I. Introduction

A Benefit-Cost Analysis (BCA) was conducted for the proposed Broening Highway corridor improvements. This project is located in Southeast Baltimore City in the area surrounding the Port of Baltimore's Seagirt and Dundalk Marine Terminals. The project will repair and enhance a freight network of roads and bridges. This infrastructure is critically necessary to support the Port of Baltimore and protect the surrounding communities by providing more direct highway access for trucks that circumvents the surrounding residential neighborhoods. The project is located in the 3rd and 7th Congressional Districts, including portions of both Baltimore City and Baltimore County, five miles southeast of downtown Baltimore in an Economically Distressed Area (EDA).

The BCA provides monetary benefits and costs, in present day dollars, associated with the project over a 30 year analysis period. The estimated benefits have been categorized by the five long-term outcomes listed in the BCA Resource Guide as follows: State of Good Repair, Economic Competitiveness, Livability, Environmental Sustainability, and Safety. An effort was made to comply with all BCA guidelines and a conservative approach has been used for all assumptions.

II. Project Summary

As described in detail in the Project Narrative, the Port of Baltimore serves as a major hub of maritime trade and international commence. A major shipping and manufacturing center, Baltimore's transportation network links the City with major markets across the country, which continues to support its role as a major shipping and manufacturing center. In 2013, the Port of Baltimore moved over 30 million tons of international cargo and is poised to continue to grow due to recent investments in major new infrastructure.

Broening Highway provides the most direct connection from the marine terminals north to I-95 via Keith Avenue or south to I-695; however, the Colgate Creek Bridge is currently a structurally deficient and functionally obsolete structure that limits how many trucks can utilize these more direct routes. The City of Baltimore is currently making emergency repairs to the existing bridge to address damage caused by an overweight truck load; however, these repairs do not address the critical need for a long-term solution. Without total replacement, the aging bridge will increasingly limit freight vehicle's ability to access the interstate highway system efficiently.

The existing detour route around the bridge utilizes several truck-restricted local neighborhood roadways, adversely impacting area residents. The continued growth in freight traffic in the area will overwhelm the residential neighborhoods, which are not designed to handle large volumes of traffic. Based on current local conditions, it is likely that the existing detour routes will be further restricted by legislative means to protect the residents of these impacted neighborhoods. These restrictions will force freight traffic to take a lengthy and inefficient detour, delaying freight movement and resulting in increased cost and environmental impacts.

The northern terminus of Broening Highway runs through a residential neighborhood. While trucks are currently restricted from this section of Broening Highway, oversize/overweight permit vehicles are unable to navigate the current alternate route. Additionally, truck counts at the intersection of Broening Highway and Holabird Avenue indicate approximately 50 non-permit trucks per day violate the truck restrictions and use this connection to access either I-95, the truck travel plaza to the west, or local destinations. An additional 476 trucks per day utilize a more circuitous route from Broening Highway west to Holabird Avenue to Ponca Street in order to access I-95 or local destinations.

In order to address these impacts to residential neighborhoods while providing a more direct route for freight traffic, the City of Baltimore is requesting grant funding for two complimentary projects:

1. **The Colgate Creek Bridge Replacement** – Replace a structurally deficient, functionally obsolete bridge on Broening Highway over Colgate Creek, which will enable trucks to reroute away from residential communities and provide more direct access to Interstate facilities. The bridge will be replaced with a modern bridge that can accommodate the oversize/overweight freight traveling in and out of the Port of Baltimore, as well as support the substantial anticipated growth in freight traffic in the area.

2. **I-95 Access and Complete Streets Improvements** – Create a new route for trucks to access I-95, circumventing a residential neighborhood and implementing complete streets improvements. A new road designed to accommodate freight traffic will direct trucks to I-95 via Cardiff Avenue, avoiding the residential section of Broening Highway and the more circuitous existing signed truck route.

The cost of the Colgate Creek Bridge replacement is $20 million. The cost of the new I-95 Access and Complete Streets Improvements is $12 million, for a total project cost of $32 million. A TIGER VI grant of $12 million is requested. The following tables are included as part of the Benefit-Cost Analysis, as described in the Benefit-Cost Analyses Guidance for TIGER Grant Applicants:

- **Tables 1** and **2** provide a summary matrix for the Colgate Creek Bridge Replacement and I-95 Access and Complete Streets Improvements, respectively.

- **Table 3** summarizes the results of the BCA using the 7 percent and 3 percent discount rates for the **Colgate Creek Bridge** portion of the improvements.

- **Table 4** summarizes the results of the BCA using the 7 percent and 3 percent discount rates for the **Cardiff Avenue/Complete Streets** portion of the improvements.

- **Table 5** summarizes the results of the BCA using the 7 percent and 3 percent discount rates for the **project as a whole**.

The following sections identify the assumptions and methodology used for the BCA, and sources for these assumptions. The complete Excel Workbook used for these calculations is also provided.

Table 1: Colgate Creek Bridge Summary Matrix

Baseline and Problems to be Addressed	Change to Baseline	Impacts	Affected Population	Economic Benefit	7% Discounted Benefits	Page
Deteriorating Colgate Creek Bridge	1. Closing the bridge to all traffic after 15 years (without-project condition)	a. DMT truck traffic growth would have to be rerouted to access I-95 and all DMT truck traffic would be rerouted after 15 years	a. All DMT truck traffic	a. Increased costs associated with additional VMT	$31 million in additional cost	8
		b. The existing bridge would have to be maintained for 15 years	b. All bridge traffic	b. Maintenance costs for the existing bridge for 15 years	Over $2 million in maintenance costs	8
	2. Replacing the Bridge (with-project condition)	Oversize permit trucks can cross the new bridge	All Permit Trucks currently too heavy to cross the bridge	Increased benefits associated with a reduction in VMT for permit trucks and truck escort vehicles	Over $40 thousand in additional benefits	9

Table 2: I-95 Access and Complete Streets Improvements Summary Matrix

Baseline and Problems to be Addressed	Change to Baseline	Impacts	Affected Population	Economic Benefit	7% Discounted Benefits	Page
Truck traffic along Broening Highway using residential streets or taking a circuitous route to I-95	Improve Cardiff Avenue and connect it to Boston Street at the existing travel plaza (with-project condition)	Reduction in truck cut through on residential streets and a shorter route to I-95 N	All trucks to and from I-95 N that do not use Keith Avenue.	Increased benefits associated with a reduction in VMT for trucks.	Over $535 thousand in additional benefits	10

Table 3: Colgate Creek Bridge BCA Summary

Long Term Outcomes	Total Net Benefits - 3% Discount Rate	Total Net Benefits - 7% Discount Rate
State of Good Repair		
Pavement	$ 11,102,274	$ 4,790,814
Maintenance of Existing Bridge	$ 3,679,114	$ 2,503,858
Maintenance of Replacement Bridge	$ (943,471)	$ (352,222)
Subtotal Quantified Benefits State of Good Repair	**$ 13,837,917**	**$ 6,942,450**
Economic Competitiveness		
Oil Import Macro Costs	$ 32,613,001	$ 14,070,598
Fuel Tax	$ (3,048,620)	$ (1,315,282)
Subtotal Quantified Benefits Economic Competitiveness	**$ 29,564,381**	**$ 12,755,316**
Livability		
Congestion	$ 19,429,873	$ 8,383,228
Noise	$ 2,903,996	$ 1,252,851
Subtotal Quantified Benefits Livability	**$ 22,333,868**	**$ 9,636,079**
Environmental Sustainability		
Pollution	$ 4,742,896	$ 2,046,302
GHG	$ 3,313,180	$ 1,382,880
Subtotal Quantified Benefits Environmental Sustainability	**$ 8,056,076**	**$ 3,429,181**
Safety		
Crash	$ 1,215,993	$ 524,723
Subtotal Quantified Benefits Safety	**$ 1,215,993**	**$ 524,723**
Total Quantified Benefits	**$ 75,008,235**	**$ 33,287,750**
Project Cost	**$ 20,000,000**	**$ 20,000,000**
Benefit Cost Ratio	**3.8**	**1.7**

Table 4: I-95 Access and Complete Streets Improvements BCA Summary

Long Term Outcomes	Total Net Benefits - 3% Discount Rate	Total Net Benefits - 7% Discount Rate
State of Good Repair		
Pavement	$ 163,910	$ 82,575
Subtotal Quantified Benefits State of Good Repair	**$ 163,910**	**$ 82,575**
Economic Competitiveness		
Oil Import Macro Costs	$ 481,987	$ 242,818
Fuel Tax	$ (45,059)	$ (22,700)
Subtotal Quantified Benefits Economic Competitiveness	**$ 436,928**	**$ 220,118**
Livability		
Congestion	$ 287,077	$ 144,625
Noise	$ 42,929	$ 21,627
Subtotal Quantified Benefits Livability	**$ 330,006**	**$ 166,252**
Environmental Sustainability		
Pollution	$ 70,091	$ 35,311
GHG	$ 46,281	$ 22,317
Subtotal Quantified Benefits Environmental Sustainability	**$ 116,372**	**$ 57,628**
Safety		
Crash	$ 17,952	$ 9,044
Subtotal Quantified Benefits Safety	**$ 17,952**	**$ 9,044**
Total Quantified Benefits	**$ 1,065,167**	**$ 535,617**
Project Cost	**$ 12,000,000**	**$ 12,000,000**
Benefit Cost Ratio	**0.1**	**0.04**

Table 5: Combined Broening Highway Project BCA Summary

Long Term Outcomes	Total Net Benefits - 3% Discount Rate	Total Net Benefits - 7% Discount Rate
State of Good Repair		
Pavement	$ 11,266,184	$ 4,873,389
Maintenance of Existing Bridge	$ 3,679,114	$ 2,503,858
Maintenance of Replacement Bridge	$ (943,471)	$ (352,222)
Subtotal Quantified Benefits State of Good Repair	**$ 14,001,828**	**$ 7,025,026**
Economic Competitiveness		
Oil Import Macro Costs	$ 33,094,988	$ 14,313,416
Fuel Tax	$ (3,093,680)	$ (1,337,982)
Subtotal Quantified Benefits Economic Competitiveness	**$ 30,001,308**	**$ 12,975,434**
Livability		
Congestion	$ 19,716,950	$ 8,527,853
Noise	$ 2,946,924	$ 1,274,478
Subtotal Quantified Benefits Livability	**$ 22,663,874**	**$ 9,802,331**
Environmental Sustainability		
Pollution	$ 4,812,987	$ 2,081,612
GHG	$ 3,359,461	$ 1,405,196
Subtotal Quantified Benefits Environmental Sustainability	**$ 8,172,448**	**$ 3,486,809**
Safety		
Crash	$ 1,233,945	$ 533,767
Subtotal Quantified Benefits Safety	**$ 1,233,945**	**$ 533,767**
Total Quantified Benefits	**$ 76,073,403**	**$ 33,823,367**
Project Cost	**$ 32,000,000**	**$ 32,000,000**
Benefit Cost Ratio	**2.4**	**1.1**

III. Assumptions and Methodology

The roadway network in the study area carries passenger vehicles, trucks, and oversize/overweight trucks that require permits. The two improvements identified in this grant require different assumptions for quantifying benefits as they apply to the different types of traffic. The following sections summarize the assumptions and methodology used for comparing monetary benefits with and without the project.

Colgate Creek Bridge: Without-Project Condition

A. Maintenance Costs

An estimate is made for the costs associated with maintaining the existing bridge through its lifespan versus constructing and maintaining a new bridge. The existing Colgate Creek Bridge has an expected life span of five to ten years, assuming that there is not a significant increase in truck traffic. However, due to substantial anticipated growth at the Port and for associated uses in the vicinity, truck traffic is anticipated to exhibit 5 percent yearly growth over the first 5 years and 1 percent growth afterwards for the 30 year analysis period. BCDOT has indicated that the bridge lifespan could be extended to 15 years with extensive maintenance if truck traffic using the bridge does not increase over that period of time. For the purposes of this analysis, it was conservatively estimated that the existing bridge would have a lifespan of 15 years, but all truck growth would be rerouted to circumvent the bridge. The yearly maintenance costs for the existing bridge are estimated at $500,000.

B. Vehicle Miles Traveled Benefits

As stated previously, truck traffic was assumed to grow at 5 percent per year for 5 years, and 1 percent thereafter for the 30 year period. Due to impacts to area residents, it is anticipated that truck traffic would eventually be restricted on Dundalk Avenue and would be forced to take a much longer route to access I-95. For the first five years, all growth in truck traffic is assumed to be rerouted around the bridge to access I-95, utilizing the shortest route that does not involve Dundalk Avenue or other neighborhood streets. This reroute adds 10.39 miles to each truck trip. After 15 years in the without-project condition, all traffic would be unable to use the Colgate Creek Bridge and would have to be rerouted. Dundalk Marine Terminal supplied daily gate counts and directional splits that were used to identify the number of trucks that would be forced to take the longer route.

Quantitative benefits based on additional vehicle miles traveled (VMT) for all trucks currently using the existing bridge that would have to be rerouted after bridge closure were calculated. A 5 percent growth for 5 years and a 1 percent growth rate for the remaining analysis period was applied to the number of trucks being rerouted. The VMT benefits for all trucks resulting from the without-project condition are calculated based on the Federal Highway Cost Responsibility tables(1), which show per mile values for converting VMT to monetary benefits for pavement wear, congestion, crash avoidance noise pollution, and air pollution (other than CO_2). The values are listed in year 2000 dollars and were converted to 2014 dollars using the Bureau of Labor Statistics CPI calculator [2]. **Table 6** shows the 2014 dollars per mile values for VMT savings. A 60 kip 5 axle truck was assumed for this portion of the analysis, and the rates for urban use were utilized. VMT benefits were not quantified for passenger vehicles currently using the existing bridge as they would still have access to Dundalk Avenue for the first 15 years, and could not be prevented from detouring through the neighborhood after closure of the bridge, so the added distance of circumventing the bridge was less than ¼ mile per vehicle.

C. Social Costs of Carbon

An estimate was made for the reduction in CO_2 associated with the VMT reduction. The VMT estimated above was converted to ton-miles conservatively assuming an average load of 15 tons per truck. Based on 71.61 tons of GHG (CO_2) per million ton-miles, as cited in the Port of Baltimore Export Expansion grant application[3], the estimated ton-miles were converted to tons of GHG and then monetized based on values outlined in the TIGER BCA Resource Guide.

Colgate Creek Bridge: With-Project Condition

A. Maintenance Costs

In the with-project condition the new bridge was assumed to be constructed in 6 years (year 2020) to conform with TIGER grant requirements. The maintenance costs associated with maintaining the new bridge increase over time, with a $2 million payment for joint and column maintenance in project year 20 that will slightly decrease additional maintenance costs for the remaining 10 years. The expected lifespan for the new bridge exceeds 75 years per SHA standard requirements; however for the purpose of this analysis only the first 30 years are included.

B. Vehicle Miles Traveled Benefits

Trucks that are overweight or oversized are required to obtain permits that specify routes to and from Dundalk Marine Terminal. In addition, some oversize loads are required to have vehicle escorts to and from I-95. The number of yearly permit trucks and escort vehicles traveling to or from Dundalk Marine Terminal was obtained from the Baltimore City Department of Transportation (BCDOT). There are four routes that all use Dundalk Avenue to circumvent the Colgate Creek Bridge, which are used based on the dimensions and weight of the particular load. Each route distance was measured and a weighted average was calculated to determine the average VMT savings per vehicle associated with the proposed bridge being able to support the permit loads. A 5 percent growth rate for five years and a 1 percent growth rate for the remaining analysis period were applied to the number of trucks, while the ratio of trucks to escort vehicles was kept constant over the 30 year period.

The VMT benefits for all permit trucks and escort vehicles resulting from the with-project condition are calculated based on the Federal Highway Cost Responsibility tables[1], which show per mile values for converting VMT to monetary benefits for pavement wear, congestion, crash avoidance noise pollution, and air pollution (other than CO_2). The values are listed in year 2000 dollars and were converted to 2014 dollars using the Bureau of Labor Statistics CPI calculator(2). **Table 6** shows the 2014 dollars per mile values for VMT savings. The values for an 80 kip 5 axle truck on urban highways were applied to the VMT reduction for permit trucks and the auto urban rates were applied to the VMT reduction for escort vehicles.

C. Social Costs of Carbon

An estimate was made for the reduction in CO_2 associated with reducing the VMT of the permit trucks. The VMT estimated above was converted to ton-miles conservatively assuming an average load of 60 tons per truck. The existing bridge is currently rated for no more than 80 tons, thus this is a conservative estimate. Based on 71.61 tons of GHG (CO_2) per million ton-miles, as cited in the Port of Baltimore Export Expansion grant application(3), the estimated ton-miles were converted to tons of GHG and then monetized based on values found in the TIGER BCA Resource Guide.

I-95 Access and Complete Streets Improvements: Without-Project Condition

A. Vehicle Miles Traveled Benefits

Currently, trucks are restricted from the use of Broening Highway at the northern connection at Boston Avenue as it passes through a residential neighborhood; however, as described in the project summary, based on a 12 hour truck count approximately 50 trucks a day are disregarding this restriction and are choosing to use Broening Highway to the north to access I-95 for a variety of reasons. An additional 476 trucks are using a more circuitous route to access I-95 via Holabird Avenue and Ponca Street. The proposed Cardiff Avenue connection from Broening Highway to Boston Street would reduce the distance to the I-95 northbound ramp for these 526 daily vehicles. Based on north- and southbound splits obtained from the Landside Access Report(4), approximately 87 percent of trucks are travelling to and from I-95 North and 13 percent are traveling to/from I-95 South.

The twelve hour truck count at Holabird Avenue and Broening Highway was conservatively assumed to represent a daily count, and the 87 percent of trucks travelling through this intersection to and from Broening Highway south of Holabird Avenue that are headed toward I-95 North were rerouted in the with-project condition. Vehicles seeking to access I-95 South can more quickly access that ramp by utilizing the existing Holabird Avenue to Ponca Street route and were disregarded. A 5 percent growth rate for five years and a 1 percent growth rate for the remaining analysis period was applied to the number of trucks to remain consistent with previous growth estimates.

The VMT benefits for I-95 North trucks resulting from the with-project condition are calculated based on the Federal Highway Cost Responsibility tables(1), which show per mile values for converting VMT to monetary benefits for pavement wear, congestion, crash avoidance noise pollution, and air pollution (other than CO_2). The values are listed in year 2000 dollars and were converted to 2014 dollars using the Bureau of Labor Statistics CPI calculator[2]. **Table 6** shows the 2014 dollars per mile values for VMT savings. The values for a 60 kip 5 axle truck on urban highway were used for the trucks benefiting from the Cardiff Avenue connection.

B. Social Costs of Carbon

An estimate was made for the reduction in CO_2 associated with reducing the VMT of trucks travelling to and from I-95 North utilizing the Cardiff Avenue connection. The VMT estimated above was converted to ton-miles conservatively assuming an average load of 15 tons per truck. Based on 71.61 tons of GHG (CO_2) per million ton-miles, as cited in the Port of Baltimore Export Expansion grant application[3], the estimated ton-miles were converted to tons of GHG and then monetized based on values found in the TIGER BCA Resource Guide.

Macro-Economic Costs of Oil Imports

In addition to the above assumptions that are specific to individual portions of the project, an estimate was made for the savings associated with the macro-economic cost of oil imports based on the total VMT savings for all vehicles with and without the project using constant assumptions. In 2013, the US imported 3.5 billion barrels of oil for a total of $384 billion[5], or $2.61 per gallon. Fuel savings resulting from the reduction in truck and auto VMT were based on an assumption of6.2 miles per gallon for trucks, as cited in the Port of Baltimore Export Expansion grant application[3], and 24.5 miles per gallon for passenger vehicles[6]. In addition to the above savings, the amount of Federal fuel taxes lost resulting from the reduction in VMT were estimated based on US tax rates of 18.4 cents per gallon for gasoline and 24.4 cents per gallon for diesel fuel[7], and were subtracted from the net benefits.

Table 6: VMT Multipliers from FHWA

FHWA 2000 Values Converted to 2014 Values						
Vehicle Class/Highway Class	**DOLLARS PER MILE**					
	Pavement	**Congestion**	**Crash**	**Air Pollution**	**Noise**	**Total**
Autos/Urban Interstate	0.0014	0.1050	0.0162	0.0181	0.0012	0.1419
60 kip 5-axle Comb/Urban Interstate	0.1432	0.2507	0.0157	0.0612	0.0375	0.5083
80 kip 5-axle Comb/Urban Interstate	0.5576	0.2735	0.0157	0.0612	0.0414	0.9495

Reference List

1. Addendum to the 1997 Federal Highway Cost Allocation Study Final Report, U.S. Department of Transportation, Federal Highway Administration, May 2000
   http://www.fhwa.dot.gov/policy/hcas/addendum.htm

2. Bureau of Labor Statistics CPI calculator
   http://www.bls.gov/data/inflation_calculator.htm

3. See Appendix A.

4. Landside Access Report.
   http://www.mdot.maryland.gov/Office_of_Planning_and_Capital_Programming/Plans_Programs_Reports/Historical_Documents/POB_Landside_Access_Report.pdf

5. Monthly and yearly US oil import information.
   http://www.pickensplan.com/oilimports/

6. University of Michigan Transportation Research Institute Average Vehicle Miles per Gallon
   http://www.umich.edu/~umtriswt/EDI_sales-weighted-mpg.html

7. Federal Highway Administration US Fuel Taxes
   http://www.fhwa.dot.gov/infrastructure/gastax.cfm

BENEFIT COST ANALYSIS APPENDIX

A

Port of Baltimore Expansion Grant Benefit Cost Analysis Excerpts

Quantitative Benefit-Cost Analysis

PORT OF BALTIMORE EXPORT EXPANSION

Maryland Port Administration

Quantitative Benefit-Cost Analysis

1. Introduction

A Benefit-Cost Analysis (BCA) was conducted for the development of Intermodal Improvements to facilities in the Port of Baltimore. This project is located within Fairfield Marine Terminal (FMT) along the south shore of the Patapsco River, west of the I-895 Harbor Tunnel. FMT is owned by the Maryland Port Administration. The BCA provides a monetization and discounting of project costs and benefits over a 30 year project life, in a common unit of measurement in present day dollars. This BCA attempts to be comprehensive and objective in identifying and quantifying project benefits and costs, and to comply with the guidelines for BCA as delineated by the US DOT in the Federal Register Notice of Funding Availability. The benefits that have been estimated for this project have been categorized by the five long-term outcomes specified in the Selection Criteria section of the Notice of Funding Availability, and a conservative approach has been taken in all cases where judgment was used in estimating the extent of benefits. In addition, an effort has been made to present the BCA estimation in as transparent a fashion as possible.

2. Project Summary

As more completely described in the TIGER grant application, Fairfield Marine Terminal specializes in the handling and processing automobiles, light trucks and similar RO/RO cargo. Currently the entire terminal is leased to Mercedes Benz. The development of intermodal improvements at FMT will provide the Port of Baltimore with a means of expanding their international export and import facilities s and provide direct rail access serving Baltimore and the national marketplace. For the purposes of the quantitative BCA, the continued development and operation of FMT without the improvements is considered the baseline, or "without-project" condition. The development of improvements such as constructing a rail yard and filling of the Wet Basin are considered the "with-project" condition.

Without these improvements, importers and exporters in these regions would face higher freight costs for truck drayage to FMT, or for rail or truck transportation that would be more costly than rail service to FMT. These freight savings for shippers are an economic benefit resulting from the development of rail access. The freight savings either reduce the costs of US exports, making them more competitive in the global market, or they reduce the cost of imported raw materials, goods and products resulting in an economic benefit to US consumers and producers, and in some cases reducing the cost of producing goods ultimately for export. These intermodal improvements will provide enhanced access to rail freight at rates less costly than truck freight.

The availability of cost-effective rail service through FMT will result in a shift from truck to rail service resulting in a reduction in the number of vehicle-miles-traveled (VMT) by heavy trucks on the nation's highway system and provide economic benefits in terms of a net reduction in congestion, accidents, noise, pavement wear, health impacts from criteria pollutant emissions and green-house gas emissions, while also reducing fuel imports. The reduction in truck VMT will also reduce the demand for imported oil, thereby contributing to improved US economic performance. Also, it will allow for handling of RO-RO at the terminal.

The total development cost of the FMT improvements, as detailed in previous sections of this application, is estimated at $17.06 million. A TIGER V grant of $10 million is being sought. For this BCA analysis, the project cost attributable to the FMT improvements is used in computing the BC ratio. No additional operations and maintenance costs have been added to the project development cost since these costs will be more than covered by the operating revenue of the terminal. Neither the operating revenue nor the operating expenses are considered in this BCA.

The following Table 1 provides a project summary matrix as described in the Notice of Funding Availability identifying the baseline, the changes, the types of impacts, the affected populations, the economic benefit, a summary of results for each category of benefit and references to the relevant pages in this document.

The following Tables 2 and 3 summarize the results of the BCA in terms of the results for each of the Long Term Outcomes, and the following sections of this document describe the methodology, and the basis of assumptions, including reference to sources, for the development of the BCA. The anticipated development of an efficient intermodal facility, the shift from truck to rail which contributed to freight costs savings, and more explicit guidance on estimating the social costs of carbon provided in the Tiger BCA Resource Guide has also contributed to the improved BCA ratio.

In addition to the descriptions and tables that are included in the following sections, the complete Excel Workbook that incorporates the calculations for the BCA is provided.

Table 1: Project Summary Matrix

Current Status Baseline & Problems to be Addressed	Change to Baseline/Alternatives	Type of Impacts	Population Affected by Impacts	Economic Benefit	Summary of Results (at 7% discount rate)	Page Reference in BCA
Current MMT/FMT terminal without intermodal access	Develop project to provide rail access, and increase 7.6 acres in capacity by filling the Wet Basin					
		Reduced freight cost due to more efficient intermodal rail service.	Importers and exporters in the, and their customers.	Reduced freight costs make exports more competitive in world markets, and reduce costs of imported materials, products benefiting US consumers and producers.	More than $26 million of reduced freight costs over project life.	Page 8
		Reduced truck VMT on local, regional and national roadways	1. Taxpayers who pay for highway maintenance 2. Highway users who experience reduced congestion 3. Highway users who	1. Reduced maintenance costs 2. Monetized value of time saved. 3. Monetized value of reduced accidents 4. Monetized	1. Almost $7 million of reduced maintenance costs 2. More than $3 million of congestion savings 3. More than	Pages 8-10

		experience fewer accidents 4. Citizens who enjoy reduced vehicle pollution 5. Citizens who enjoy reduced highway noise	value of reduced pollution 5. Monetized value of reduced noise (all net of equivalent rail impacts}	$500 thousand in safety benefits. 4. About $1.3 million in pollution savings, including GHG. 5. About $384 thousand in noise benefits	
	Reduced imported petroleum	All citizens participating in the US economy	Reduced negative impact of oil dependence on the US economy	Almost $16 million of benefit to the US economy	Page 11
	Avoid Rehabilitation Costs	Users of the FMT/MMT facility	Reduce capital costs of the facility thereby reducing freight costs of commodities moving through the facility	About 4.7 million in avoided rehabilitation benefits	Page 12

Table 2: Benefit Cost with NPV 7% Discount Rate

Long Term Outcomes	Total Net Benefits
State of Good Repair	
Pavement	$ 6,970,273
Rehabilitation Avoided Cost	$ 4,677,391
Subtotal Quantified Benefits State of Good Repair	**$ 11,647,664**
Economic Competitiveness	
Oil Import Macro Costs - Truck	$ 15,986,770
Oil Import Macro Costs - Rail	$ (5,999,877)
Freight Savings	$ 26,655,613
Truck Fuel Tax	$ (6,280,453)
Rail Fuel Tax	$ 2,357,071
Subtotal Quantified Benefits Economic Competitiveness	**$ 32,719,123**
Livability	
Congestion	$ 3,029,174
Noise	$ 384,166
Subtotal Quantified Benefits Livability	**$ 3,413,340**
Environmental Sustainability	
Pollution - Truck	$ 2,581,389
Pollution - Rail	$ (2,328,986)
GHG - Truck	$ 1,798,051
GHG - Rail	$ (674,813)
Subtotal Quantified Benefits Environmental Sustainability	**$ 1,375,640**
Safety	
Crash - Truck	$ 602,171
Crash - Rail	$ (35,348)
Subtotal Quantified Benefits Safety	**$ 566,823**
Total Quantified Benefits FMT/MMT	**$ 49,722,591**
FMT/MMT Project Cost	**$ 17,060,000**
Discount Rate	**7.0%**
Benefit Cost Ratio	**2.9**

Table 3: Benefit Cost with NPV 3% Discount Rate

Long Term Outcomes	Total Net Benefits
State of Good Repair	
Pavement	$ 14,443,612
Rehabilitation Avoided Cost	$ 5,658,957
Subtotal Quantified Benefits State of Good Repair	**$ 20,102,569**
Economic Competitiveness	
Oil Import Macro Costs - Truck	$ 33,127,352
Oil Import Macro Costs - Rail	$ (12,432,784)
Freight Savings	$ 59,018,404
Truck Fuel Tax	$ (7,040,939)
Rail Fuel Tax	$ 2,642,483
Subtotal Quantified Benefits Economic Competitiveness	**$ 75,314,516**
Livability	
Congestion	$ 6,276,973
Noise	$ 796,059
Subtotal Quantified Benefits Livability	**$ 7,073,032**
Environmental Sustainability	
Pollution - Truck	$ 5,349,084
Pollution - Rail	$ (4,826,063)
GHG - Truck	$ 3,986,895
GHG - Rail	$ (1,496,292)
Subtotal Quantified Benefits Environmental Sustainability	**$ 3,013,624**
Safety	
Crash - Truck	$ 1,247,803
Crash - Rail	$ (73,248)
Subtotal Quantified Benefits Safety	**$ 1,174,556**
Total Quantified Benefits FMT/MMT	**$ 106,678,297**
FMT/MMT Project Cost	**$ 17,060,000**
Discount Rate	**3.0%**
Benefit Cost Ratio	**6.3**

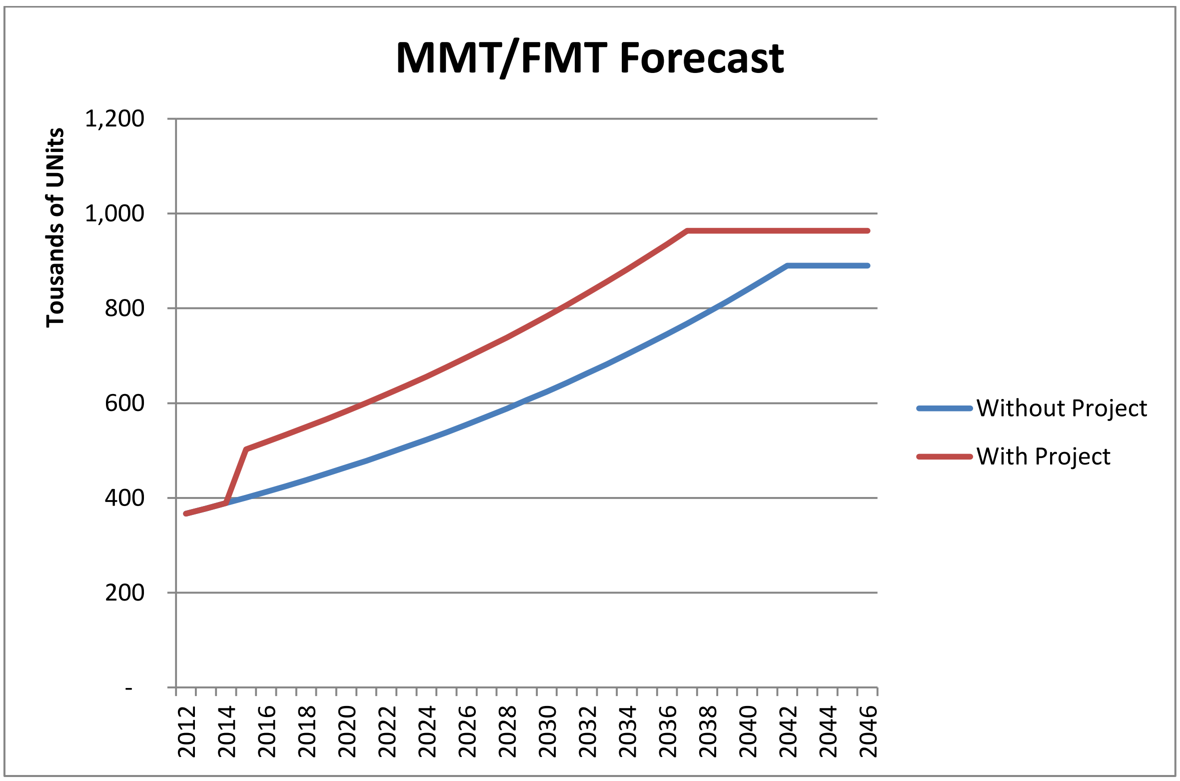
3. Assumptions & Methodology

Volume and Growth:

The Port of Baltimore was ranked first in the nation in handling Autos and light Trucks in 2012, and had 23% of the East Coast Market Share from Portland Maine to Jacksonville, Florida. In 2012 the Port handled 322,000 units of auto exports and 320,000 units of auto imports. From these volumes, for both exports and imports MMT/FMT handled 193,000 units of autos or 366,700 tons. On the other hand, even though the Port in general handled 1,021,000 tons of Ro-Ro, MMT/FMT terminal hasn't been able to support this type of cargo. The projections used in the BCA assume a growth rate of 3% through 2046. This growth rate is conservative and consistent with US trend of GDP growth since the International Monetary Fund (IMF) currently forecast long-term US GDP average growth of approximately 2.7%.

The FMT/MMT terminal with 160 acres has a capacity of approximately 912,000 tons, since one acre has the capacity of approximately 3000 vehicle units and each unit is approximately on average 1.9 tons. By adding 7.6 acres when filling the Wet Basin, this capacity will increase to approximately 955,000 tons. “With-project” scenario, beginning in 2037 we assume a flat growth rate since the capacity of the entire terminal including the additional 7.6 acres of the filling of the Wet Basin will be met. On the other hand, in the “without-project” scenario the growth rate will flattened later on in 2042 since the additional 7.6 acres of the Wet Basin are not been contemplated.

Figure 1: Forecast for Volume Tons



Inland Markets Served by Port of Baltimore - FMT/ MMT Terminal:

Without the FMT improvements, the cost of shipping to and from inland market regions would be higher than if more efficiently served by rail. In some regions cargo could be shipped using truck drayage, but the cost would be higher than could be achieved with an efficient multi-modal facility. Currently the Port of Baltimore for automobiles serve the following inland locations: Detroit, MI; Toledo, OH; Brampton, Ontario; Belvidere, IL; Chicago, IL; Oakville, Ontario; Louisville, KY; Kansas City, MO; Oshawa, Ontario; Princeton, IN; Georgetown, KY; Marysville, OH; Lincoln, AL; Normal, IL; Lafayette, IN. For Ro-Ro it serves the following inland locations: Waterloo, IA; Davenport, IA; East Moline, IL; Grand Island, NE;

Sturtevant, WI; Fargo, ND; Jackson, MN; Hesston, KS; Decatur, IL; Peoria, IL; East Peoria, IL;, Aurora, IL; Chattanooga, TN; Lexington, KY; Manitowoc, WI; Shady Grove, PA, McConnelsburg, PA; Burlington, IA, Benson, MN, New Holland, PA; Winnipeg, Manitoba; Waverly, IA; Shippensburg, PA; Guelph, Ontario; Macungie, PA; Dublin, VA; West Chester, PA; Brantford, Ontario; and Petersboro, Ontario.

FMT/MMT only handles automobiles and the only transportation mode used is trucks. By providing rail access and develop terminal improvements, the terminal will be able to handle Ro-Ro as well, and there would be a modal split. For purposes of estimating vehicle-miles-traveled as part of the BCA, as will be described in more detail below, inland locations, and their distances from Baltimore, were identified for both truck and rail, and the average mileage for both transportation modes was calculated. Also, after reviewing the distances to the rail and truck markets, and considering the fact that the FMT/MMT terminal will have rail access, a judgment was made that “with-project”, 20% of vehicles will be transported by rail and all new Ro-Ro at the terminal will be transported by rail as well. Based on the tonnage volumes the Port handles currently, a judgment was made and it has been assumed that MMT/FMT once the improvements are finalized will be able to start handling an additional tonnage of Ro-Ro of about 10% of the total. This translates to 108,318 tons of Ro-Ro starting in 2017. For Ro-Ro tons a growth of 3% annually is expected as well.

Freight Savings:

Without the development of MMT/FMT improvements, shippers will incur a higher freight cost. The volume of this freight is based on the total volume in the previously described truck-only markets. The freight savings for this BCA are calculated based on the following: Due to the shift in modal split from truck to rail, freight costs are reduced since the cost per ton mile rail is lower than the cost per mile truck. “With-project”, truck moves will be reduced from 100% to 80%. In addition to this, the improvements to the MMT/FMT terminal would make this terminal more efficient. Thus, it is assumed Ro-Ro will move from other ports to MMT/FMT, in particular because of the new rail access, resulting in freight savings at 10% of average cost per ton-mile for all Ro-Ro tons.

These savings were estimated using the difference in per ton-mile costs for truck and rail freight as estimated in a study done by the National Cooperative Highway Research Program, entitled “Return on Investment on Rail Freight Capacity Improvements,” (reference 3.) This report indicates rail freight costs at $.045 per ton-mile and truck at $.08 per ton-mile. No rail offsets for Ro-Ro have been calculated since it has been assumed that these Ro-Ro tons have been handled by rail in other ports and it was just a transfer to the new terminal due to increase efficiency.

Table 4, below, displays the detailed calculations for estimating freight savings based on the methodology described above, including all of the assumptions regarding parameters used in the calculations. In addition, the Excel Workbook which includes these calculations has also been provided.

Benefits Based on Additional Vehicle-Miles-Traveled in the Without Project Case:

An estimate is made of the additional truck VMT that would result from the without-project condition. This estimate is based on the FMT/MMT volumes that would move by truck rail service from the terminal was not available. Based on the distances to the various mixed markets it is estimated that the average truck distance is 636.46 miles, and the average rail distance is 811.2 miles for automobiles and 926 miles for Ro-Ro. The difference in average mileage for both autos and Ro-Ro consists in that both types of cargo have different inland markets.

Monetizing Additional Truck VMT:

The VMT for all truck volumes resulting from the without-project condition are valued based on the Federal Highway Cost Responsibility tables (reference 1). The values used are an average of those for 60 kip and 80 kip 5 axle vehicles, and 85% - 15% weighted average of rural and urban highways. The per-mile values are applied to pavement wear, congestion, crash avoidance, noise and air pollution (other than CO_2). The costs per mile in this study are presented in year 2000 dollars, therefore, for this BCA have been escalated using the Bureau of Labor Statistics CPI calculator (http://www.bls.gov/data/inflation_calculator.htm) to represent them in 2012 dollars. The values used for each category are:

Pavement (14.1 cents/mile) – represent the contribution of a mile of travel to pavement deterioration and the costs of repairing the damage.

Congestion (6.1 cents/mile) – reflect the value of added travel time due to additional increments of traffic.

Crash (1.2 cents/mile) – include medical costs, property damage, lost productivity, pain and suffering and other costs associated with highway crashes.

Air Pollution Other Than CO_2 (5.2 cents/mile) – are measured in terms of the cost of premature death, illness, and other effects of various highway-related emissions.

Noise (0.8 cents/mile) – reflect changes in the value of adjacent properties caused by motor vehicle noise.

Reduced Social Costs of Carbon:

In addition to the above described parameters used to monetize additional truck VMT resulting from the without-project condition, an estimate was made of the social costs of carbon based on the impact of additional truck VMT on CO_2. The VMT estimated as described above were converted to ton-miles using an average load per truck of 15 tons, and assuming that 50% of the return trips are empty. Ton-miles were then converted into GHG (CO_2) based on 71.61 tons of GHG per million ton-miles as cited in reference 2. The tons of GHG were monetized based on guidance in the Notice of Funding Availability which cites "*Social Costs of Carbon for Regulatory Impact Analysis Under Executive Order 12866,*" (Reference 6) and specifically table A1 in the appendix of that report. A portion of Table A1 is shown below in Figure 4. The methodology described in TIGER Benefit-Cost Analysis (BCA) Resource Guide, updated 5/3/13 was followed.

Figure 2: Table A1

15A.10 APPENDIX

Table A1: Annual SCC Values: 2010–2050 (in 2007 dollars)

Discount Year	5% Avg	3% Avg	2.5% Avg	3% 95th
2010	4.7	21.4	35.1	64.9
2011	4.9	21.9	35.7	66.5
2012	5.1	22.4	36.4	68.1
2013	5.3	22.8	37.0	69.6
2014	5.5	23.3	37.7	71.2
2015	5.7	23.8	38.4	72.8
2016	5.9	24.3	39.0	74.4
2017	6.1	24.8	39.7	76.0
2018	6.3	25.3	40.4	77.5
2019	6.5	25.8	41.0	79.1
2020	6.8	26.3	41.7	80.7
2021	7.1	27.0	42.5	82.6
2022	7.4	27.6	43.4	84.6
2023	7.7	28.3	44.2	86.5
2024	7.9	28.9	45.0	88.4
2025	8.2	29.6	45.9	90.4
2026	8.5	30.2	46.7	92.3
2027	8.8	30.9	47.5	94.2
2028	9.1	31.5	48.4	96.2
2029	9.4	32.1	49.2	98.1
2030	9.7	32.8	50.0	100.0
2031	10.0	33.4	50.9	102.0
2032	10.3	34.1	51.7	103.9
2033	10.6	34.7	52.5	105.8
2034	10.9	35.4	53.4	107.8
2035	11.2	36.0	54.2	109.7
2036	11.5	36.7	55.0	111.6
2037	11.8	37.3	55.9	113.6
2038	12.1	37.9	56.7	115.5
2039	12.4	38.6	57.5	117.4
2040	12.7	39.2	58.4	119.3
2041	13.0	39.8	59.0	121.0
2042	13.3	40.4	59.7	122.7
2043	13.6	40.9	60.4	124.4
2044	13.9	41.5	61.0	126.1
2045	14.2	42.1	61.7	127.8
2046	14.5	42.6	62.4	129.4
2047	14.8	43.2	63.0	131.1

40

As the guidance indicates, the table lays out a range of values to use for monetizing the social costs of carbon at various years in the future. For the purposes of this BCA, and following the clarification described in TIGER Benefit-Cost Analysis (BCA) Resource Guide, updated 5/3/13, the 3% values were chosen, and the total value of GHG reductions were discounted at 3% for both the 7% and 3% benefit-cost discount scenarios.

Macro-economic Costs of Oil Imports:

Over the 30 year project evaluation period, the “with-project” alternative results in the reduction of more than 190 million truck vehicle-miles-traveled which is equivalent to saving more than 30 million gallons of oil. In addition to contributing to the shipper freight cost reductions previously discussed, additional external costs associated with imported oil may be avoided as a result of these reductions. For example, “Transportation Cost and Benefit Analysis II – Resource Consumption External Costs,” published by the Victoria Transport Policy Institute (reference 4) identifies six categories of external costs associated with imported oil: Macro-economic costs, National Security costs, environmental damages, human health risks, financial subsidies, and depletion of non-renewable resources.

Reference 4 points out that “a major Federal study (reference 5) estimated that oil dependence cost the US economy $150 - $250 billion in 2005 when petroleum prices were just $35 - $45 per barrel, which suggests that these costs currently total $300 to $500 billion annually, equivalent to $85 to $140 per barrel, $2.00 to $3.00 per gallon, or $0.10 to $0.15 per vehicle-mile.” For the purposes of this BCA, a value of $2.00 per gallon was applied to the fuel consumed by the reduced truck VMT, estimated at 6.2 miles per gallon. No additional benefits were attributed to the other categories discussed in reference 4, since either there is considerable debate about appropriate values that should be used to monetize the oil reductions, or they were accounted for to some extent in the other measures described in this analysis.

Rail Offsets to Additional Truck VMT:

An effort was made to insure that the benefits resulting from reduced truck VMT were net benefits by offsetting costs resulting from the additional rail volume that would correspond to the reduced truck VMT. These offsets were made to the emissions, crash and CO_2 costs based on information provided in references 1 and 2. In addition, an offset was estimated for the loss of Federal fuel taxes resulting from the higher fuel efficiency of rail freight.

For emissions, it can be determined from reference 1 that the great preponderance of emissions costs is the result of PM. Reference 3 demonstrates that emissions of PM per ton-mile for rail are 90% of those for trucks. This ratio was used to estimate the rail emissions costs. (Reference 2 also concludes that it is unnecessary to compensate for possible differences in modal route circuity, therefore for the purposes of this BCA, truck VMT were used as an estimate of rail VMT.)

For crash, reference 2 demonstrates that injuries per ton-mile for rail are 6% of those for trucks. This ratio was used to estimate the rail crash costs.

For Social Costs of Carbon/GHG (CO_2), reference 2 demonstrates that GHG emissions per ton-mile for rail are approximately 38% of that for trucks. This ratio was used to estimate the tons of GHG for rail, which were monetized on the same basis as that for trucks described above.

In addition, an estimate was included that represents the loss of Federal Diesel tax revenues for the lost truck VMT, offset by the tax revenue from the equivalent rail use. The total truck VMT is converted to gallons of diesel using 6.2 miles per gallon (as indicated in reference 2) and the current Federal diesel tax per gallon ($0.244) is applied. The equivalent rail tax is estimated based on the ratio of fuel efficiency per ton-mile for rail as compared to trucks as demonstrated in reference 2. With trucks achieving 155 ton-miles per gallon and rail achieving 413 ton-miles per gallon, rail would consume 38% of the fuel as compared to trucks, for the same ton-miles, and therefore, pay 38% of the Federal fuel tax.

For oil import costs, the costs of equivalent rail activity was estimated based on the relative fuel efficiency of rail compared to truck per ton-mile, at 38% as described above.

The detailed calculations for benefits resulting from the monetization of reduced truck VMT are displayed in Table 8. As previously mentioned, the Excel Workbook supporting these calculations is also submitted.

Avoided Bulkhead Rehabilitation Cost

The bulkhead structures that form the Wet Basin are deteriorated past the point of repair and are well past their design life. The most cost effective means of rehabilitating these structures is to drive a new steel sheetpile wall inboard of the existing sheetpile wall. In 2005, 800 linear feet of new sheetpile wall was installed along the FMT bulkhead north of Pier 4 at a cost of $1,800,000, which translated to a unit cost of $2,250/LF. The total bulkhead length along the perimeter of the Wet Basin is 2045 LF. This equated to a total bulkhead rehabilitation cost of $4,601,250. By filling the Wet Basin, this will be an avoided cost/savings. However, for purposes of this BCA, we used an escalation factor of 3% since these amounts are in 2005 dollars. This is a one-time avoided cost that will incur in 2017.

Table 4: Freight Savings Benefit Calculations (7% discount rate):

With project		truck moves		rail moves				
	CAGR	share	avg dist	share	avg dist		tons per truck	15.2
Auto imports	3%	80%	636.46	20%	811.2		units/truck	8
Auto exports	3%	80%	636.46	20%	811.2		units/rail car	15
Other RO-RO imp	3%				926			
Other RO-RO exp	3%				926			
Without project						70	tons/rail car	
Auto imports	3%	100%	636.46	0%	811.2	0.045	$/ton-mile rail	
Auto exports	3%	100%	636.46	0%	811.2	0.08	$/ton-mile truck	10% ro ro rail efficiency savings

Without Project – Auto

Calendar Year	Project Year	Auto imports (units)	VMT imports	Auto exports (units)	Total Tons	Ton Miles	Truck Freight Cost	VMT exports	Total VMT
2012		128,000	10,183,360	65,000	366,700	233,389,882	$ 18,671,191	5,171,237.50	15,354,598
2013		131,840	10,488,861	66,950	377,701	240,391,578	$ 19,231,326	5,326,374.63	15,815,235
2014		135,795	10,803,527	68,959	389,032	247,603,326	$ 19,808,266	5,486,165.86	16,289,692
2015		139,869	11,127,632	71,027	400,703	255,031,426	$ 20,402,514	5,650,750.84	16,778,383
2016		144,065	11,461,461	73,158	412,724	262,682,368	$ 21,014,589	5,820,273.36	17,281,735
2017	1	148,387	11,805,305	75,353	425,106	270,562,839	$ 21,645,027	5,994,881.57	17,800,187
2018	2	152,839	12,159,464	77,613	437,859	278,679,725	$ 22,294,378	6,174,728.01	18,334,192
2019	3	157,424	12,524,248	79,942	450,995	287,040,116	$ 22,963,209	6,359,969.85	18,884,218
2020	4	162,147	12,899,976	82,340	464,525	295,651,320	$ 23,652,106	6,550,768.95	19,450,745
2021	5	167,011	13,286,975	84,810	478,460	304,520,859	$ 24,361,669	6,747,292.02	20,034,267
2022	6	172,021	13,685,584	87,355	492,814	313,656,485	$ 25,092,519	6,949,710.78	20,635,295
2023	7	177,182	14,096,152	89,975	507,599	323,066,180	$ 25,845,294	7,158,202.10	21,254,354
2024	8	182,497	14,519,036	92,674	522,827	332,758,165	$ 26,620,653	7,372,948.16	21,891,985
2025	9	187,972	14,954,607	95,455	538,511	342,740,910	$ 27,419,273	7,594,136.61	22,548,744
2026	10	193,611	15,403,246	98,318	554,667	353,023,137	$ 28,241,851	7,821,960.71	23,225,206
2027	11	199,420	15,865,343	101,268	571,307	363,613,832	$ 29,089,107	8,056,619.53	23,921,963
2028	12	205,402	16,341,303	104,306	588,446	374,522,246	$ 29,961,780	8,298,318.11	24,639,621
2029	13	211,564	16,831,542	107,435	606,099	385,757,914	$ 30,860,633	8,547,267.66	25,378,810
2030	14	217,911	17,336,489	110,658	624,282	397,330,651	$ 31,786,452	8,803,685.69	26,140,174
2031	15	224,449	17,856,583	113,978	643,011	409,250,571	$ 32,740,046	9,067,796.26	26,924,380
2032	16	231,182	18,392,281	117,397	662,301	421,528,088	$ 33,722,247	9,339,830.15	27,732,111
2033	17	238,118	18,944,049	120,919	682,170	434,173,931	$ 34,733,914	9,620,025.05	28,564,074
2034	18	245,261	19,512,371	124,547	702,635	447,199,148	$ 35,775,932	9,908,625.80	29,420,997
2035	19	252,619	20,097,742	128,283	723,714	460,615,123	$ 36,849,210	10,205,884.58	30,303,627
2036	20	260,198	20,700,674	132,132	745,426	474,433,577	$ 37,954,686	10,512,061.11	31,212,735
2037	21	268,004	21,321,694	136,096	767,788	488,666,584	$ 39,093,327	10,827,422.95	32,149,117
2038	22	276,044	21,961,345	140,178	790,822	503,326,581	$ 40,266,127	11,152,245.63	33,113,591
2039	23	284,325	22,620,186	144,384	814,547	518,426,379	$ 41,474,110	11,486,813.00	34,106,999
2040	24	292,855	23,298,791	148,715	838,983	533,979,170	$ 42,718,334	11,831,417.39	35,130,209
2041	25	301,640	23,997,755	153,177	864,153	549,998,545	$ 43,999,884	12,186,359.92	36,184,115
2042	26	310,690	24,717,688	157,772	890,077	566,498,502	$ 45,319,880	12,551,950.71	37,269,638
2043	27	310,690	24,717,688	157,772	890,077	566,498,502	$ 45,319,880	12,551,950.71	37,269,638
2044	28	310,690	24,717,688	157,772	890,077	566,498,502	$ 45,319,880	12,551,950.71	37,269,638
2045	29	310,690	24,717,688	157,772	890,077	566,498,502	$ 45,319,880	12,551,950.71	37,269,638
2046	30	310,690	24,717,688	157,772	890,077	566,498,502	$ 45,319,880	12,551,950.71	37,269,638
		7,643,101.19	**608,066,023.08**	**3,881,262.32**	**21,896,290.68**	**13,936,113,166.47**	**1,114,889,053.32**	**308,783,527.35**	**916,849,550.43**

With Project – Auto (Freight Savings)

Calendar Year	Auto imports (units)	VMT imports	Auto exports (units)	Total Tons auto	Auto ton miles by truck	Truck Freight Cost	Auto ton-mi by rail	Auto rail freight cost	Total freight cost	Auto freight savings	Disc auto freight savings
2012	128,000		65,000	366,700	233,389,882	$ 18,671,191	-		$ 18,671,191	$ -	$ -
2013	131,840		66,950	377,701	240,391,578	$ 19,231,326	-		$ 19,231,326	$ -	$ -
2014	135,795		68,959	389,032	247,603,326	$ 19,808,266	-		$ 19,808,266	$ -	$ -
2015	139,869		71,027	400,703	204,025,140	$ 16,322,011		$ -	$ 16,322,011		$ -
2016	144,065		73,158	412,724	210,145,895	$ 16,811,672		$ -	$ 16,811,672		$ -
2017	148,387	9,444,244	75,353	425,106	216,450,272	$ 17,316,022	68,969,165	$ 3,103,612	$ 20,419,634	$ (1,225,393)	$ (873,688)
2018	152,839	9,727,572	77,613	437,859	222,943,780	$ 17,835,502	71,038,240	$ 3,196,721	$ 21,032,223	$ (1,262,155)	$ (841,027)
2019	157,424	10,019,399	79,942	450,995	229,632,093	$ 18,370,567	73,169,388	$ 3,292,622	$ 21,663,190	$ (1,300,019)	$ (809,587)
2020	162,147	10,319,981	82,340	464,525	236,521,056	$ 18,921,684	75,364,469	$ 3,391,401	$ 22,313,086	$ (1,339,020)	$ (779,322)
2021	167,011	10,629,580	84,810	478,460	243,616,688	$ 19,489,335	77,625,403	$ 3,493,143	$ 22,982,478	$ (1,379,191)	$ (750,188)
2022	172,021	10,948,467	87,355	492,814	250,925,188	$ 20,074,015	79,954,165	$ 3,597,937	$ 23,671,952	$ (1,420,566)	$ (722,144)
2023	177,182	11,276,921	89,975	507,599	258,452,944	$ 20,676,236	82,352,790	$ 3,705,876	$ 24,382,111	$ (1,463,183)	$ (695,148)
2024	182,497	11,615,229	92,674	522,827	266,206,532	$ 21,296,523	84,823,374	$ 3,817,052	$ 25,113,574	$ (1,507,079)	$ (669,161)
2025	187,972	11,963,686	95,455	538,511	274,192,728	$ 21,935,418	87,368,075	$ 3,931,563	$ 25,866,982	$ (1,552,291)	$ (644,146)
2026	193,611	12,322,597	98,318	554,667	282,418,510	$ 22,593,481	89,989,118	$ 4,049,510	$ 26,642,991	$ (1,598,860)	$ (620,065)
2027	199,420	12,692,274	101,268	571,307	290,891,065	$ 23,271,285	92,688,791	$ 4,170,996	$ 27,442,281	$ (1,646,826)	$ (596,885)
2028	205,402	13,073,043	104,306	588,446	299,617,797	$ 23,969,424	95,469,455	$ 4,296,125	$ 28,265,549	$ (1,696,230)	$ (574,572)
2029	211,564	13,465,234	107,435	606,099	308,606,331	$ 24,688,506	98,333,539	$ 4,425,009	$ 29,113,516	$ (1,747,117)	$ (553,093)
2030	217,911	13,869,191	110,658	624,282	317,864,521	$ 25,429,162	101,283,545	$ 4,557,760	$ 29,986,921	$ (1,799,531)	$ (532,416)
2031	224,449	14,285,267	113,978	643,011	327,400,457	$ 26,192,037	104,322,051	$ 4,694,492	$ 30,886,529	$ (1,853,517)	$ (512,513)
2032	231,182	14,713,825	117,397	662,301	337,222,470	$ 26,977,798	107,451,713	$ 4,835,327	$ 31,813,125	$ (1,909,122)	$ (493,353)
2033	238,118	15,155,239	120,919	682,170	347,339,144	$ 27,787,132	110,675,264	$ 4,980,387	$ 32,767,518	$ (1,966,396)	$ (474,910)
2034	245,261	15,609,897	124,547	702,635	357,759,319	$ 28,620,746	113,995,522	$ 5,129,798	$ 33,750,544	$ (2,025,388)	$ (457,157)
2035	252,619	16,078,194	128,283	723,714	368,492,098	$ 29,479,368	117,415,388	$ 5,283,692	$ 34,763,060	$ (2,086,150)	$ (440,067)
2036	260,198	16,560,539	132,132	745,426	379,546,861	$ 30,363,749	120,937,849	$ 5,442,203	$ 35,805,952	$ (2,148,734)	$ (423,616)
2037	268,004	17,057,356	136,096	767,788	390,933,267	$ 31,274,661	124,565,985	$ 5,605,469	$ 36,880,131	$ (2,213,196)	$ (407,780)
2038	268,004	17,057,356	136,096	767,788	390,933,267	$ 31,274,661	124,565,985	$ 5,605,469	$ 36,880,131	$ (3,385,996)	$ (583,053)
2039	268,004	17,057,356	136,096	767,788	390,933,267	$ 31,274,661	124,565,985	$ 5,605,469	$ 36,880,131	$ (4,593,980)	$ (739,311)
2040	268,004	17,057,356	136,096	767,788	390,933,267	$ 31,274,661	124,565,985	$ 5,605,469	$ 36,880,131	$ (5,838,203)	$ (878,079)
2041	268,004	17,057,356	136,096	767,788	390,933,267	$ 31,274,661	124,565,985	$ 5,605,469	$ 36,880,131	$ (7,119,753)	$ (1,000,773)
2042	268,004	17,057,356	136,096	767,788	390,933,267	$ 31,274,661	124,565,985	$ 5,605,469	$ 36,880,131	$ (8,439,749)	$ (1,108,706)
2043	268,004	17,057,356	136,096	767,788	390,933,267	$ 31,274,661	124,565,985	$ 5,605,469	$ 36,880,131	$ (8,439,749)	$ (1,036,173)
2044	268,004	17,057,356	136,096	767,788	390,933,267	$ 31,274,661	124,565,985	$ 5,605,469	$ 36,880,131	$ (8,439,749)	$ (968,386)
2045	268,004	17,057,356	136,096	767,788	390,933,267	$ 31,274,661	124,565,985	$ 5,605,469	$ 36,880,131	$ (8,439,749)	$ (905,034)
2046	268,004	17,057,356	136,096	767,788	390,933,267	$ 31,274,661	124,565,985	$ 5,605,469	$ 36,880,131	$ (8,439,749)	$ (845,826)
	7,346,821.58	**424,343,933.49**	**3,730,807.84**	**21,047,495.89**	**10,860,988,347.04**	**868,879,067.76**	**3,098,887,151.11**	**139,449,921.80**	**1,008,328,989.56**	**(98,276,643.05)**	**(20,936,178.32)**

With Project – Auto (VMT) and Ro-Ro (Freight Savings)

Calendar Year	VMT exports	Total VMT	VMT Reduction	Ro-Ro imports (tons)	Ro-Ro exports (tons)	Total ro ro tons	Total roro ton-mi	Ro ro freight savings	Disc ro ro freight savings	Total disc freight savings	Total tons auto and ro ro
2012											366,700
2013		-									377,701
2014		-									389,032
2015		-		54,200	47,900	102,100	94,544,600		$ -	$ -	502,803
2016		-		55,826	49,337	105,163	97,380,938		$ -	$ -	517,887
2017	4,795,905.25	14,240,149	(3,560,037)	57,501	50,817	108,318	100,302,366	$ (451,361)	$ (321,814)	$ (1,195,502)	533,424
2018	4,939,782.41	14,667,354	(3,666,838)	59,226	52,342	111,567	103,311,437	$ (464,901)	$ (309,783)	$ (1,150,810)	549,426
2019	5,087,975.88	15,107,375	(3,776,844)	61,003	53,912	114,914	106,410,780	$ (478,849)	$ (298,203)	$ (1,107,790)	565,909
2020	5,240,615.16	15,560,596	(3,890,149)	62,833	55,529	118,362	109,603,104	$ (493,214)	$ (287,055)	$ (1,066,377)	582,886
2021	5,397,833.61	16,027,414	(4,006,853)	64,718	57,195	121,913	112,891,197	$ (508,010)	$ (276,324)	$ (1,026,512)	600,373
2022	5,559,768.62	16,508,236	(4,127,059)	66,659	58,911	125,570	116,277,933	$ (523,251)	$ (265,994)	$ (988,138)	618,384
2023	5,726,561.68	17,003,483	(4,250,871)	68,659	60,678	129,337	119,766,271	$ (538,948)	$ (256,050)	$ (951,198)	636,936
2024	5,898,358.53	17,513,588	(4,378,397)	70,719	62,499	133,217	123,359,259	$ (555,117)	$ (246,478)	$ (915,639)	656,044
2025	6,075,309.29	18,038,995	(4,509,749)	72,840	64,374	137,214	127,060,037	$ (571,770)	$ (237,264)	$ (881,410)	675,725
2026	6,257,568.57	18,580,165	(4,645,041)	75,025	66,305	141,330	130,871,838	$ (588,923)	$ (228,395)	$ (848,460)	695,997
2027	6,445,295.62	19,137,570	(4,784,393)	77,276	68,294	145,570	134,797,993	$ (606,591)	$ (219,856)	$ (816,742)	716,877
2028	6,638,654.49	19,711,697	(4,927,924)	79,595	70,343	149,937	138,841,933	$ (624,789)	$ (211,638)	$ (786,209)	738,383
2029	6,837,814.13	20,303,048	(5,075,762)	81,982	72,453	154,435	143,007,191	$ (643,532)	$ (203,726)	$ (756,818)	760,535
2030	7,042,948.55	20,912,140	(5,228,035)	84,442	74,627	159,068	147,297,406	$ (662,838)	$ (196,110)	$ (728,526)	783,351
2031	7,254,237.01	21,539,504	(5,384,876)	86,975	76,865	163,841	151,716,328	$ (682,723)	$ (188,779)	$ (701,292)	806,851
2032	7,471,864.12	22,185,689	(5,546,422)	89,584	79,171	168,756	156,267,818	$ (703,205)	$ (181,722)	$ (675,075)	831,057
2033	7,696,020.04	22,851,260	(5,712,815)	92,272	81,547	173,818	160,955,853	$ (724,301)	$ (174,928)	$ (649,839)	855,988
2034	7,926,900.64	23,536,797	(5,884,199)	95,040	83,993	179,033	165,784,528	$ (746,030)	$ (168,389)	$ (625,546)	881,668
2035	8,164,707.66	24,242,901	(6,060,725)	97,891	86,513	184,404	170,758,064	$ (768,411)	$ (162,094)	$ (602,161)	908,118
2036	8,409,648.89	24,970,188	(6,242,547)	100,828	89,108	189,936	175,880,806	$ (791,464)	$ (156,034)	$ (579,650)	935,362
2037	8,661,938.36	25,719,294	(6,429,823)	103,853	91,781	195,634	181,157,230	$ (815,208)	$ (150,201)	$ (557,981)	963,423
2038	8,661,938.36	25,719,294	(7,394,297)	103,853	91,781	195,634	181,157,230	$ (815,208)	$ (140,375)	$ (723,428)	963,423
2039	8,661,938.36	25,719,294	(8,387,705)	103,853	91,781	195,634	181,157,230	$ (815,208)	$ (131,192)	$ (870,502)	963,423
2040	8,661,938.36	25,719,294	(9,410,915)	103,853	91,781	195,634	181,157,230	$ (815,208)	$ (122,609)	$ (1,000,688)	963,423
2041	8,661,938.36	25,719,294	(10,464,821)	103,853	91,781	195,634	181,157,230	$ (815,208)	$ (114,588)	$ (1,115,360)	963,423
2042	8,661,938.36	25,719,294	(11,550,344)	103,853	91,781	195,634	181,157,230	$ (815,208)	$ (107,091)	$ (1,215,797)	963,423
2043	8,661,938.36	25,719,294	(11,550,344)	103,853	91,781	195,634	181,157,230	$ (815,208)	$ (100,085)	$ (1,136,259)	963,423
2044	8,661,938.36	25,719,294	(11,550,344)	103,853	91,781	195,634	181,157,230	$ (815,208)	$ (93,538)	$ (1,061,924)	963,423
2045	8,661,938.36	25,719,294	(11,550,344)	103,853	91,781	195,634	181,157,230	$ (815,208)	$ (87,419)	$ (992,453)	963,423
2046	8,661,938.36	25,719,294	(11,550,344)	103,853	91,781	195,634	181,157,230	$ (815,208)	$ (81,700)	$ (927,526)	963,423
	215,487,153.72	**639,831,087.21**	**(195,498,819.78)**	**2,693,621.54**	**2,380,525.31**	**5,074,146.85**	**4,698,659,981.81**	**(20,280,305.00)**	**(5,719,434.45)**	**(26,655,612.77)**	**23,967,519.64**

Table 5: VMT Savings Based Benefit Calculations (7% Discount rate):

$ 0.141	Pavement
$ 0.061	Congestion
$ 0.012	Crash
$ 0.052	Air Pollution
$ 0.008	Noise

mpg	Macro-costs/gallon
6.2	$ 2.00

		Rail Fuel Efficiency Ratio		Rail Injuries;Truck Injuries		Rail; Truck PM		
Freight tons/truck unit(int'l or dom)		155	ton-mi./gal; truck	5.814	rail per billion ton-mi.	0.01624	rail g/ton-mi.	
17	load	413	ton-mi./gal; rail	99.044	truck per billion ton-mi.	0.018	truck g/ton-mi.	
50%	empty return	37.5%		5.9%		90.2%		
15.2	tons				$ 0.244	Federal diesel tax		
				Tons GHG (CO2) per M ton-mi.=	71.61			

VMT Savings (7% discount rate)

Calendar Year	Project Year	Pavement Savings	discount factor	Discounted Pavement Savings 3%	Congestion Savings	Discounted Congestion Savings	Crash Savings	Discounted Crash Savings	Air pollution savings	Discounted Air pollution	Noise Savings	Discounted Noise Savings	Gallons of truck fuel saved	Macro-economic Oil Import Savings	Discounted Macro-Econ. Oil Import Savings
2012			1.00												
2013			0.93												
2014			0.87												
2015		-	0.82	-	-	-	-	-	-	-	-	-	-	-	-
2016		-	0.76	-	-	-	-	-	-	-	-	-	-	-	-
2017	1	(500,705)	0.71	(356,996)	(217,599)	(155,145)	(43,257)	(30,841)	(185,432)	(132,211)	(27,596)	(19,676)	(574,199.57)	(1,148,399)	(818,793)
2018	2	(515,726)	0.67	(343,650)	(224,127)	(149,345)	(44,554)	(29,688)	(190,995)	(127,268)	(28,424)	(18,940)	(591,425.56)	(1,182,851)	(788,184)
2019	3	(531,198)	0.62	(330,803)	(230,851)	(143,762)	(45,891)	(28,579)	(196,725)	(122,511)	(29,277)	(18,232)	(609,168.33)	(1,218,337)	(758,719)
2020	4	(547,134)	0.58	(318,437)	(237,776)	(138,388)	(47,268)	(27,510)	(202,627)	(117,931)	(30,155)	(17,551)	(627,443.38)	(1,254,887)	(730,356)
2021	5	(563,548)	0.54	(306,533)	(244,909)	(133,214)	(48,686)	(26,482)	(208,706)	(113,522)	(31,060)	(16,895)	(646,266.68)	(1,292,533)	(703,053)
2022	6	(580,454)	0.51	(295,074)	(252,257)	(128,234)	(50,146)	(25,492)	(214,967)	(109,278)	(31,992)	(16,263)	(665,654.68)	(1,331,309)	(676,770)
2023	7	(597,868)	0.48	(284,043)	(259,824)	(123,441)	(51,651)	(24,539)	(221,416)	(105,193)	(32,951)	(15,655)	(685,624.32)	(1,371,249)	(651,470)
2024	8	(615,804)	0.44	(273,424)	(267,619)	(118,826)	(53,200)	(23,622)	(228,058)	(101,261)	(33,940)	(15,070)	(706,193.05)	(1,412,386)	(627,116)
2025	9	(634,278)	0.41	(263,203)	(275,648)	(114,384)	(54,796)	(22,738)	(234,900)	(97,475)	(34,958)	(14,506)	(727,378.84)	(1,454,758)	(603,673)
2026	10	(653,306)	0.39	(253,364)	(283,917)	(110,108)	(56,440)	(21,888)	(241,947)	(93,831)	(36,007)	(13,964)	(749,200.21)	(1,498,400)	(581,106)
2027	11	(672,906)	0.36	(243,892)	(292,435)	(105,992)	(58,133)	(21,070)	(249,206)	(90,324)	(37,087)	(13,442)	(771,676.21)	(1,543,352)	(559,382)
2028	12	(693,093)	0.34	(234,775)	(301,208)	(102,029)	(59,877)	(20,282)	(256,682)	(86,947)	(38,200)	(12,940)	(794,826.50)	(1,589,653)	(538,470)
2029	13	(713,886)	0.32	(225,998)	(310,244)	(98,215)	(61,674)	(19,524)	(264,382)	(83,697)	(39,346)	(12,456)	(818,671.29)	(1,637,343)	(518,341)
2030	14	(735,302)	0.30	(217,549)	(319,551)	(94,544)	(63,524)	(18,794)	(272,314)	(80,568)	(40,526)	(11,990)	(843,231.43)	(1,686,463)	(498,964)
2031	15	(757,361)	0.28	(209,417)	(329,138)	(91,009)	(65,429)	(18,092)	(280,483)	(77,556)	(41,742)	(11,542)	(868,528.38)	(1,737,057)	(480,311)
2032	16	(780,082)	0.26	(201,588)	(339,012)	(87,607)	(67,392)	(17,415)	(288,898)	(74,657)	(42,994)	(11,111)	(894,584.23)	(1,789,168)	(462,355)
2033	17	(803,485)	0.24	(194,052)	(349,182)	(84,332)	(69,414)	(16,764)	(297,565)	(71,866)	(44,284)	(10,695)	(921,421.75)	(1,842,844)	(445,071)
2034	18	(827,589)	0.23	(186,798)	(359,658)	(81,179)	(71,497)	(16,138)	(306,491)	(69,179)	(45,613)	(10,295)	(949,064.41)	(1,898,129)	(428,433)
2035	19	(852,417)	0.21	(179,815)	(370,447)	(78,145)	(73,641)	(15,534)	(315,686)	(66,593)	(46,981)	(9,910)	(977,536.34)	(1,955,073)	(412,416)
2036	20	(877,989)	0.20	(173,093)	(381,561)	(75,223)	(75,851)	(14,954)	(325,157)	(64,104)	(48,390)	(9,540)	(1,006,862.43)	(2,013,725)	(396,999)
2037	21	(904,329)	0.18	(166,622)	(393,008)	(72,411)	(78,126)	(14,395)	(334,912)	(61,707)	(49,842)	(9,183)	(1,037,068.30)	(2,074,137)	(382,158)
2038	22	(1,039,978)	0.17	(179,080)	(451,959)	(77,825)	(89,845)	(15,471)	(385,148)	(66,321)	(57,318)	(9,870)	(1,192,628.55)	(2,385,257)	(410,731)
2039	23	(1,179,697)	0.16	(189,849)	(512,678)	(82,506)	(101,916)	(16,401)	(436,892)	(70,309)	(65,019)	(10,464)	(1,352,855.60)	(2,705,711)	(435,431)
2040	24	(1,323,608)	0.15	(199,073)	(575,220)	(86,514)	(114,348)	(17,198)	(490,188)	(73,725)	(72,951)	(10,972)	(1,517,889.46)	(3,035,779)	(456,588)
2041	25	(1,471,835)	0.14	(206,885)	(639,637)	(89,909)	(127,154)	(17,873)	(545,083)	(76,618)	(81,120)	(11,402)	(1,687,874.34)	(3,375,749)	(474,505)
2042	26	(1,624,510)	0.13	(213,407)	(705,987)	(92,743)	(140,344)	(18,437)	(601,625)	(79,034)	(89,535)	(11,762)	(1,862,958.77)	(3,725,918)	(489,463)
2043	27	(1,624,510)	0.12	(199,446)	(705,987)	(86,676)	(140,344)	(17,230)	(601,625)	(73,863)	(89,535)	(10,992)	(1,862,958.77)	(3,725,918)	(457,442)
2044	28	(1,624,510)	0.11	(186,398)	(705,987)	(81,006)	(140,344)	(16,103)	(601,625)	(69,031)	(89,535)	(10,273)	(1,862,958.77)	(3,725,918)	(427,516)
2045	29	(1,624,510)	0.11	(174,204)	(705,987)	(75,706)	(140,344)	(15,050)	(601,625)	(64,515)	(89,535)	(9,601)	(1,862,958.77)	(3,725,918)	(399,548)
2046	30	(1,624,510)	0.10	(162,807)	(705,987)	(70,754)	(140,344)	(14,065)	(601,625)	(60,294)	(89,535)	(8,973)	(1,862,958.77)	(3,725,918)	(373,409)
		(27,496,127.01)		**(6,970,273.18)**	**(11,949,396.16)**	**(3,029,174.09)**	**(2,375,427.96)**	**(602,171.42)**	**(10,182,986.13)**	**(2,581,388.83)**	**(1,515,448.20)**	**(384,166.39)**	**(31,532,067.71)**	**(63,064,135.41)**	**(15,986,769.75)**

Rail Offsets (3% escalation factor)

Calendar Year	Total truck VMT reductions	Ton-miles of VMT reductions	Tons GHG (CO2) eliminated	$ per ton of GHG (current year)	Value of GHG reduction	Discounted Value of GHG	Rail offset macro-econ savings (disc)	Rail offset crash (disc)	Rail offset air pollution(disc)	Rail offset GHG(disc)	Gallons of truck fuel saved	Federal Truck Fuel Tax	Discounted Federal Truck Fuel Tax	Rail Fuel Tax Offset (disc)	Bulkhead Rehabilitation AvoidedCost	Discounted Rehabilitation Avoided Costs
2012															5,658,957.12	
2013															5,828,725.84	
2014															6,003,587.61	
2015	-	-	-	$ 23.80	$ -	-	-	-	-	-	-	-	-	-	6,183,695.24	
2016	-	-	-	$ 24.30	$ -	-	-	-	-	-	-	-	-	-	6,369,206.10	
2017	(3,560,037)	(54,112,568)	(3,875)	$ 24.80	$ (96,100.02)	(68,518)	307,295.09	1,810.42	119,283.45	25,714.98	(574,199.57)	140,104.70	114,367.17	(42,922.30)	6,560,282.28	4,677,390.60
2018	(3,666,838)	(55,735,945)	(3,991)	$ 25.30	$ (100,978.65)	(67,286)	295,807.42	1,742.74	114,824.26	25,252.74	(591,425.56)	144,307.84	117,798.18	(44,209.97)		
2019	(3,776,844)	(57,408,023)	(4,111)	$ 25.80	$ (106,063.50)	(66,051)	284,749.20	1,677.60	110,531.76	24,789.12	(609,168.33)	148,637.07	121,332.13	(45,536.27)		
2020	(3,890,149)	(59,130,264)	(4,234)	$ 26.30	$ (111,362.57)	(64,814)	274,104.37	1,614.88	106,399.73	24,324.88	(627,443.38)	153,096.18	124,972.09	(46,902.36)		
2021	(4,006,853)	(60,904,172)	(4,361)	$ 27.00	$ (117,756.39)	(64,052)	263,857.48	1,554.51	102,422.17	24,038.76	(646,266.68)	157,689.07	128,721.25	(48,309.43)		
2022	(4,127,059)	(62,731,297)	(4,492)	$ 27.60	$ (123,984.39)	(63,027)	253,993.65	1,496.40	98,593.31	23,654.34	(665,654.68)	162,419.74	132,582.89	(49,758.71)		
2023	(4,250,871)	(64,613,236)	(4,627)	$ 28.30	$ (130,942.79)	(62,210)	244,498.56	1,440.46	94,907.58	23,347.57	(685,624.32)	167,292.33	136,560.38	(51,251.47)		
2024	(4,378,397)	(66,551,633)	(4,766)	$ 28.90	$ (137,730.53)	(61,154)	235,358.42	1,386.61	91,359.63	22,951.26	(706,193.05)	172,311.10	140,657.19	(52,789.02)		
2025	(4,509,749)	(68,548,182)	(4,909)	$ 29.60	$ (145,298.57)	(60,294)	226,559.98	1,334.77	87,944.32	22,628.40	(727,378.84)	177,480.44	144,876.90	(54,372.69)		
2026	(4,645,041)	(70,604,627)	(5,056)	$ 30.20	$ (152,691.12)	(59,216)	218,090.45	1,284.88	84,656.68	22,224.02	(749,200.21)	182,804.85	149,223.21	(56,003.87)		
2027	(4,784,393)	(72,722,766)	(5,208)	$ 30.90	$ (160,917.23)	(58,324)	209,937.53	1,236.84	81,491.94	21,889.08	(771,676.21)	188,289.00	153,699.91	(57,683.98)		
2028	(4,927,924)	(74,904,449)	(5,364)	$ 31.50	$ (168,963.09)	(57,234)	202,089.40	1,190.61	78,445.51	21,479.94	(794,826.50)	193,937.67	158,310.90	(59,414.50)		
2029	(5,075,762)	(77,151,583)	(5,525)	$ 32.10	$ (177,346.88)	(56,143)	194,534.66	1,146.10	75,512.97	21,070.80	(818,671.29)	199,755.80	163,060.23	(61,196.94)		
2030	(5,228,035)	(79,466,130)	(5,691)	$ 32.80	$ (186,650.68)	(55,223)	187,262.33	1,103.25	72,690.06	20,725.41	(843,231.43)	205,748.47	167,952.04	(63,032.85)		
2031	(5,384,876)	(81,850,114)	(5,861)	$ 33.40	$ (195,766.97)	(54,131)	180,261.87	1,062.01	69,972.67	20,315.58	(868,528.38)	211,920.92	172,990.60	(64,923.83)		
2032	(5,546,422)	(84,305,618)	(6,037)	$ 34.10	$ (205,865.97)	(53,200)	173,523.11	1,022.31	67,356.87	19,965.98	(894,584.23)	218,278.55	178,180.32	(66,871.55)		
2033	(5,712,815)	(86,834,786)	(6,218)	$ 34.70	$ (215,772.89)	(52,112)	167,036.27	984.09	64,838.86	19,557.76	(921,421.75)	224,826.91	183,525.73	(68,877.69)		
2034	(5,884,199)	(89,439,830)	(6,405)	$ 35.40	$ (226,729.43)	(51,176)	160,791.92	947.30	62,414.97	19,206.42	(949,064.41)	231,571.72	189,031.50	(70,944.03)		
2035	(6,060,725)	(92,123,025)	(6,597)	$ 36.40	$ (240,128.24)	(50,654)	154,781.01	911.89	60,081.70	19,010.70	(977,536.34)	238,518.87	194,702.44	(73,072.35)		
2036	(6,242,547)	(94,886,715)	(6,795)	$ 37.40	$ (254,126.93)	(50,100)	148,994.80	877.80	57,835.66	18,802.76	(1,006,862.43)	245,674.43	200,543.52	(75,264.52)		
2037	(6,429,823)	(97,733,317)	(6,999)	$ 38.40	$ (268,749.42)	(49,517)	143,424.90	844.99	55,673.58	18,583.81	(1,037,068.30)	253,044.67	206,559.82	(77,522.45)		
2038	(7,394,297)	(112,393,314)	(8,048)	$ 39.40	$ (317,110.32)	(54,605)	154,148.26	908.16	59,836.09	20,493.39	(1,192,628.55)	291,001.37	237,543.80	(89,150.82)		
2039	(8,387,705)	(127,493,112)	(9,130)	$ 40.40	$ (368,843.18)	(59,358)	163,418.45	962.78	63,434.52	22,277.24	(1,352,855.60)	330,096.77	269,457.29	(101,128.04)		
2040	(9,410,915)	(143,045,903)	(10,244)	$ 41.40	$ (424,081.61)	(63,783)	171,358.64	1,009.56	66,516.68	23,937.86	(1,517,889.46)	370,365.03	302,328.19	(113,464.57)		
2041	(10,464,821)	(159,065,278)	(11,391)	$ 42.40	$ (482,964.18)	(67,887)	178,082.89	1,049.17	69,126.85	25,478.10	(1,687,874.34)	411,841.34	336,185.21	(126,171.21)		
2042	(11,550,344)	(175,565,235)	(12,572)	$ 43.40	$ (545,634.63)	(71,678)	183,696.78	1,082.25	71,306.01	26,901.11	(1,862,958.77)	454,561.94	371,057.95	(139,259.04)		
2043	(11,550,344)	(175,565,235)	(12,572)	$ 44.40	$ (558,206.85)	(68,533)	171,679.24	1,011.45	66,641.13	25,720.52	(1,862,958.77)	454,561.94	371,057.95	(139,259.04)		
2044	(11,550,344)	(175,565,235)	(12,572)	$ 45.40	$ (570,779.08)	(65,492)	160,447.89	945.28	62,281.43	24,579.26	(1,862,958.77)	454,561.94	371,057.95	(139,259.04)		
2045	(11,550,344)	(175,565,235)	(12,572)	$ 46.40	$ (583,351.31)	(62,556)	149,951.30	883.44	58,206.94	23,477.25	(1,862,958.77)	454,561.94	371,057.95	(139,259.04)		
2046	(11,550,344)	(175,565,235)	(12,572)	$ 47.40	$ (595,923.53)	(59,723)	140,141.40	825.64	54,399.01	22,414.23	(1,862,958.77)	454,561.94	371,057.95	(139,259.04)		
	(195,498,819.78)	**(2,971,582,060.64)**	**(212,794.99)**	**1,041.50**	**(7,970,820.98)**	**(1,798,050.88)**	**5,999,877.27**	**35,348.17**	**2,328,986.36**	**674,813.28**	**(31,532,067.71)**	**7,693,824.52**	**6,280,452.62**	**(2,357,070.60)**		**-**

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