

Globalplex Multi-Modal Connections Project

2019 Port Development Infrastructure Grant Application

Benefit Cost Analysis

**September 16, 2019**

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# Introduction

This technical memorandum presents the long-term benefits associated with the Globalplex Multi-Modal Connections Project (hereafter, “Project”), estimated by a benefit-cost analysis (BCA). The BCA was conducted to support the Project’s grant application for the U.S. Department of Transportation’s (DOT) 2019 Port Infrastructure Development Program (PIDG), using the methods described in the U.S. DOT’s Benefit-Cost Analysis Guidance for Discretionary Grant Programs.[[1]](#footnote-1) The results are the discounted streams of anticipated benefits and costs and the Benefit-Cost Ratio (BCR) for the Project using a 7 percent discount rate.

The Project consists of several different components which will work together to improve the capacity and efficiency of the Port of South Louisiana’s (POSL) public Globalplex facility. Within the Globalplex facility, cargo has quadrupled since 2007, largely in part due to the continuous strides of the POSL to bring the facility to a state of good repair (SOGR). The various construction projects and upgrades have been developed strategically and are designed to facilitate industrial development.

The drastic increase in throughput has created demand for additional infrastructure improvements at the Globalplex facility. The POSL’s plan is to bring the current infrastructure at Globalplex to working standards and increase warehousing options along with improving the linked transportation network, increasing the capacity and addressing the remaining bottlenecks at the facility to allow it to function as an efficient public bulk and breakbulk facility. The Project consists of the construction of main five components: heavy load capacity floor at Building 71, conveyor improvements, access road rehabilitation, a rail spur connection, and a new dock access bridge/road for heavy cargo.

The benefits quantified in the BCA are described in the following pages in 2017 dollars, discounted to 2019. In accordance with the Notice of Funding Opportunity for the PIDG, benefits for the Project are described within the following benefit categories: bringing facilities to a SOGR and improving safety and efficiency.

# Benefits Analysis Framework

Due in part to the continuous strides of the POSL to make improvements and bring various components to a SOGR, demand for the facility has increased and storage at the Globalplex facility is now at capacity. Building 71 is in disrepair, does not have a strong enough floor to be used for the desired cargo, and is accessed by a gravel road that requires significant annual operations and maintenance (O&M) spending. In addition, the access bridge to the general cargo dock is one-way, which results in inefficiencies when unloading vessels.

Because storage at Globalplex is currently at capacity, a major tenant at Globalplex must dray a portion of its imports to another facility with available storage. The tenant’s New Orleans facility is located on the Inner Harbor Navigation Canal, which no longer has deep draft access. Any imports above Globalplex’s storage capacity are therefore drayed to the New Orleans facility, where they are then loaded onto rail for further distribution throughout the country. The combination of improvements included in this Project would allow both bulk and general cargo imports at Globalplex to be efficiently transferred to Building 71, which will be able to accommodate an estimated 1.4 million tons per year, and then loaded directly onto the rail network for shipment.

Although an existing tenant has an immediate need, Project improvements will also be accessible to other existing and future tenants and are expected to attract more business and economic development at the Port. The conveyor improvements will include both inbound and outbound conveyors so the site can be used for both imports and exports.

The Project Impact Matrix is shown in Table 1.

Table : Impact Matrix

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Current Status/Baseline & Problem to be Addressed** | **Change to Baseline or Alternatives** | **Types of Impacts** | **Affected Population** | **Economic Benefit (Net Present Values, $2017 M)** |
| **Discounted at 7%** |
| Storage at Globalplex is at capacity. An existing warehouse is in disrepair and does not have a strong enough floor to be used for the desired cargo. It also lacks a direct rail link. The current tenants must dray additional cargo to another warehouse.  The access bridge to the general cargo dock is one-way, causing inefficiencies in vessel unloading.  The current conveyor system from the bulk dock is in disrepair and does not extend far enough to the warehouse.  A gravel road providing access to the warehouse requires significant annual O&M. | The existing warehouse floor will be modified to be able to hold the desired cargo. A direct rail spur will be added. The gravel access road will be paved, bringing it to a state of good repair and reducing annual O&M costs. The conveyor system will be extended to the warehouse from the bulk dock. The general cargo dock access bridge will be expanded for two-way traffic, reducing inefficiencies and decreasing vessel unloading time. Combined, these improvements will eliminate the need for drayage of cargo to another warehouse, saving considerable truck miles and all associated costs. | **Bring Facilities to a State of Good Repair** | | |
| Life-cycle Costs | POSL Tenants | $(3.4) |
| Reduced Pavement Damage | Louisiana DOTD; Taxpayers | $10.9 |
| Reduced Truck Emissions | Local Residents | $4.3 |
| Residual Value | POSL | $2.3 |
| **Advance Technology-Supported Safety and Efficiency** | | |
| Truck Operating Cost Savings | POSL Tenants | $69.5 |
| Vessel Operating Cost Savings | Vessel Operators | $15.2 |
| Reduced Roadway Accidents | Local Residents | $9.7 |
| Reduced Roadway Congestion | Local Residents | $22.3 |

## Analysis Assumptions

A list of assumptions for the Project is provided in the BCA workbook (see Inputs tab in the file POSL PIDG BCA Workbook Protected.xlsx) as well as in Table 2.

Table : Assumptions and Inputs

| **Input** | **Value** | **Source** |
| --- | --- | --- |
| Discount Rate | 7% | BCA Guidance for Discretionary Grant Programs - December, 2018 |
| Discount Year | 2019 |
| Dollar Year | 2017 |
| Analysis Period (years) | 20 |
| Project Completion / Scheduled Opening | 2021 | POSL & Associated Terminals |
| Analysis Period Begin - Benefits Realized | 2022 |
| Analysis Period End | 2041 | Project completion + Analysis period |
| Conversion rate for Metric tons to Short Tons | 1.1015 | BCA Guidance for Discretionary Grant Programs - December 2018 |
| Conversion rate for grams per metric ton | 1,000,000 | <https://www.metric-conversions.org/weight/grams-to-metric-tons.htm> |
| Conversion rate for kg per metric ton | 1,000 |
| Conversion - pounds per short ton | 2,000 |
| Building 71 Footprint (sq. ft.) | 54,000 | POSL & Associated Terminals |
| Building 71 Capacity (lbs./sq. ft.) | 2,000 |
| Building 71 Capacity (tons/sq. ft.) | 54,000 |
| Cycle time of warehouse (days) | 14 |
| Annualization | 360 |
| Maximum Annual Warehouse Throughput (tons) | 1,388,571 |
| Percent Warehouse Tonnage using Conveyor | 50% |
| Percent Warehouse Tonnage using Access Bridge | 50% |
| Percent Warehouse Capacity Used in Year 1 | 75% |
| Annual Growth | 5% |
| Truck capacity (lbs.) - assumes tandem axle | 40,000 | https://ops.fhwa.dot.gov/freight/policy/rpt\_congress/truck\_sw\_laws/app\_a.htm#la |
| Truck capacity (short tons) - assumes tandem axle | 20 |
| One-Way Drayage distance - with project (miles) | 0.5 | Google Earth |
| One-Way Drayage distance - without project (miles) | 33.5 |
| One-Way Drayage time - with project (minutes) | 2 |
| One-Way Drayage time - without project (minutes) | 47 |
| Truck loading time - with project (minutes) | 19 | POSL and Associated Terminals |
| Truck loading time - without project (minutes) | 25 |
| Value of Time - Truck (2017$) | $28.60 | BCA Guidance for Discretionary Grant Programs - December 2018 |
| Vehicle Operating Cost per mile (2017$), truck | $0.90 |
| Average Marginal Costs per Hour, 2008-2014 (2014$): | | Source: Table 9, An Analysis of the Operational Costs of Trucking: 2015 Update (http://atri-online.org/wp-content/uploads/2015/09/ATRI-Operational-Costs-of-Trucking-2015-FINAL-09-2015.pdf), Converted to 2017$ using GDP Deflator |
| Fuel-Oil Costs | $23.29 |
| Truck/Trailer Lease or Purchase Payments | $8.59 |
| Repair and Maintenance | $6.31 |
| Truck Insurance Premiums | $2.89 |
| Tires | $1.76 |
| Licensing and Permits | $0.76 |
| Driver Benefits | $5.15 |
| Total (excluding Driver Pay, Tires and License/Permits) (2014$) | $46.23 |
| Total (excluding Driver Pay, Tires and License/Permits) (2017$) | $48.08 |
| Truck Operating Costs/hour (2017$) | $76.68 | Sum of Value of Time and Marginal Costs per Hour, excluding tires and license/permits |
| In Port Vessel Operating Cost per Hour ($2004) | $399.00 | 50,000 DWT Vessel (http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.225.486&rep=rep1&type=pdf), Converted to 2017$ using GDP Deflator |
| In Port Vessel Operating Cost per Hour ($2017) | $509.29 |
| Fatalities in Large Truck Crashes, per 100M VMT by Large Trucks, 2017 | 1.6 | Source: Tables 4, 7, and 10 (https://www.fmcsa.dot.gov/safety/data-and-statistics/large-truck-and-bus-crash-facts-2017) |
| Persons Injured in Large Truck Crashes, per 100M VMT by Large Trucks, 2017 | 49.7 |
| Large Trucks Involved in PDO Crashes, per 100M VMT by Large Trucks, 2017 | 122.1 |
| Cost of Congestion per Truck mile ($2000) | $0.4090 | https://www.fhwa.dot.gov/policy/hcas/addendum.cfm, Converted to 2017$ using GDP Deflator |
| Cost of Congestion per Truck mile ($2017) | $0.5661 |
| Pavement Costs per Truck mile ($2000) | $0.2006 |
| Pavement Costs per Truck mile ($2017) | $0.2777 |
| Truck Emissions Rate g per mile VOC (average of gasoline and diesel) | 1.0165 | nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100EVY6.TXT |
| Truck Emissions Rate g per mile Nox (average of gasoline and diesel) | 5.7635 |
| Truck Emissions Rate g per mile PM2.5 (average of gasoline and diesel) | 0.123 |
| Diesel Fuel kg CO2 per gallon | 10.21 | https://www.epa.gov/sites/production/files/2018-03/documents/emission-factors\_mar\_2018\_0.pdf |
| Motor gasoline kg CO2 per gallon | 8.78 |
| Heavy Duty Trucks, average MPG | 6.4 | https://www.eia.gov/opendata/qb.php?category=711246&sdid=TOTAL.TRFRRUS.A |

The basis for several Project benefits is the reduction in vehicle miles traveled (VMT) that will occur once imports no longer have to be drayed to another warehouse for storage. Based on the existing demand, it is assumed that the warehouse will handle 75 percent of its capacity upon opening and grow at 5 percent per year until it reaches its estimated annual capacity of approximately 1.4 million tons per year. Cargo throughput and vehicle miles saved are shown in Table 3.

Table : Building 71 Cargo Throughput and VMT Avoided

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Project Year** | **Calendar Year** | **Building 71 Usage**  **(short tons)** | **One-Way Truck Trips** | **Drayage Distance - without project (VMT)** | **Drayage Distance - with project (VMT)** | **VMT Avoided** |
| 1 | 2022 | 1,041,429 | 52,071 | 3,488,786 | 52,071 | 3,436,714 |
| 2 | 2023 | 1,093,500 | 54,675 | 3,663,225 | 54,675 | 3,608,550 |
| 3 | 2024 | 1,148,175 | 57,409 | 3,846,386 | 57,409 | 3,788,978 |
| 4 | 2025 | 1,205,584 | 60,279 | 4,038,706 | 60,279 | 3,978,426 |
| 5 | 2026 | 1,265,863 | 63,293 | 4,240,641 | 63,293 | 4,177,348 |
| 6 | 2027 | 1,329,156 | 66,458 | 4,452,673 | 66,458 | 4,386,215 |
| 7 | 2028 | 1,388,571 | 69,429 | 4,651,714 | 69,429 | 4,582,286 |
| 8 | 2029 | 1,388,571 | 69,429 | 4,651,714 | 69,429 | 4,582,286 |
| 9 | 2030 | 1,388,571 | 69,429 | 4,651,714 | 69,429 | 4,582,286 |
| 10 | 2031 | 1,388,571 | 69,429 | 4,651,714 | 69,429 | 4,582,286 |
| 11 | 2032 | 1,388,571 | 69,429 | 4,651,714 | 69,429 | 4,582,286 |
| 12 | 2033 | 1,388,571 | 69,429 | 4,651,714 | 69,429 | 4,582,286 |
| 13 | 2034 | 1,388,571 | 69,429 | 4,651,714 | 69,429 | 4,582,286 |
| 14 | 2035 | 1,388,571 | 69,429 | 4,651,714 | 69,429 | 4,582,286 |
| 15 | 2036 | 1,388,571 | 69,429 | 4,651,714 | 69,429 | 4,582,286 |
| 16 | 2037 | 1,388,571 | 69,429 | 4,651,714 | 69,429 | 4,582,286 |
| 17 | 2038 | 1,388,571 | 69,429 | 4,651,714 | 69,429 | 4,582,286 |
| 18 | 2039 | 1,388,571 | 69,429 | 4,651,714 | 69,429 | 4,582,286 |
| 19 | 2040 | 1,388,571 | 69,429 | 4,651,714 | 69,429 | 4,582,286 |
| 20 | 2041 | 1,388,571 | 69,429 | 4,651,714 | 69,429 | 4,582,286 |

# Benefits

This Project achieves two of the stated goals in the NOFO: 1) Advance technology-supported safety and design efficiency and 2) Bring facilities to a SOGR.

## Advance Technology-Supported Safety and Design Efficiency

Benefits of advancing technology-supported safety and design efficiency include truck operating cost savings, vessel operating cost savings, reduced roadway accidents, and reduced congestion. It should be noted that all of the improvements in the Project will facilitate both imports and exports. The current tenant has an existing need to facilitate imports; however, the Project will also promote manufacturing, agricultural, and other exports by increasing the efficient movement of goods and increasing the national export capacity. The benefits described in this section could be applied to both stated NOFO objectives. The methods used to estimate these benefits are described in this section.

### Truck Operating Cost Savings

The project produces truck operating cost savings in two separate ways. The tonnage that uses Building 71 no longer must be drayed to an alternate warehouse, saving 45 minutes per one-way trip. The reduced drayage time is multiplied by the truck operating cost per hour of $76.68 to calculate the reduced truck operating costs.

Additionally, improvements to the general cargo access bridge allow for two-way traffic, decreasing the time needed to load each truck from 25 minutes to 19 minutes. Half of the commodities using the warehouse are expected to be general cargo that would use this access bridge and experience this cost savings. Other general cargo that would not use Building 71 would also benefit from this efficiency improvement; however, since that cargo is not the focus of the other features of the Project, it was not included for the purposes of calculating Project benefits. Since these time savings occur when the trucks are idling while loading/unloading, the time was valued at the value of the truck driver time of $28.60 per hour, not the full truck operating cost.

Total truck operating cost savings associated with the Project are $69.5 million in 2017 dollars, discounted to 2019 using a 7 percent discount rate.

### Vessel Operating Cost Savings

The increased efficiency of truck loading at the general cargo dock will reduce the total time necessary to unload deep draft vessels by an equivalent amount of time. Vessel operating costs were estimated to be $509.29 per hour in 2017 dollars.

Vessel operating cost savings associated with the Project are $15.2 million in 2017 dollars, discounted to 2019 using a 7 percent discount rate.

### Reduced Roadway Accidents

The Project will reduce the number of large trucks on the road in an urban area. The reduction in VMT is associated with fewer roadway accidents and associated fatalities, injuries, and property damage. Rates for fatalities, injuries, and property damage per 100 million miles VMT by large trucks are shown in Table 2. Statistical values for each of these outcomes are shown in 2017 dollars in Table 4.

Table : Crash Outcome Values

|  |  |
| --- | --- |
| **Outcome** | **Value** |
| Fatality | $9,600,000 |
| Injury (Severity Unknown) | $174,000 |
| Property Damage Only (PDO) (per vehicle) | $4,300 |

The value of reduced roadway accidents associated with the Project are $9.7 million in 2017 dollars, discounted to 2019 using a 7 percent discount rate.

### Reduced Congestion

The reduction in VMT is also associated with reduced congestion for other drivers using the roadway. The cost of congestion is estimated to be $0.57 per VMT. The value of reduced roadway congestion associated with the Project $22.3 million in 2017 dollars, discounted to 2019 using a 7 percent discount rate.

## Bring Facilities to a State of Good Repair

Benefits captured to bring facilities to a state of good repair include life-cycle cost savings, reduced pavement damage, reduced emissions, and residual value. The methods used to estimate these benefits are described in this section.

### Life-Cycle Cost Savings

The Project will impact the total life-cycle costs associated with the facility. The current Building 71 access road is gravel and the Port spends $6,500 per month maintaining the gravel road, including the labor, equipment, and materials to routinely resurface and spread water to reduce dust on the roadway. The Project would pave this access road according to current standards and reduce annual O&M to the Louisiana DOTD average annual cost of $6,046 per road-mile (2019 dollars).

Other aspects of the Project will increase O&M costs. Annual O&M costs for each Project component are shown in Table 5.

Table : Project Component O&M Costs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Project Item** | **Quantity** | **Unit** | **Unit Cost** | **Total** | **Dollar Year** | **Total ($2017)** |
| Building 71 Floor Slab Load Capacity Upgrade | 54,000 | sq. ft | $5.00 | $270,000 | 2019 | $259,012 |
| Conveyor Improvements | $3,825,000 | Const Cost | 5% | $191,250 | 2019 | $183,467 |
| Access Road Improvements | 0.5 | mile | $6,046 | $3,023 | 2019 | $2,900 |
| Rail Spur Rehabilitation | 0.5 | mile | $6,000 | $3,000 | 2017 | $3,000 |
| Access Bridge & Road | 0.2 | mile | $6,046 | $1,209 | 2019 | $1,160 |
| **Total Annual O&M** | |  |  |  |  | **$449,539** |

The total net life-cycle costs over the course of the 20-year period of analysis is an increase of $3.4 million in 2017 dollars, discounted to 2019 using a 7 percent discount rate.

### Reduced Pavement Damage

The reduction in VMT is associated with reduced pavement damage and associated repair costs. Pavement damage is estimated at $0.28 per heavy truck VMT. The value of reduced roadway pavement damage associated with the Project is $10.9 million in 2017 dollars, discounted to 2019 using a 7 percent discount rate.

### Reduced Emissions

The reduction in VMT is also associated with reduced emissions. The increased efficiency of truck loading at the general cargo dock will decrease truck idling, which will also reduce emissions. Reduced emissions associated with the VMT reduction were quantified for this analysis but those associated with the reduced idling were not. Emission rates are shown in Table 2 per truck VMT for volatile organic compounds (VOC), nitrous oxide (NOx), and particulate matter (PM) and per gallon of diesel for carbon dioxide (CO2). Social costs per ton for each of these emission types are shown in Table 6.

Table : Social Costs by Emission Type

|  |  |
| --- | --- |
| **Emission Type** | **Value per Short Ton (2017$)** |
| VOC | $2,000 |
| NOx | $8,300 |
| PM | $377,800 |
| CO2 (per metric ton) (2017-2034) | $1 |
| CO2 (per metric ton) (2035-2050) | $2 |

The quantified value of reduced emissions associated with the Project is $4.3 million in 2017 dollars, discounted to 2019 using a 7 percent discount rate.

### Residual Value

Several project components have useful lives longer than the 20-year period of analysis. These components will have remaining value at the end of the period.

Table : Project Components Useful Lives and Residual Value

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Project Component** | **Initial Value** | **Useful Life[[2]](#footnote-2)** | **Remaining Life in 2041** | **Value in 2041** |
| Access roads and bridge | $10,305,000 | 60 years | 67% | $6,870,000 |
| Building | $5,995,000 | 40 years | 50% | $2,998,000 |
| Rail Spur | $1,223,000 | 38 years | 47% | $580,000 |
| Conveyor | $3,670,000 | 20 years | 0% | $0 |
| **Total Value Remaining after 2041** | |  |  | **$10,447,000** |

The residual value of the project components in 2041 is $2.3 million in 2017 dollars, discounted to 2019 using a 7 percent discount rate.

# Costs

Project costs include the engineering, design, and construction costs of each of the five project components. Project costs in 2019 dollars are shown in Table 8.

Table : Project Costs (2019 Dollars)1

|  |  |  |  |
| --- | --- | --- | --- |
| **Item Description** | **Engineering** | **Construction** | **Total (2019$)** |
| Building 71 Floor Slab Load Capacity Upgrade | $1,103,000 | $6,248,000 | $7,350,000 |
| Conveyor Improvements | $675,000 | $3,825,000 | $4,500,000 |
| Access Road Rehabilitation | $248,000 | $1,403,000 | $1,651,000 |
| Rail Spur Connection | $225,000 | $1,275,000 | $1,500,000 |
| Access Bridge & Inter-facility Heavy-Load Access Road | $1,118,000 | $9,336,000 | $10,454,000 |
| **Total Project Cost** | **$3,368,000** | **$22,086,000** | **$25,455,000** |

1Totals may not sum due to rounding.

Design engineering is planned for March to July 2020. Procurement and construction bidding are anticipated to take five months from August to December 2020. Construction is expected to last 12 months from January to December 2021.

Project costs were converted from 2019 dollars to 2017 dollars using the GDP deflator so that Project costs could be accurately compared to Project benefits. Costs were separated between design engineering costs in 2020 and construction costs in 2021 and discounted to 2019. Total Project costs are estimated at $21.5 million in 2017 dollars, discounted to 2019 using a 7 percent discount rate.

# Benefit Cost Analysis Results

Total Project benefits were compared to total Project costs to determine the net benefits and Benefit-Cost Ratio for the Project. The Globalplex Multi-Modal Connections Project has net benefits of $109.2 million and a BCR of 6.1. Total benefits and costs are shown in Table 9.

Table : Benefit Cost Analysis

|  |  |
| --- | --- |
| **Project Benefits and Costs** | **Value in Millions of 2017 Dollars** |
| **Costs** | |
| **Capital Costs** | **$21.5** |
|  | |
| **Benefits** | |
| **State of Good Repair** | **$14.1** |
| Life-Cycle Costs | $(3.4) |
| Reduced Pavement Damage | $10.9 |
| Reduced Truck Emissions | $4.3 |
| Residual | $2.3 |
| **Safety & Efficiency** | **$116.7** |
| Truck Operating Cost Savings | $69.5 |
| Vessel Operating Cost Savings | $15.2 |
| Reduced Accidents | $9.7 |
| Reduced Congestion | $22.3 |
| **Total Benefits** | **$130.7** |
|  | |
| **BC Ratio** | **6.1** |
| **Net Present Value** | **$109.2** |

1. Benefit-Cost Analysis Guidance for Discretionary Grant Programs, December 2018. Retrieved <https://www.transportation.gov/sites/dot.gov/files/docs/mission/office-policy/transportation-policy/14091/benefit-cost-analysis-guidance-2018.pdf> [↑](#footnote-ref-1)
2. Source: BEA Rate of Depreciation, Service Lives, Declining-Balance Rates, and Hulten-Wykoff Categories [↑](#footnote-ref-2)