,872	337,459	43,600
2	**2021**	7,377	1,872	337,459	43,600
3	**2022**	7,377	1,872	337,459	43,600
4	**2023**	7,377	1,872	337,459	43,600
5	**2024**	7,377	1,872	337,459	43,600
6	**2025**	7,377	1,872	337,459	43,600
7	**2026**	7,377	1,872	337,459	43,600
8	**2027**	7,377	1,872	337,459	43,600
9	**2028**	7,377	1,872	337,459	43,600
10	**2029**	7,377	1,872	337,459	43,600
11	**2030**	7,377	1,872	337,459	43,600
12	**2031**	7,377	1,872	337,459	43,600
13	**2032**	7,377	1,872	337,459	43,600
14	**2033**	7,377	1,872	337,459	43,600
15	**2034**	7,377	1,872	337,459	43,600
16	**2035**	7,377	1,872	337,459	43,600
17	**2036**	7,377	1,872	337,459	43,600
18	**2037**	7,377	1,872	337,459	43,600
19	**2038**	7,377	1,872	337,459	43,600
20	**2039**	7,377	1,872	337,459	43,600
21	**2040**	7,377	1,872	337,459	43,600
22	**2041**	7,377	1,872	337,459	43,600
23	**2042**	7,377	1,872	337,459	43,600
24	**2043**	7,377	1,872	337,459	43,600
25	**2044**	7,377	1,872	337,459	43,600
26	**2045**	7,377	1,872	337,459	43,600
27	**2046**	7,377	1,872	337,459	43,600
28	**2047**	7,377	1,872	337,459	43,600
29	**2048**	7,377	1,872	337,459	43,600
30	**2049**	7,377	1,872	337,459	43,600

Table 27
Annual Consumer Price Index – Urban – United States

CPI-U U.S. Annual Average	
1991	136.200
1992	140.300
1993	144.500
1994	148.200
1995	152.400
1996	156.900
1997	160.500
1998	163.000
1999	166.600
2000	172.200
2001	177.100
2002	179.900
2003	184.000
2004	188.900
2005	195.300
2006	201.600
2007	207.342
2008	215.303
2009	214.537
2010	218.056
2011	224.939
2012	229.594
2013	232.957
2014	236.736
2015	237.017
2016	242.839

Economic Impact

Job-Years Created

Table 26
Job-Years Provided by Capital Expenditure

Job-year Creation	3rd Quarter - 2017	4th Quarter - 2017	1st Quarter - 2018	2nd Quarter - 2018	3rd Quarter - 2018	4th Quarter - 2018	1st Quarter - 2019	2nd Quarter - 2019	3rd Quarter - 2019	4th Quarter - 2019	TOTAL
Direct & Indirect Job-years	2	5	8	22	31	31	66	67	48	34	**314**
Induced Job-years	1	3	4	12	17	17	37	38	27	19	**175**
TOTAL	**3**	**8**	**12**	**34**	**48**	**48**	**103**	**105**	**75**	**53**	**489**

Existing Economic Climate

The user's effected by the proposed TIGER project include residents immediate adjacent to the Globalplex facility, St. John the Baptist Parish, the River Region, the State of Louisiana, and drivers throughout the United States. The Globalplex facility resides in the New Orleans Urbanized Area; however, it is less than 0.5 miles from the rural area that covers the majority of St. John the Baptist Parish. The population effected by the project's reduced emissions, reduced congestion, and increased safety in the immediate area are residents of a rural, economically distressed area. **Table 23** displays the selected socioeconomic characteristics of the Census Tracts immediately adjacent to the Globalplex facility. Additionally, **Table 24** displays the selected socioeconomic characteristics of the effected Parish, River Region, State, and Country.

The FHWA Supplemental Guidance on the Determination of Economically Distressed Areas Under the Recovery Act (August 24, 2009) states that an area is considered economically distressed if the unemployment rate is 1 percent or more greater than the national average unemployment rate, or if it has a per capita income of 80 percent or less of the national average. According to the 2014 ACS 5-year estimates, an economically distressed area must have an unemployment rate greater than 10.2% or a per capita income of less than $22,844. By this standard, all three Census Tracts immediately adjacent to Globalplex are economically distressed areas. Additionally, St. John the Baptist and St. James Parishes are also an economically distressed parishes. In addition to being classified as economically distressed, two of the Census Tracts immediately adjacent to Globalplex have a percentage of impoverished persons of 37.0 and 42.6%, over double the national average.

Figure 1
Adjacent Census Tracts

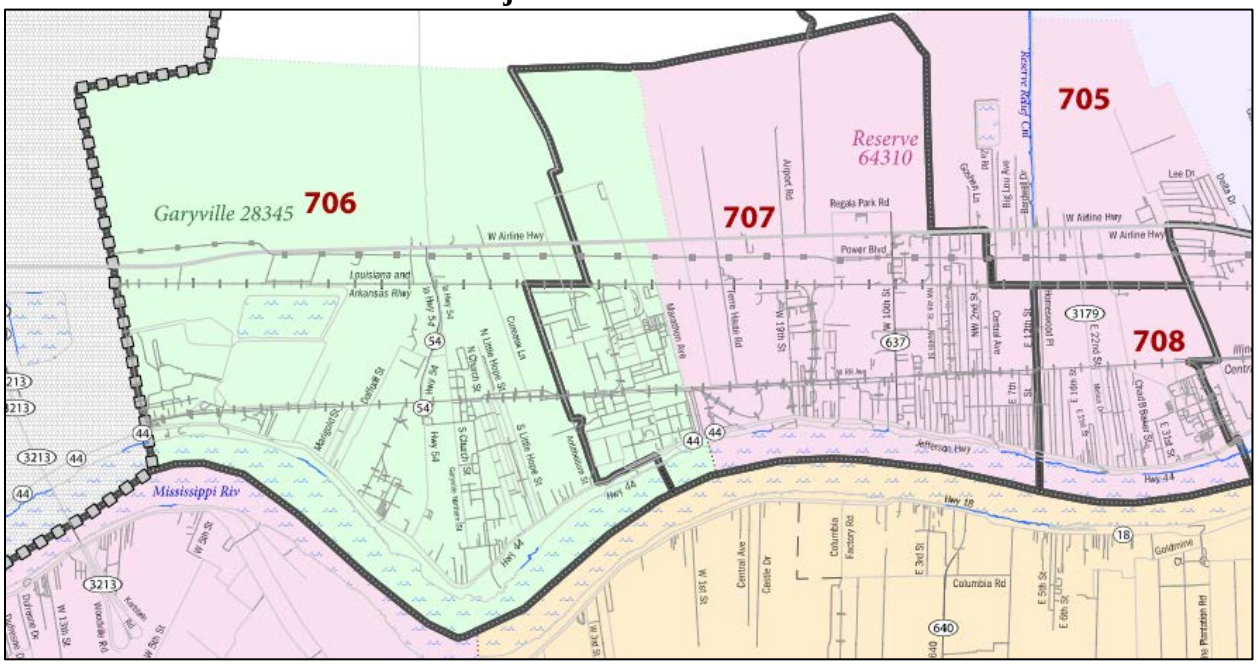

Table 27
Adjacent Census Tract Economic Data

Subject	**Census Tract 706**	**Census Tract 707**	**Census Tract 708**	**Total Immediate Project Area**
Total Population	2,314	4,135	1,966	8,415
Civilian labor force	967	1,883	778	3,628
Percent Unemployed	22.30%	6.30%	19.20%	13.33%
INDUSTRY				
Civilian employed population 16 years and over	751	1,764	629	3,144
Agriculture, forestry, fishing and hunting, and	4	41	0	45
Construction	34	175	90	299
Manufacturing	180	267	101	548
Wholesale trade	0	88	17	105
Retail trade	67	288	14	369
Transportation and warehousing, and utilities	26	135	33	194
Information	19	38	24	81
Finance and insurance, and real estate and rental	26	54	64	144
Professional, scientific, and management, and	137	108	46	291
Educational services, and health care and social	146	289	143	578
Arts, entertainment, and recreation, and	12	141	43	196
Other services, except public administration	61	100	32	193
Public administration	39	40	22	101
Households	896	1,601	709	3,206
Median household income (dollars)	37,120	48,008	37,450	42,630
Per capita income (dollars)	19,846	22,945	16,745	20,644
Percent of All People in Poverty	38.40%	12.10%	39.40%	25.71%

Table 28
Effected Users Economic Data

Subject	United States	Louisiana	St. Charles Parish	St. James Parish	St. John the Baptist Parish
Total Population	316,515,021	4,625,253	52,639	21,650	44,161
Civilian labor force	158,897,824	2,194,199	26,863	10,146	21,660
Percent Unemployed	8.30%	8.10%	7.70%	11.00%	9.20%
INDUSTRY					
Civilian employed population 16 years and	145,747,779	2,016,049	24,804	9,035	19,661
Agriculture, forestry, fishing and hunting,	2,852,402	94,748	240	247	317
Construction	9,027,391	161,968	2,431	688	1,683
Manufacturing	15,171,260	160,133	3,044	2,025	2,701
Wholesale trade	3,968,627	52,115	1,095	188	547
Retail trade	16,835,942	234,286	2,760	1040	2,373
Transportation and warehousing, and	7,226,063	104,920	1,992	612	1,259
Information	3,094,143	32,446	295	12	359
Finance and insurance, and real estate and	9,578,175	103,214	1,081	322	910
Professional, scientific, and management,	16,074,502	177,910	2,086	812	1,758
Educational services, and health care and	33,739,126	471,011	5,256	1,667	4,353
Arts, entertainment, and recreation, and	13,984,957	208,299	2,238	634	2,015
Other services, except public	7,198,201	103,954	1,219	363	709
Public administration	6,996,990	111,045	1,067	425	677
Households	116926305	1727919	18383	7964	15332
Median household income (dollars)	53,889	45,047	59,990	51,107	50,921
Per capita income (dollars)	28,930	24,981	27,247	24,071	22,660
Percent of All People in Poverty	15.50%	19.80%	11.80%	18.00%	18.20%

The project will also benefit minority populations. The state of Louisiana, the River Region, and the Census Tracts immediately adjacent to the project have a high percentage of non-white residents.

Table 29
Race and Ethnicity Data

Subject	United States	Louisiana	St. Charles Parish	St. James Parish	St. John the Baptist Parish	Census Tract 706	Census Tract 707	Census Tract 708	Project Area
Population	316,515,021	4,625,253	52,639	21,650	44,161	2,314	4,135	1,966	8,415
White	232,943,055	2,902,538	37,152	10,537	18,573	942	2,634	171	3,747
White (%)	73.6%	62.8%	70.6%	48.7%	42.1%	40.7%	63.7%	8.7%	44.5%
Non White	83,571,966	1,722,715	15,487	11,113	25,588	1,372	1,501	1,795	4,668
Non White (%)	26.4%	37.2%	29.4%	51.3%	57.9%	59.3%	36.3%	91.3%	55.5%
Hispanic/Latino	54,232,205	218,263	2,971	333	2,333	0	291	0	291
Hispanic/Latino (%)	17.1%	4.7%	5.6%	1.5%	5.3%	0.0%	7.0%	0.0%	3.5%

Bringing temporary job-years, permanent jobs, and economic development to this area will aid local residents. The temporary job-years created with this project are valued at $76,923 and the permanent jobs are valued between $55,000 and $75,000 plus benefits, both of which are much higher than the per capita income and median household incomes in the project vicinity.

Component and Sensitivity Analysis

Table 26 displays the BCA outcome when adjustments are made to the project features, discount rates, and other assumptions. This component and sensitivity analysis shows that the project has incrementally justified components that each have a benefit cost ratio above 1.0 when completed individually.

Other inputs were adjusted to confirm assumptions made within the BCA. If smaller vessels utilizing fewer crew members are used at GlobalPlex, rather than the assumed Panamax-sized vessels, it only reduces the net present value of benefits by 16%.

Table 26
Component and Sensitivity Analysis

BCA Change	Adjusted BCA	NPV of Net Benefits	Change in NPV of Net Benefits	Percent Change in NPV of Net Benefits
Initial Analysis	2.80	$56,697,084	-	-
3% Discount Rate	4.42	$119,024,000	$62,326,916	109.9%
Vessels have only 20 crew members	2.51	$47,619,000	($9,078,084)	-16.0%
Access Bridge Only	1.23	$2,341,000	($54,356,084)	-95.9%
Cranes & Reinforcement Only	3.68	$54,356,000	($2,341,084)	-4.1%

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Large Truck Emission Rates
https://nepis.epa.gov/Exe/ZyNET.exe/P100EVY6.txt?ZyActionD=ZyDocument&Client=EPA&Index=2006%20Thru%202010&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&UseQField=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A%5CZYFILES%5CINDEX%20DATA%5C06THRU10%5CTXT%5C00000033%5CP100EVY6.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h%7C-&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=hpfr&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=5

Bureau of Labor Statistics Median Wage

https://www.bls.gov/oes/current/oes_nat.htm#53-0000

Associated Terminals feasibility analysis

National Highway Transportation Safety Association
https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812373

Notice of Funding Opportunity for the Department of Transportation's National Infrastructure Investments Under the Full-Year Continuing Appropriations