PORT OF MOBILE
ALABAMA PORT AUTHORITY

BCA Narrative

Pier D2 Dock Extension (Project) FY 2023
Port Infrastructure Development Program (PIDP)
Grant Request

Submitted to:
U.S. Department of Transportation-Maritime Administration

Submitted by:
Alabama State Port Authority (ASPA)
250 North Water Street
Mobile, AL 36602

April 28, 2023

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Executive Summary

Table 1: Executive Summary

Current Status/ Baseline & Problem to be Addressed	Change to Baseline	Type of Impacts	Affected Population	Economic Benefits	Summary of Results
Port of Mobile adding Berth length, mooring dolphin and strengthening to permit more and heavier break bulk cargo to be handled by water instead of truck.	Improvements on the Port to facilitate more efficient loading, unloading and storage of steel imports and exports.	Economic, Environment/ Quality of Life, Competitive.	Mobile, Alabama, and vicinity.	Monetized value of reduced highway use and subjective benefits relating to lifting the economy of the historically disadvantaged Port community.	Investment Cost $5.2 m ($4.0m discounted), including $3.1m ($2.6m 2021$) non-federal match for a 50% match (in 2021 dollars)
Creates very significant safety and environmental benefits.	Reduces adverse impact of lengthy transfers of steel coils from dock to warehouse.	Accident reductions. Fuel consumption savings. Social benefits of reduced air emissions.	External and regional communities are affected by air emissions, accidents, and road use.	Monetized value of reduced accidents, fuel consumption, and emissions.	$2.0m in these categories' undiscounted benefits ($0.7m discounted) (2021 dollars)
Creates significant travel time, operating expense, shipper savings, and highway maintenance benefits.	Port expects to eliminate truck drayage and shorten forklift transfers.	Improves traffic flow and reduces delays and maintenance.	Less highway wear, reduced travel time, and savings for existing users.	Monetized value of competitive benefits, reduced hwy. maintenance, net consumer benefit.	$8.2m in these categories' undiscounted benefits ($2.9m discounted) Benefit/Cost Ratio of 1.13.

1. Summary Project Description

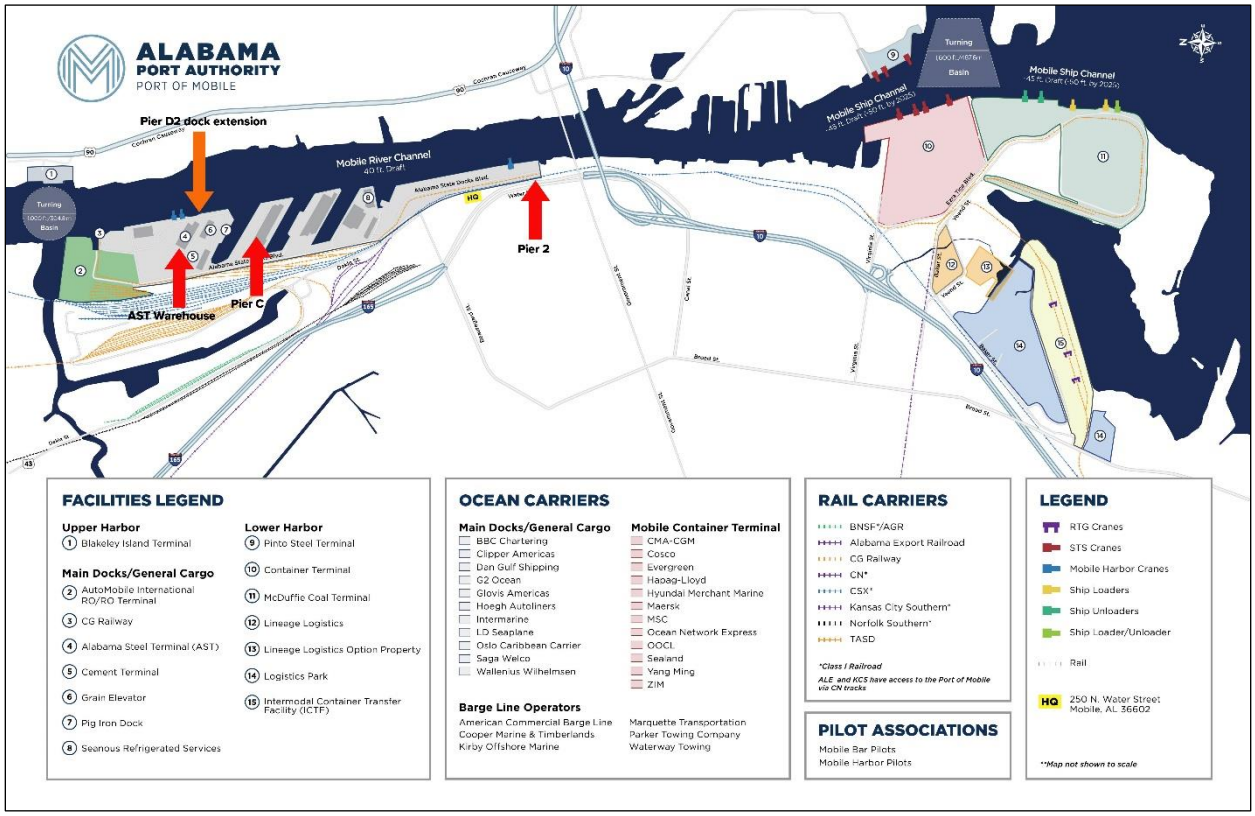

Figure 1: Existing Port Handling Positions

a. Summary of Problem to be Solved.

Most of the steel products produced at the state-of-the-art AcelorMittal-Nippon Steel plant (35 miles upstream from the Port of Mobile at Calvert, AL) are produced from billets barged upriver from an unloading dock on Pinto Island in the Port of Mobile. Returning barges are then used to carry coil steel products downriver to the AST Steel Warehouse on Pier D2, as indicated with the orange arrow in Figure 1, above.

There is a gap between dock segments at the point indicated by the yellow arrow in Figure 2:Current Barge Unloading Work Scheme that will be addressed by this capital project. This gap prevents mooring of barges carrying steel coils from the Calvert plant to Pier D2, which is adjacent to the AST Steel Warehouse.

As a result, barges must be located approximately 1,900 feet upstream as space permits. About 10% of the time, they must be located at Pier 2 some 2.2 miles downstream due to congestion. This results in excessive forklift and truck travel in unloading barges along with consequent

excessive machine operating and labor hours and significant truck traffic on the busy stretch of port access road between Pier 2 and AST Warehouse.

This inefficiency directly affects approximately one million tons of export steel, and this level of activity causes significant quality of life issues, including emissions, congestion, and accidents because of the longer-than-necessary paths for forklifts used to move the steel coils from barges to warehousing and for trucks needed to dray the heavy coils over port access roads from the distant barge unloading point at Pier 2.

Additionally, imported coiled and other steel products amounting to 200,000 tons are adversely affected by the delays imposed on ships loading at Pier D2. Frequently, these import ships are diverted to neighboring Pier C and sometimes to Pier 2. In either case additional emissions, congestion, and safety issues are imposed. If normal operations could be established at Pier D2, these ships could also be accommodated at Pier D2.

Finally, the mill at Calvert, AL is installing a 1.65 million annual tons Electric Arc Furnace which will allow it to make a wider variety of high tensile strength and other specialty steels aimed at the international markets and particularly the USMC Trade Agreement nations. If additional steel exports are generated over the next two years, they would be likely to flow through this same supply chain as discussed above, putting additional pressure on operations.

Proposed Improvements:

- Extend Pier D2 by 203 lineal feet downstream,
- Install / move sheet piling, Install wooden fenders, and
- Make a continuous mooring space fully conforming to existing dock.

Investments including engineering require a total $6.160 million as budgeted or $5.24 million expressed in 2021 dollars. Of this, matching funding in the amount of $3.079 million ($2.596 in 2021 dollars) will be provided by non-federal matching investment.

Service life of dock and wharfage assets is expected to exceed the 20 years discounting period provided in USDOT Guidance for enhancement- and improvement-type projects. In total, the discounted 20-year costs including capital and maintenance are $3.96 million, discounting at 7%.

2. Demographically Quantifiable Benefits Discussion

a. Urban or Rural Designation?

The project location lies within Census Tact 12 and is considered Rural under the 2010 Census-designated urbanized area.

b. Demographic Qualifier: Poverty

The census track is also located within a Persistent Poverty Tract, as indicated in the U.S. Department of Transportation Grant Project Location Verification tool. The Port of Mobile is adjacent to multiple historically disadvantaged communities. The project is in the Federally designated CDZ Opportunity Zone: 01097001200, and Empowerment Zone for Census Tract 001203 as an Urban Renewal Community. According to EPA EJScreen, the population below poverty level for this tract is 367 of 3,354.

c. Demographic Qualifier: Economic Equity

The project location (Census Tract 12) and the surrounding community has a per capita income in 2021 was just $27,432, well below the national average of $70,480+. At the end of 2022, the unemployment rate for Alabama was 2.8%. However, in Mobile County the unemployment rate over the same period was 5.7% which is 2.3 points higher than the U.S. average of 3.4%. In general, the unemployment rate has been historically high in the region.

The Port of Mobile is a significant employment generator, including a substantial number of minority-held jobs. Over the last decade, Black employee hours for direct ASPA employees have averaged approximately 30% of total employee hours, compared with a Mobile County population that is approximately 36% Black. Black International Longshoremen's Association (ILA) employment on the container terminal or the rail intermodal facility is even stronger. Black employee hours in the container terminal and rail intermodal facilities averaged 41% of total employee hours, compared with a Mobile County population that is approximately 36% Black.

d. Demographic Qualifier: Ethnicity and Race

The City of Mobile, Alabama has a population that is 41.5% White and 52.5% Black, making up 97% of the population[1]. Other races include Asian (1.8%) and those who identify as some other race (0.9%). There is 2.6% of the population who are Hispanic or Latino.

[1] ACS 2021 5-Year Estimates

e. How does the Port's Business Expansion Impact Equity Issues?

The results of EPAs Environmental Justice Screening Tool (EJSCREEN) show that Census Tract 12 have the following seven categories that meet the criteria that identifies it as disadvantaged: Climate change, energy, health, legacy pollution, transportation, water and wastewater, and workforce development. ASPA understands that although there is no regional or state Climate Action Plan in place, EJ communities are more vulnerable and at risk when it comes to the impacts of pollution and climate change on their health and wellbeing. ASPA will use the DOT's Climate Action Plan as continuous guidance throughout construction. This project will reduce the long-term emissions compared to current operations.

A large part of the Port's labor force of are drawn from those demographic groups most disadvantaged by today's technology centric and education focused economy. To secure a good paying job as a trucker or operations worker typically does not require higher education in the form of a completed college or graduate degree. Thus, the Port's expansion provides an excellent source of employment for those populations frequently facing the lack of sustained employment and falling into poverty.

ASPA for many years maintained a policy of equal opportunity hiring from the local population and, along with that, a policy of training and promoting from within on the basis on merit. Current demographics of ASPA's labor force demonstrate that commitment.

Upon completion of construction, the Port of Mobile will have additional capacity at its piers and on its roadway system to continue to grow the economic impact it has on increasing incomes for those living in the surrounding APP and HDC communities. The largest impact on near and mid-term jobs will be directly related to the project construction contract. Any long-term benefits will be related to the increased economic output of the related businesses in the community.

3. Methodology for Computing Monetized Benefits

We are measuring the public and competitive benefits of diverting truck drayed steel coil traffic from the Port's privately maintained and busy access road to on-dock maneuvering, while simultaneously shortening the distance of on-dock maneuvers by placing the point where barges are unloaded immediately adjacent to the warehouse where coils are stored until shipment.

Typically, among quantitative inputs needed to create benefit estimates for environmental quality of life, sustainability, safety, and operating cost savings are:

- Reduced truck or forklift haulage expressed as:
  - Miles traveled, tons hauled, ton-miles hauled, labor hours, etc.
- Environmental and quality of life characteristics including:
  - Gallons of fuel consumed, contaminants produced, hours driven, congestion and safety effects, etc.

a. How did we derive transport effects for this investment?

It may be helpful to take a walking tour of the facilities to demonstrate the criticality of this relatively small but important investment. Figure 2 shows the current layout of Pier 2D and the issues surrounding barge unloading. At present a ship occupies the area nearest the warehouse and the crane and forklifts unloading the barges coming downriver from the steel mill in Calvert must negotiate a long-distance run to the warehouse (blue lines) among vehicle traffic on the pier access road that is open to all forms of vehicular traffic. Arrows indicate the missing dock gap.

Figure 2:Current Barge Unloading Work Scheme

Moving away from Pier D2, we mentioned that traffic could be diverted to Pier 2 some 2.2 miles away. Not only is the distance a problem but the route includes several hairpin turns that are quite risky when executed with one or more coils positioned upright on your trailer and nine active railroad crossings. See Figure 4 showing part of the lengthy and curvy route, and Figure 5 showing affected crossings.

Figure 4: High Risk Turns

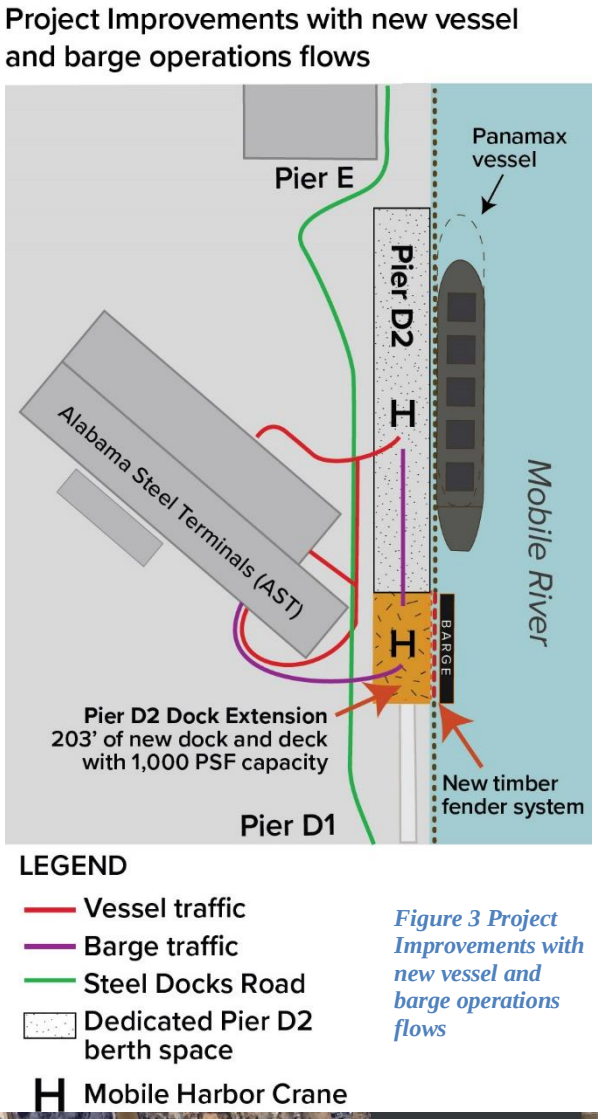

Figure 3 Project Improvements with new vessel and barge operations flows

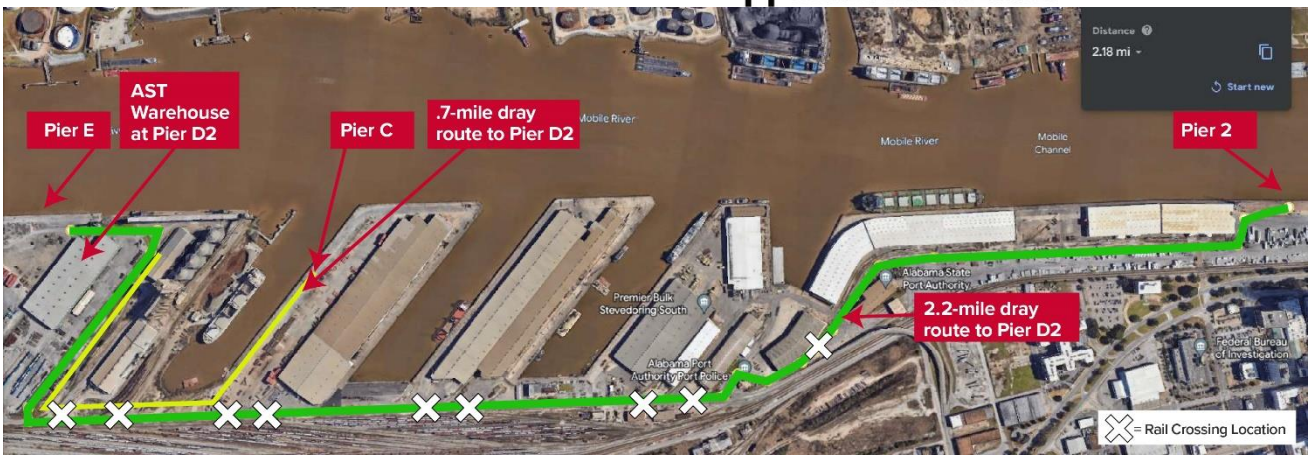

Figure 5: Route Distance for Dray trucks to Pier C and Pier 2 from AST Warehouse at Pier D2

The solution to the problem is straightforward. Refurbishing the 203 lineal feet of the dock allows the coil barges to be positioned immediately in front of the steel warehouse doors instead of a quarter of a mile distant. This reduces the distance that the forklifts travel by approximately 75% and, consequently, the amount of equipment required to maintain a safe tempo of work, and the amount of work that can be performed at the dock on an annual basis.

Effect on Exported Steel

The beneficial effects of this change on the approximately 1 million tons of steel products exported from Pier D2 are many:

- Reduces the distance traveled by the heavy forklifts (approximately 24 tons in loaded direction) along and across busy Steel Terminal Road and State Docks Road by 75%,
- This in turn reduces the possibility of personal and vehicular accidents,
- Reduces emissions because of fewer machines required for less distance, and
- Reduces roadway and dock surface wear and tear.

Because of overload conditions at Pier D2, barges must be diverted approximately 10% of the time, to one of the Port's general cargo docks – usually Pier 2. The effects of eliminating the risky and inefficient dray of two 19-ton coils along State Docks Road 2.2 miles from Pier 2 are important:

- Eliminates the need for 10 dray trucks to operate continuously for five and a half hours per barge on busy State Docks Road,
- Eliminates the need to turn a heavily laden tractor-trailer around hair pin turns at the corner of State Docks Road and 12th Street and again at the entrance to the warehouse,
- Eliminates nine railroad grade crossings over busy railroad switching tracks, and
- Eliminates the need to remotely position three to four forklifts and a crane at Pier 2 for five and a half hours per barge.

Effect on Imported Steel

Because of the slower tempo of work currently being realized at Pier D2, vessels carrying imported steel products cannot be accommodated there. This results in approximately 200,000 tons of imported products being offloaded from vessels at Pier C and drayed seven tenths of a mile to Pier D warehouse. There are two sources of savings here. First, the dray (two 12-ton coils per truck) is eliminated and replaced by forklift movements and second, the path for the forklifts is 500 feet from alongside the ship to the warehouse which compares favorably with the double handling that occurs if the coils are trucked from one place to another.

All these effects are quantified in the following Table 1 in terms of reduced miles traveled, reduced ton-miles generated, reduced machine hours operated, and reduced labor hours required for export operations -- thus allowing the displaced 200,000 import tons to be accommodated more efficiently.

Table 2 Matrix of No Build and Build Scenarios and Cumulative Difference (Benefits)

Table of Data and Assumptions - Pier D Improvements for Steel Cargoes

		Present or No Build Scenario							Build Scenario							
Location	Data Element Name	Quantity 1	Quantity 2	Quantity 3	Cum. Annual	Comments		Location	Data Element Name	Quantity 1	Quantity 2	Quantity 3	Cum. Annual	Comments	Cum. Annual Difference	Comments
Pier D	**Vessel Calls**	60			60			Pier D	**Vessel Calls**	60			60		-	
	Barge Calls	440			440	See diverted			**Barge Calls**	480			480	None diverted	40	added at D
	Coils per Barge		106		46,640				Coils per Barge		106		50,880		4,240	added at D
	Tons per Coil		19						Tons per Coil		19				-	
	Cumulatrive Tons				**886,160**				**Cumulatrive Tons**				**966,720**		80,560	added at D
	Feet to Warehouse	900	2	1800	792,000				Feet to Warehouse	300	2	600	288,000		(504,000)	(efficiency at D)
	Miles to Warehouse	0.17	2	0.34	15,900				Miles to Warehouse	0.06	2	0.11	5,782		(10,118)	(efficiency at D)
	Ton Miles to Warehouse	0.17	2	4.94	230,550	5 T Forklift			Ton Miles to Warehouse	0.06	2	1.65	83,836	5 T Forklift	(146,714)	(efficiency at D)
	Machine Hours per Barge								**Machine Hours per Barge**							
	Crane	3.5	1	3.5	1,540				Crane	3.5	1	3.5	1,680		140	offset
	Fork Lift	3.5	3.5	12.25	5,390				Fork Lift	3.5	2	7	3,360		(2,030)	(efficiency at D)
	Labor Hours per Barge								**Labor Hours per Barge**							
	Crane Operator	3.5	1	3.5	1,540				Crane Operator	3.5	1	3.5	1,680		140	offset
	Fork Lift Operator	3.5	3.5	12.25	5,390				Fork Lift Operator	3.5	2	7	3,360		(2,030)	(efficiency at D)
	Dockhands	3.5	2	7	3,080				Dockhands	3.5	2	7	3,360		280	
	Vessel Loading	Doesn't change							Vessel Loading	Doesn't change						
Barges Diverted to Pier 2 Account Congestion at Pier D								**Barges Diverted to Pier 2 Account Congestion at Pier D Restored to D2**								
Pier 2	Vessel Calls	0			0			Pier 2	Vessel Calls	0			0		-	
	Barge Calls	40			40	Total 480			**Barge Calls**	0			0		(40)	(to D)
	Coils per Barge		106		4,240				Coils per Barge		106		0		(4,240)	(to D)
	Tons per Coil		19						Tons per Coil		19				-	
	Cumulatrive Tons				**80,560**				**Cumulatrive Tons**				0		(80,560)	(to D)
	Feet to Warehouse	11,510	2	23,021	920,832				Feet to Warehouse	11,510	2	23,021	0		(920,832)	(net saved)
	Miles to Warehouse	2.18	2	4.36	18,486				Miles to Warehouse	2.18	2	4.36	0		(18,486)	(net saved)
	Ton Miles to Warehouse	2.18	2	85.02	360,485	1 Coil + Truck			Ton Miles to Warehouse	2.18	2	85.02	0		(360,485)	(net saved)
	Machine Hours per Barge								**Machine Hours per Barge**							
	Crane	5.5	1	5.5	220				Crane	5.5	1	5.5	0		(220)	(net saved)
	Fork Lift	5.5	3.5	19.25	770				Fork Lift	5.5	3.5	19.25	0		(770)	(net saved)
	Dray Truck	5.5	10	55	2,200				Dray Truck	5.5	10	55	0		(2,200)	(net saved)
	Labor Hours per Barge								**Labor Hours per Barge**							
	Crane Operator	5.5	1	5.5	220				Crane Operator	5.5	1	5.5	0		(220)	(net saved)
	Fork Lift Operator	5.5	3.5	19.25	770				Fork Lift Operator	5.5	3.5	19.25	0		(770)	(net saved)
	Dockhands	5.5	2	11	440				Dockhands	5.5	2	11	0		(440)	(net saved)
	Dray Truck	5.5	10	55	2,200				Dray Truck	5.5	10	55	0		(2,200)	(net saved)
	Vessel Loading	Doesn't change							Vessel Loading	Doesn't change						
Import Steel Products Diverted to Pier 2 or C Account Congestion at Pier D								**Import Steel Products if Handled at Pier D**								
Pier C or 2	Vessel Calls	40			40			Pier D	Vessel Calls	40			40		40	to D
	Tons per Vessel	5,000			5,000				Tons per Vessel	5,000			5,000		5,000	to D
	Coils per Vessel		417		16,667				Coils per Vessel		417		16,667		16,667	to D
	Tons per Coil		12						Tons per Coil		12					
	Cumulatrive Tons				**200,000**				**Cumulatrive Tons**				**200,000**		200,000	to D
	Feet to Warehouse	3,696	2	7,392	295,680	Pier C			Feet to Warehouse	500.00	2	1,000	40,000	to Pier D	(255,680)	(net saved)
	Miles to Warehouse	0.70	2	1.40	23,333				Miles to Warehouse	0.09	2	0.19	3,157		(20,177)	if transfer to D
	Ton Miles to Warehouse	0.70	2	30.80	513,333	2 Coil + Truck			Ton Miles to Warehouse	0.09	2	2.08	34,722	5 T Forklift	(478,611)	if transfer to D
	Machine Hours per Vessel								**Machine Hours per Vessel**							
	Crane	12	0	0	-	Ship's Cranes			Crane	12	0	0	-	Ship's Cranes	-	
	Fork Lift	12	3.5	42	1,680				Fork Lift	12	2	24	960		(720)	if transfer to D
	Dray Truck	12	10	120	4,800				Dray Truck	12	0	0	-		(4,800)	if transfer to D
	Labor Hours per Vessel								**Labor Hours per Vessel**							
	Crane Operator	12	0	0	-	Ship's Cranes			Crane Operator	12	0	0	-	Ship's Cranes	-	
	Fork Lift Operator	12	3.5	42	1,680				Fork Lift Operator	12	2	24	960		(720)	if transfer to D
	Dockhands	12	2	24	960				Dockhands	12	2	24	960		-	
	Dray Truck	12	10	120	4,800				Dray Truck	12	0	0	-		(4,800)	if transfer to D
	Vessel Loading	Doesn't apply				Import			Vessel Loading	Doesn't apply				Import		

4. Benefit-Cost Analysis

A quantitative benefit-cost analysis (BCA) was performed using available information about current truck drayage practices and current and proposed water operations, USDOT guidance, and supported by documentable costs and industry research data.

This BCA is not a comprehensive measure of the project's total potential economic impact as many likely regional benefits related to increased competitiveness of Mobile area and Alabama firms and products and their employment and multiplier effects are not used in this type of analysis[2].

Identifiable future years' costs and benefits have been projected, in constant 2021 dollars, for a period extending 20 years beyond construction. Per federal guidance, the monetized value of these quantified future benefits and costs are discounted to Present Value at a discount rate of 7%, except for carbon emissions savings, which are discounted at 3%.

Table 3: Benefit Cost Summary

Benefit or Cost Category (in millions of present value dollars)	**Present Value @ 7%**
Tot. Project Cost including O&M and Match-- PV @ 7%	$3,962,932
Quantified Benefits--PV @ 7%:	
Accident Reduction	$79,239
Non-Carbon Emissions Reduction	$72,273
Fuel Cost Savings	$541,975
Social Cost of Carbon @ 3%	$68,697
Additional Savings:	
Road Wear Savings	$38,112
Operating Cost Savings	$366,253
Travel Time Savings	$2,406,127
Savings to Existing Users	$835,460
Truck Externalities Cost	$72,180
Total Quantified Benefits	4,480,316

[2] USDOT, Office of the Secretary, "Benefit-Cost Analysis Guidance for Discretionary Grant Programs. January 2023.

5. Project Benefits

Quantified project benefits are estimated through 2045, 20 years after the project is fully functioning. Benefits are projected using constant, 2021 dollars discounted at 7%, except for carbon emissions damage, which, per federal guidelines, is discounted at 3%. Abbreviated summaries of analysis methods and authorities are presented below. The BCA Matrix spreadsheet is provided in the Appendix and an unlocked Excel workbook containing all calculations will be provided with the grant application.

a. Accident Reduction

Safety benefits are calculated based on the estimated number of accidents that will be eliminated or avoided because of the Project. The accident data used for the analysis are based on experienced rates for National highways as found in *Traffic Safety Facts Annual Report Tables* published by the National Highway Transportation and Safety Administration.[3] Such rates were applied to avoided truck vehicle miles traveled to generate direct avoided accident cost related to reduced truck mileage. An undiscounted sample of these calculations is shown below.

Table 4: Accident Savings (partial capture of full table)

ACCIDENT SAVINGS							
Year	Operational Year #	Truck 100MVMT Avoided	People Killed	People Injured	PDO	Killed Cost	Injured Cost
			1.34	79.00	125.00	$ 11,800,000	$ 213,900
			100MVMT	100MVMT	100MVMT	Per Accident	Per Accident
							$136,806/Inj.
2026	1	0.0008	0.00	0.07	0.10	$ 12,133	$ 9,815
2027	2	0.0008	0.00	0.07	0.10	$ 12,133	$ 9,815
2028	3	0.0008	0.00	0.07	0.10	$ 12,133	$ 9,815
2029	4	0.0008	0.00	0.07	0.10	$ 12,133	$ 9,815
2030	5	0.0008	0.00	0.07	0.10	$ 12,133	$ 9,815

b. Fuel Consumption and Emissions Reduction

Fuel consumption drives both fuel saving and emissions effects to the extent that hundreds of lengthy dray truck trips are diverted to shorter on-dock forklift movements, which are more fuel efficient. This is contrasted with the same calculations for a heavy-duty diesel truck which in this service moves approximately 19 tons 6.5 miles per gallon of diesel.[4]

3 https://cdan.nhtsa.gov/tsftables/tsfar.htm
[4] https://www.bts.gov/content/combination-truck-fuel-consumption-and-travel

Table 5: Need title and/or caption

Year	Truck-Miles Saved	Reduced Truck Hours	Truck Fuel Avoided (Gallons)	Forklift Miles Saved	Forklift Hours Saved	Forklift Fuel Saved
2026	41,820	7,000	6,745	6,962	3,520	12,320
2027	41,820	7,000	6,745	6,962	3,520	12,320
2028	41,820	7,000	6,745	6,962	3,520	12,320
2029	41,820	7,000	6,745	6,962	3,520	12,320
2030	41,820	7,000	6,745	6,962	3,520	12,320

The savings resulting from decreased truck drayage are complemented by fuel savings by forklifts. Fuel cost savings are based on prices of $4.027 per gallon[5] for mid-grade diesel for both truck and forklifts. A sample of undiscounted calculations is shown below.

Table 6: Fuel Savings Calculation (partial capture undiscounted)

FUEL COST SAVINGS					
Year	Reduced Truck Consumption	Value: Reduced Truck Consumption	Reduced Forklift Consumption	Value: Reduced Forklift Consumption	Fuel Savings
	Gallons	$ 4.027	Gallons	$ 4.027	
2026	6,745	$ 27,163	12,320	$ 49,613	$ 76,775
2027	6,745	$ 27,163	12,320	$ 49,613	$ 76,775
2028	6,745	$ 27,163	12,320	$ 49,613	$ 76,775
2029	6,745	$ 27,163	12,320	$ 49,613	$ 76,775
2030	6,745	$ 27,163	12,320	$ 49,613	$ 76,775

Emissions reductions are estimated for carbon and for non-carbon emissions. For the purposes of calculating fuel consumption and emissions benefits, heavy-duty combination (tractor-trailer) drayage trucks are assumed.

- Export Coils: For on-dock operations we assumed that forklift operations would be truncated from 1,900 feet as presently to roughly 300 feet per coil. Mileage and ton-mile savings for truck to on-dock substitutions are calculated based on the assumption that one coil averaging 19 tons in weight is driven 2.18 miles from Pier 2 to AST warehouse. We assume 100% "deadhead" or empty-return movements for this dray movement.

[5] https://www.eia.gov/dnav/pet/pet_pri_gnd_dcus_nus_w.htm.

- Import Steel: Work time and mileage savings for truck to on-dock substitutions are calculated based on the assumption steel products averaging 24 tons per truckload (2 coils) are driven 0.7 miles from Pier C to the AST warehouse on adjoining Pier D. Here again, 100% "deadhead" or empty-return movements are assumed for this equipment. In the more efficient case, the ship simply docks at Pier D2, the dray is eliminated entirely, and some additional forklift work is substituted.
- Carbon emissions are estimated based on estimated reduction of fuel consumption using an assumed 1.6 KG of CO_2 per mile for heavy trucks.

Table 7: Total savings over 20 years

Total savings over 20 years	**381,302**	**1,493**	**4.07**	**.015**	**.687**
Average annual savings	19,065	75	0.20	0.103	.034
Average Annual Value of Fuel Consumption/ Emissions Savings	$75,775	$5,274	$3,823	$4,682	$1,756

- Unit costs for the social cost of carbon per year as presented in the 2023 BCA Guidance Table A-8, are applied to net savings in metric tons to calculate carbon-based emissions avoided.[6]
- Non-carbon emission quantities were estimated based on EPA metrics. The appropriate unit price for each type of emission was sourced from USDOT's BCA Guidance.

Table 8: Authorities for Emissions Quantities for Truck and Forklift.

Factors Applied to Emissions Analysis			
Truck fuel consumption rate (diesel)	0.689	gallons/hour	https://truckingresearch.org/research/results/ATRITRBOpCosts.pdf
CO_2 G per mile (heavy truck)	1646.774194	grams	https://www.epa.gov/sites/default/files/2018-03/documents/emission-factors_mar_2018_0.pdf
MPG: Combination trucks (2020)	6.2		https://www.bts.gov/content/combination-truck-fuel-consumption-and-travel
Avg. Miles/Day	164.2		https://www.fhwa.dot.gov/policyinformation/statistics/2020/pdf/vm1.pdf
SOx	3.97	lbs/1,000 gallons	https://cfpub.epa.gov/webfire/SearchEmissionFactor/factorSearch2.cfm
Nox Heavy-Duty Vehicles	4.169	grams/mile	https://www.bts.gov/archive/publications/national_transportation_statistics/table_04_43
PM2.5 Heavy-Duty Vehicles	0.106	grams/mile	https://www.bts.gov/archive/publications/national_transportation_statistics/table_04_43
SOx	1,802	grams/1,000 gallons	

Table 9 reflects an estimated combined Export and Import Steel annual reduction of fuel use ranging from 381,302 gallons in 2026 onward. Total forecasted fuel savings and emissions reductions are summarized in the following table.

[6] Social Cost of Carbon has been discounted at a 3% cost of capital, per USDOT's BCA Guidance, which has been used here.

Table 9: Estimated combined Export and Import Steel annual reduction of fuel use

	Fuel consumption (gal)	Carbon Tonnes	NOx Tonnes	PM Tonnes	SOX Tonnes
Total savings over 20 years	13,279,148	182,537	273.5	6.7	24.1
Average annual savings	663,957	9,127	13.7	0.334	1.2
Average Annual Value of Fuel **C**onsumption/ Emissions Savings	$2,725,545	$670,509	$257,782	$302,822	$61,595

c. Road Wear Savings

Trucks impart significantly more wear on highway pavement and bridges than do autos. When truck traffic is shifted to water this wear is eliminated and counted as a public benefit. "The Full Cost of Intercity Highway Transportation," by David Levinson and David Gillen[7], an article that appeared in the Journal *Transport and Environment* in 1997, computed the long-run marginal cost of highway infrastructure. We inflated the equivalent cost per mile for combination trucks to 2021 using federal gross domestic product deflator data.

The following table also presents an alternative long-run marginal or fully costed road wear alternative cost of 12.9 cents per mile, which we used in this analysis. The reasoning is that State Docks Road and other service roads used by draymen within the Port are maintained by the Port Authority on its budget which, generally speaking, must pay the full cost of keeping the roadways in a state of good repair.

[7] https://doi.org/10.1016/S1361-9209(97)00037-0.

Table 10: Costs Authorities Used for Road Wear

The Full Cost of Intercity Highway Transportation. Levinson and Gillen. 1997.				
LR Marginal Cost of Infrastructure		0.0514	Per VKT	
Miles to KM		1.6		
Adjusted Marginal Cost		0.08224		
Inflation 1997 to 2021		1.57		
2021 Value		0.129	Per VMT	

d. Roadway Congestion/Operating Cost Savings/Travel Time Savings/External Truck Savings

Vehicle operating cost savings for trucks were computed using per-mile figures from Table A-5 of USDOT's BCA Guidance. Travel time savings were computed using Table A-3 of the BCA Guidance. Per-hour values for commercial truck drivers were applied to truck operations and forklift operations in the analysis. DOT's BCA Guidance provides unit costs per vehicle mile traveled for external congestion, noise, and safety. Net benefits from reduced external effects were computed for dray trucks. We assumed no *external* congestion, noise, or safety expense for forklift movements.

Table 11: Operating, Travel Time, and Truck Externalities Authorities

Vehicle Operating Cost/Mile	BCA Guidance, Table A-5	$	1.01
Commercial Truck Operator Transit Time Value/Hour (Table A-3)		$	32.40
External Value per Bus and Truck VMT (Table A-14)			
	Congestion	$	0.22
	Noise	$	0.02
	Safety	$	0.02

e. Operating Cost Reduction (Competitiveness Benefits)

According to USDOT's BCA Guidance, "The primary benefits from a proposed project will typically arise in the "market" for the transportation facility or service that the project would improve and would be experienced directly by its users." In this case the operating cost reduction by eliminating the cost of drayage is also beneficial to the competitiveness of the export steel.

It is generally conceded that water is more economical for the shipper than truck transport if water can be employed for the same purposes. In this case, the central thesis is that water transport would end 2.2 miles shorter in the Build case and the cost of trucking the goods back 2.2 miles to the warehouse would be eliminated.

As the draymen truckers are independent operators not affiliated with the Port or Warehouse, to calculate the beneficial competitive effects for shippers and end users, we used the cost imputed for the drayage that was eliminated. This is calculated at the rate of $2.83-per-mile flatbed truck rate for the Southeast times 4.4 miles per dray, including empty backhaul, which is highlighted in Figure 5.

Consumer Cost Savings Authorities

Figure 6: Consumer cost savings authorities

6. Project Investment Costs

Project investment costs are arrayed in Table 12, show the project elements, sequence, and year of expenditure. It is anticipated that the Port will pay all project costs associated with permitting and engineering as a matching expenditure.

Capital recovery years or service life amortization years are also shown.

The BCA assumes the project investment phase will largely be executed from 2024 to 2026, while maintaining present operational continuity. and will be complete with full benefits beginning in 2026.

a. Operations & Maintenance Costs:

The project is expected to generate discounted average $2,318 annual incremental maintenance costs for miscellaneous maintenance and annual dredging above those already associated with present operations.

b. Service Life:

In service, as contemplated here, docks have very long service lives, more than 20 years, and require only incidental maintenance and dredging. Notwithstanding, per the Guidance, a service life of 20 years is assumed here for this improvement of an existing asset.

Table 12: Summary of Proposed Investments and O&M Expense (undiscounted 2021 dollars)

Build Pier D2 Extension and 20 year Maintenance Plan																										
Capital Recovery Year	Budget	-4	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Discounting Year	Year	0	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
NPV of $1.00	CapEx	1	0.873	0.816	0.763	0.713	0.666	0.623	0.582	0.544	0.508	0.475	0.444	0.415	0.388	0.362	0.339	0.317	0.296	0.277	0.258	0.242	0.226	0.211	0.197
Fiscal Year	Dollars	**2021**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**	**2042**	**2043**	**2044**	**2045**
E&P and Capiital Expenditure:	Deflator	15.7%																							
Engineering	409,850	345,504		172,752	172,752																				
Demolition	172,500	145,418			145,418			(CapEx Stated in undiscounted 2021 dollars)																	
Relocate Existing Ret. Wall	908,500	765,866			765,866																				
New Structure	3,967,500	3,344,603			3,344,603																				
Fender and Mooring	701,500	591,365				591,365																			
Total CapEx plus E&P	6,159,850	5,192,754	-	172,752	4,428,637	591,365	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NPV of CapEx Dollars		*3,941,238*	-	*141,017*	*3,378,586*	*421,635*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dredging						10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Dock Inspection										15,000					15,000					15,000					
Underwater Inspection												15,000					15,000					15,000			
Fender Replacement																				-					
Pavement Maintenance															10,000					10,000					
Annual Maintenace		Build Case				10,000	10,000	10,000	10,000	25,000	10,000	25,000	10,000	10,000	35,000	10,000	25,000	10,000	10,000	35,000	10,000	25,000	10,000	10,000	10,000
Annual Mx. Deflated by 15.7% to 2021 $						***8,430***	***8,430***	***8,430***	***8,430***	***21,075***	***8,430***	***21,075***	***8,430***	***8,430***	***29,505***	***8,430***	***21,075***	***8,430***	***8,430***	***29,505***	***8,430***	***21,075***	***8,430***	***8,430***	***8,430***

7. Appendix. BCA Spreadsheet

Summary tables of undiscounted and discounted cash flows from investments, maintenance, and net benefits are reproduced below. Please note that Consumer Cost Savings resulting from truck transport cost reductions, shaded in gray on both tables, are not included in the totals for undiscounted and discounted cash flows and the computed benefit-cost ratio.

Summary/BCA Matrix

1	2	3	4	5	6	7	8	9	10	11	12	
		Undiscounted Project Costs	Discounted Project Costs	Undiscounted Value of User Benefits in Base Year Dollars								
Project Year	Calendar Year	Site Work/Annual Maintenance	To 2021, @7%	Road Wear Savings	External Truck Cost Savings	Operating Cost Savings	Travel Time Savings	Fuel Cost Savings	Social Cost of Carbon Savings	Non-Carbon Emission Savings	Accident Savings	Savings to Existing Users
	2023	$ -										
	2024	$ (201,983)	$ (164,878)									
Construction	2025	$ (4,399,406)	$ (3,356,286)									
1	2026	$ (591,365)	$ (421,635)	$ 5,399	$ 10,225	$ 51,883	$ 340,848	$ 76,775	$ 4,629	$ 9,949	$ 11,225	$ 118,350
2	2027	$ -	$ (2,900)	$ 5,399	$ 10,225	$ 51,883	$ 340,848	$ 76,775	$ 4,704	$ 10,134	$ 11,225	$ 118,350
3	2028	$ -	$ -	$ 5,399	$ 10,225	$ 51,883	$ 340,848	$ 76,775	$ 4,853	$ 10,299	$ 11,225	$ 118,350
4	2029	$ -	$ -	$ 5,399	$ 10,225	$ 51,883	$ 340,848	$ 76,775	$ 4,652	$ 10,135	$ 11,225	$ 118,350
5	2030	$ -	$ -	$ 5,399	$ 10,225	$ 51,883	$ 340,848	$ 76,775	$ 4,727	$ 10,227	$ 11,225	$ 118,350
6	2031	$ -	$ -	$ 5,399	$ 10,225	$ 51,883	$ 340,848	$ 76,775	$ 4,871	$ 10,299	$ 11,225	$ 118,350
7	2032	$ (12,645)	$ (6,008)	$ 5,399	$ 10,225	$ 51,883	$ 340,848	$ 76,775	$ 4,945	$ 10,299	$ 11,225	$ 118,350
8	2033	$ -	$ -	$ 5,399	$ 10,225	$ 51,883	$ 340,848	$ 76,775	$ 5,020	$ 10,299	$ 11,225	$ 118,350
9	2034	$ -	$ -	$ 5,399	$ 10,225	$ 51,883	$ 340,848	$ 76,775	$ 5,100	$ 10,299	$ 11,225	$ 118,350
10	2035	$ (8,430)	$ (3,269)	$ 5,399	$ 10,225	$ 51,883	$ 340,848	$ 76,775	$ 5,175	$ 10,299	$ 11,225	$ 118,350
11	2036	$ -	$ -	$ 5,399	$ 10,225	$ 51,883	$ 340,848	$ 76,775	$ 5,250	$ 10,299	$ 11,225	$ 118,350
12	2037	$ (12,645)	$ (4,283)	$ 5,399	$ 10,225	$ 51,883	$ 340,848	$ 76,775	$ 5,393	$ 10,299	$ 11,225	$ 118,350
13	2038	$ -	$ -	$ 5,399	$ 10,225	$ 51,883	$ 340,848	$ 76,775	$ 5,468	$ 10,299	$ 11,225	$ 118,350
14	2039	$ -	$ -	$ 5,399	$ 10,225	$ 51,883	$ 340,848	$ 76,775	$ 5,548	$ 10,299	$ 11,225	$ 118,350
15	2040	$ (8,430)	$ (2,331)	$ 5,399	$ 10,225	$ 51,883	$ 340,848	$ 76,775	$ 5,623	$ 10,299	$ 11,225	$ 118,350
16	2041	$ -	$ -	$ 5,399	$ 10,225	$ 51,883	$ 340,848	$ 76,775	$ 5,698	$ 10,299	$ 11,225	$ 118,350
17	2042	$ (12,645)	$ (3,054)	$ 5,399	$ 10,225	$ 51,883	$ 340,848	$ 76,775	$ 5,841	$ 10,299	$ 11,225	$ 118,350
18	2043	$ -	$ -	$ 5,399	$ 10,225	$ 51,883	$ 340,848	$ 76,775	$ 5,916	$ 10,299	$ 11,225	$ 118,350
19	2044	$ -	$ -	$ 5,399	$ 10,225	$ 51,883	$ 340,848	$ 76,775	$ 5,996	$ 10,299	$ 11,225	$ 118,350
20	2045	$ 8,430	$ 1,662	$ 5,399	$ 10,225	$ 51,883	$ 340,848	$ 76,775	$ 6,071	$ 10,299	$ 11,225	$ 118,350
Total		$ (5,239,119)	$ (3,962,982)	$ 107,978	$ 204,498	$ 1,037,655	$ 6,816,960	$ 1,535,505	$ 105,481	$ 205,233	$ 224,498	$ 2,366,997
										Total Undiscounted Benefits		$ 12,604,804

Summary Discounted

13	14	15	16	17	18	19	20		21	22
	7% discounted Value of User Benefits in Base Year (2021) Dollars									
7% Discount Factor to 2021	Road Wear Savings	External Truck Cost Savings	Operating Cost Savings	Travel Time Savings	Fuel Cost Savings	Non-Carbon Emission Savings	Accident Savings	Savings to Existing Users	3% Discount Factor to 2021	Social Cost of Carbon Savings @3%
0.62	$ 3,362	$ 6,368	$ 32,310	$ 212,263	$ 47,812	$ 6,196	$ 6,990	$ 73,702	0.86	$ 3,993
0.58	$ 3,142	$ 5,951	$ 30,196	$ 198,377	$ 44,684	$ 5,898	$ 6,533	$ 68,881	0.84	$ 3,939
0.54	$ 2,937	$ 5,562	$ 28,221	$ 185,399	$ 41,761	$ 5,602	$ 6,106	$ 64,374	0.81	$ 3,946
0.51	$ 2,745	$ 5,198	$ 26,375	$ 173,270	$ 39,029	$ 5,152	$ 5,706	$ 60,163	0.79	$ 3,673
0.48	$ 2,565	$ 4,858	$ 24,649	$ 161,934	$ 36,475	$ 4,859	$ 5,333	$ 56,227	0.77	$ 3,623
0.44	$ 2,397	$ 4,540	$ 23,037	$ 151,341	$ 34,089	$ 4,573	$ 4,984	$ 52,549	0.74	$ 3,624
0.41	$ 2,240	$ 4,243	$ 21,529	$ 141,440	$ 31,859	$ 4,274	$ 4,658	$ 49,111	0.72	$ 3,573
0.39	$ 2,094	$ 3,965	$ 20,121	$ 132,187	$ 29,775	$ 3,994	$ 4,353	$ 45,898	0.70	$ 3,521
0.36	$ 1,957	$ 3,706	$ 18,805	$ 123,539	$ 27,827	$ 3,733	$ 4,068	$ 42,895	0.68	$ 3,473
0.34	$ 1,829	$ 3,464	$ 17,574	$ 115,457	$ 26,006	$ 3,489	$ 3,802	$ 40,089	0.66	$ 3,421
0.32	$ 1,709	$ 3,237	$ 16,425	$ 107,904	$ 24,305	$ 3,260	$ 3,554	$ 37,467	0.64	$ 3,370
0.30	$ 1,597	$ 3,025	$ 15,350	$ 100,845	$ 22,715	$ 3,047	$ 3,321	$ 35,015	0.62	$ 3,361
0.28	$ 1,493	$ 2,827	$ 14,346	$ 94,247	$ 21,229	$ 2,848	$ 3,104	$ 32,725	0.61	$ 3,308
0.26	$ 1,395	$ 2,642	$ 13,407	$ 88,082	$ 19,840	$ 2,662	$ 2,901	$ 30,584	0.59	$ 3,259
0.24	$ 1,304	$ 2,469	$ 12,530	$ 82,319	$ 18,542	$ 2,487	$ 2,711	$ 28,583	0.57	$ 3,207
0.23	$ 1,219	$ 2,308	$ 11,711	$ 76,934	$ 17,329	$ 2,325	$ 2,534	$ 26,713	0.55	$ 3,155
0.21	$ 1,139	$ 2,157	$ 10,945	$ 71,901	$ 16,195	$ 2,173	$ 2,368	$ 24,966	0.54	$ 3,140
0.20	$ 1,064	$ 2,016	$ 10,229	$ 67,197	$ 15,136	$ 2,030	$ 2,213	$ 23,332	0.52	$ 3,087
0.18	$ 995	$ 1,884	$ 9,559	$ 62,801	$ 14,146	$ 1,898	$ 2,068	$ 21,806	0.51	$ 3,038
0.17	$ 930	$ 1,761	$ 8,934	$ 58,692	$ 13,220	$ 1,773	$ 1,933	$ 20,379	0.49	$ 2,987
	$ 38,112	$ 72,180	$ 366,253	$ 2,406,127	$ 541,975	$ 72,273	$ 79,239	$ 835,460		$ 68,697
						TotalDiscounted Benefits @7% (Except for Carbon@3%)				$ 4,480,316
						Benefit-Cost Ratio				1.13