THE ECONOMIC IMPACTS OF THE PORT OF BROWNSVILLE, 2015

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August 15, 2016

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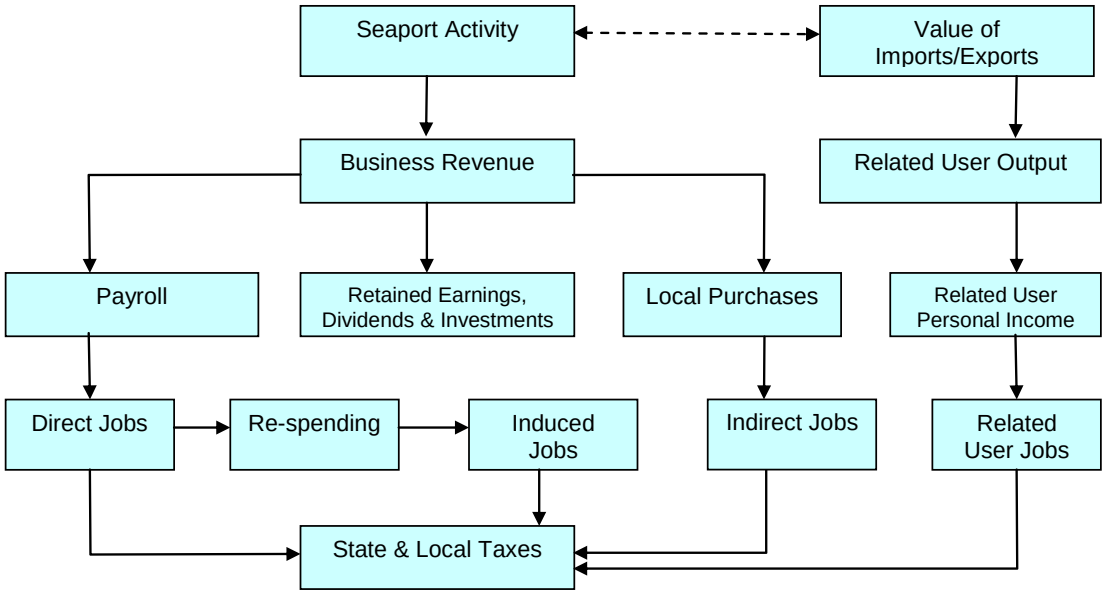
EXECUTIVE SUMMARY

As part of the economic analysis of the State of Texas Port and Maritime Transportation System conducted by Martin Associates, a separate report was prepared for the Port of Brownsville to summarize the economic impacts generated by marine cargo activity at the public marine terminals located within the Brownsville Navigation District. The Port of Brownsville is located at the southernmost tip of Texas at the end of a 17-mile channel that meets the Gulf of Mexico at the Brazos Santiago Pass. The Main Harbor consists of the Turning Basin, Turning Basin Extension, and Turning Basin Approach. The Turning Basin is 3,500 feet long, varies in width from 400 to 1,200 feet and contains Cargo Docks 1 through 4, 7, 8 and 10, 11, 12 and 13. Liquid docks 1, 2, 3 and 5, a 400 foot Bulk Cargo Dock serving the Grain Elevator and Bulk Plant, a Liquid Cargo Dock and General Cargo docks 15 and 16 are located in the Turning Basin Extension which is 5,400 feet long and has a 500 foot bottom width. In addition to all of the waterfront facilities on the Brownsville Ship Channel that are owned by the Brownsville Navigation District, the Brownsville Navigation District is a major center for industrial development with over 230 companies doing business. Activities in the Port of Brownsville include: construction of offshore drilling rigs, ship dismantling and ship repairing, steel fabrication, LPG storage/distribution, waste oil recovery, bulk terminaling for petroleum products and miscellaneous liquids, and grain handling and storage. The impacts of both the industrial maritime activity and the marine cargo activity are included in the analysis. However, the non-maritime real estate economic impacts are not included in this current analysis. The impacts are measured for the year 2015 and in short tons. Impacts are estimated in terms of jobs, personal earnings, business revenue, and state and local taxes. In addition to the baseline impact estimates, computer models specific to each terminal operation have been prepared that can be used in evaluating the sensitivity of impacts to changes in tonnage, labor productivity, labor work rules, commodity mix, inland origins/destinations of commodities and vessel size.

Exhibit E-1, on the following page, graphically demonstrates how seaport activity impacts the local and regional economies. As this exhibit indicates, the marine cargo and vessel activity initially generate business revenue to the firms supplying marine services. This revenue is used to purchase employment (direct jobs) to provide the services, to pay stockholders and for retained earnings, and to purchase goods and services from local firms, as well as national and international firms (creating indirect jobs with these firms). Businesses also pay taxes from the business revenue.

Exhibit E-1
Flows of Economic Impacts through the Economy



The employees hired by the firms receive wages and salaries (personal income), a portion of which is saved, while another portion is used to buy goods and services such as food, housing, clothing, health care, etc. These purchases create a re-spending impact throughout the economy, known as the personal income multiplier. As a result of these local purchases, additional jobs (known as induced jobs) are created in the local economy. Finally, taxes are paid by individuals employed with the firms providing the services to the marine terminals.

As demonstrated by this chart, four types of impacts are measured:

- Jobs;
- Employee earnings;
- Business revenue;
- State and local taxes.

With respect to jobs, four types of job impacts are measured. These are direct, induced, indirect and related jobs. The job impacts are defined as follows:

- Direct jobs are those jobs with local firms providing support services to the seaport. These jobs are dependent upon this activity and would suffer immediate dislocation if the seaport activity

were to cease. Seaport direct jobs include jobs with railroads and trucking companies moving cargo to and from the marine terminals dependent on the use of the shipping channel, members of the International Longshoremen's Association (ILA) and non-ILA dockworkers, steamship agents, freight forwarders, ship chandlers, warehouse operators, terminal operators, stevedores, etc.

- Induced jobs are jobs created locally and throughout the regional economy due to purchases of goods and services by those directly employed. These jobs are with grocery stores, the local construction industry, retail stores, health care providers, local transportation services, etc., and would also be discontinued if seaport activity were to cease.

- Indirect jobs are those jobs generated in the local economy as the result of local purchases by the firms directly dependent upon seaport activity. These jobs include jobs in local office supply firms, equipment and parts suppliers, maintenance and repair services, etc.

- Related jobs are with Texas shippers and consignees related to steel products received at the terminals and used in local construction and ship repair activity, as well as the jobs related to the petroleum products and grain moving via the Port. Related jobs are not dependent upon the seaport marine terminals to the same extent as are the direct, induced and indirect jobs. For example, these firms can and do use other ports. It is the demand for the final product which creates the demand for the employment with these shippers/consignees, not the use of a particular seaport or marine terminal.

The employee earnings consist of wages and salaries and include a re-spending effect (local purchases of goods and services by those directly employed), while business revenue consists of total business receipts by firms providing services in support of the marine activity. State and local taxes include taxes paid by individuals, as well as firms dependent upon the seaport activity.

The study is based on interviews with firms providing services to the cargo and vessels handled at the marine terminals in the Brownsville Navigation District. These interviews are included in the statewide economic impact analysis in which the data collection consisted of interviews with 2,106 firms providing maritime services in the State of Texas. In many cases, especially with lines and agents, miscellaneous maritime services, tug and barge companies, and maritime construction firms, these firms were providing maritime services at more than one port in the analysis. In this situation in which one firm provides services at multiple ports, care was taken to allocate the level of activity to Port of Brownsville and the Brownsville Navigation District's marine terminals. These firms represent more than 98 percent of the firms in the Port of Brownsville seaport community, underscoring the defensibility of the study. Furthermore, the impacts can be traced back to the individual firm. The data collected from the interviews were then used to develop an operational model of the marine terminals and ship and rig repair operations located at Brownsville.

SUMMARY OF IMPACTS GENERATED BY THE PORT OF BROWNSVILLE

The economic impacts generated by the marine cargo terminals and ship repair/oil rig maintenance operations are summarized in Exhibit E-2.

Exhibit E-2
Summary of the Local and Regional Economic Impacts Generated by
The Port of Brownsville

PORT OF BROWNSVILLE	
JOBS	
Direct	3,181
Induced	3,001
Indirect	1,783
Related Users	36,071
TOTAL JOBS	**44,036**
PERSONAL INCOME ($ Millions)	
Direct	$132.23
Re-Spending/Local Consumption	$350.19
Indirect	$85.70
Related User Income	$1,623.20
TOTAL PERSONAL INCOME	**$2,191.32**
REVENUE/ECONOMIC OUTPUT ($ Millions)	
Direct Business Revenue	$580.03
Local Purchases	$158.76
Related Users Output	$2,074.78
TOTAL REVENUE	**$2,813.57**
STATE AND LOCAL TAXES ($ Millions)	
Direct	$9.92
Re-Spending/Local Consumption	$26.26
Indirect	$6.43
Related User Taxes	$121.74
TOTAL TAXES	**$164.35**

Specifically, the vessel and cargo activity at the marine cargo facilities and ship repair/oil rig maintenance operations generated the following impacts in the State of Texas in 2015:

44,036 jobs in Texas are in some way related to the cargo moving via the marine terminals and activity at the ship and rig repair yards. Of the 44,036 jobs:

- **3,181 direct jobs** are generated by the marine cargo and vessel activity and ship and rig repair operations.

- As the result of local and regional purchases by those 3,181 individuals holding the direct jobs, an additional **3,001 induced jobs** are supported in the regional economy.

- **1,783 indirect jobs** were supported by $158.8 million of local purchases by businesses supplying services at the marine terminals and by businesses dependent upon the Port of Brownsville for the shipment and receipt of cargo and on the ship and rig repair operations.

- In addition to the direct, induced and indirect job impacts, 36,071 jobs in Texas are related to the cargo moving over the marine terminals at the Port. The jobs are considered to be **related** to activities at the marine terminals at the Port of Brownsville, but the degree of dependence on the marine terminals is difficult to quantify and should not be considered as dependent on the port as are the direct, induced and indirect jobs. If the marine terminals were not available to these organizations, they would suffer an economic penalty over the longer term. Such a penalty would vary from loss of employment opportunities in some cases to an increase in total transportation costs in other cases, which could, in turn, result in employment reductions.

In 2015, marine cargo activity at the marine terminals at the Port of Brownsville and the ship and rig repair operations supported a total of $3.0 billion of economic activity in the State of Texas.

- Of the $3.0 billion, $580.0 million is the direct business revenue received by the firms directly dependent upon the Port and providing maritime services and inland transportation services to the cargo handled at the marine terminals and the vessels calling the ports, as well as ship and rig repair and maintenance services. An additional $2.1 billion represents the value of the output to the State of Texas that is created due to the cargo moving via the Port of Brownsville. This includes the value added at each stage of producing an export cargo, as well as the value added at each stage of production for the firms using imported raw materials and intermediate products that flow via the marine terminals and are consumed within the State. In addition, $350.2 million of the re-spending of personal income and local consumption purchases are supported in the Texas economy. These components are additive

and represent independent monetary impacts supported by the cargo and vessel activity. Other dollar value impact measures are not included in the total economic value since they are interdependent. Direct income is not included since it is part of the direct business impact and similarly, local purchases by the firms are from the direct business revenue generated by port activity, and also used to pay indirect income. Finally, taxes are paid by the individuals from the direct, induced, indirect and related income and the direct business revenue and the related output.

- Marine activity supported nearly $2.2 billion of total personal wage and salary income and local consumption expenditures for Texas residents. This includes $568.1 million of direct, indirect, induced and local consumption expenditures, while the remaining $1.6 billion was received by the related port users. The 3,181 direct job holders received $132.2 million of direct wage and salary income.

A total of $42.6 million of state and local tax revenue was generated by maritime and ship and rig maintenance and repair activity at the Port of Brownsville. In addition, $121.7 million of state and local taxes were created due to the economic activity of the related users of the cargo moving via the marine terminals.

Since the current impact study is based on the State-wide Economic Impact Study of port and maritime activity at the Texas ports, fishing impacts and non-cargo related tenant impacts have not been included.

I. OVERVIEW OF THE ANALYSIS AND SUMMARY OF METHODOLOGY

As part of the economic analysis of the State of Texas Port and Maritime Transportation System conducted by Martin Associates, a separate report was prepared for the Port of Brownsville to summarize the economic impacts generated by marine cargo activity at the public marine terminals located within the Brownsville Navigation District, as well as the ship and oil rig maintenance and repair operations. The impacts are estimated in terms of jobs, personal earnings, business revenue, and state and local taxes. The impacts are estimated for marine cargo and ship and rig repair activity in 2015. In addition to quantifying the baseline impacts of the marine terminals and the impacts of the ship and oil rig maintenance and repair operations, economic impact models of both cargo and ship repair operations have been developed. The marine cargo model can be used in evaluating the sensitivity of impacts to changes in tonnage by type of cargo, labor productivity, labor work rules, commodity mix, inland origins/destinations of commodities and vessel size. The model can also be used to evaluate the impacts of new terminal development such as new berth development and the construction of a new warehouse, and for annual updates. The ship and oil rig repair and maintenance model can be used to assess the impacts of new projects as well as to estimate the lost economic impacts of ship yard activity due to oil rig markets that are restricted from being serviced by the yard due to the current channel dimensions.

The methodology used in this analysis has been developed by Martin Associates and has been used to estimate the economic impacts of seaport activity at public and private marine terminals of more than 300 United States and Canadian ports. With respect to Texas Ports, Martin Associates has developed economic studies for the Ports of Houston, Harlingen, Beaumont, Port Arthur, Orange, Victoria, Corpus Christi, Freeport, Galveston, Texas City and Port Lavaca-Point Comfort.

The remainder of this chapter presents an overview of the economic impact analysis and consists of the following sections:

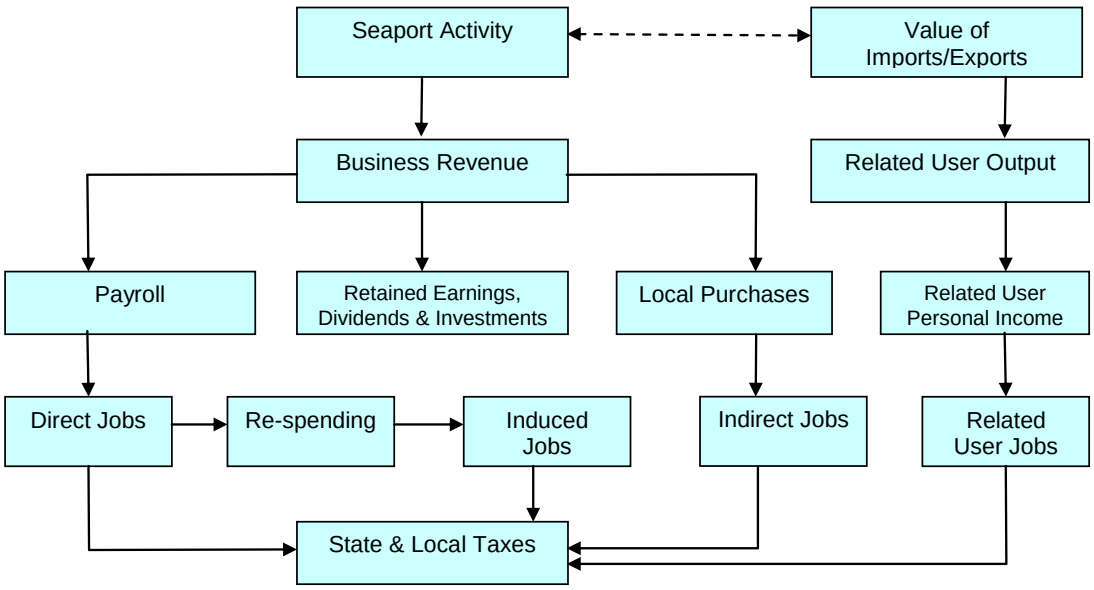
- Flow of economic impacts through the local and regional economies;
- The structure of the impact analysis;
- Summary of the methodology;
- Commodities included in the analysis.

1. FLOW OF IMPACTS

Waterborne activity at a seaport contributes to the local and regional economy by generating business revenue to local and national firms providing vessel and cargo handling services at the marine terminals. These firms, in turn, provide employment and income to individuals, and pay taxes to state and local governments. Exhibit I-1, on the following page, shows how activity at marine terminals

generate impacts throughout the local, state and national economies. As this exhibit indicates, the impact of a seaport on a local, state or national economy cannot be reduced to a single number, but instead, the seaport activity creates several impacts. These are the revenue impact, employment impact, personal income impact, and tax impact. These impacts are non-additive. For example, the income impact is a part of the revenue impact, and adding these impacts together would result in double counting. Exhibit I-1 shows graphically how activity at the Port of Brownsville's public marine terminals generates the four impacts.

Exhibit I-1
Flow of Economic Impacts Generated by Marine Activity



1.1. Business Revenue Impact

At the outset, activity at the port generates business revenue for firms which provide services. This business revenue impact is dispersed throughout the economy in several ways. It is used to hire people to provide the services, to purchase goods and services, and to make Federal, state and local tax payments. The remainder is used to pay stock holders, retire debt, make investments, or is held as retained earnings. It is to be emphasized that the only portions of the revenue impact that can be definitely identified as remaining in the local economy are those portions paid out in salaries to local employees, for local purchases by individuals and businesses directly dependent on the seaport, in contributions to state and local taxes, in lease payments to the Port of Brownsville by tenants, and wharfage and dockage fees paid to the Port.

1.2. Employment Impact

The employment impact of seaport activity consists of four levels of job impacts:

- Direct employment impact - jobs directly generated by seaport activity. Direct jobs generated by marine cargo include jobs with railroads and trucking companies moving cargo between inland origins and destinations and the marine terminals, longshoremen and dockworkers, steamship agents, freight forwarders, stevedores, etc. It is to be emphasized that these are classified as directly generated in the sense that these jobs would experience near term dislocation if the activity at the marine terminals were to be discontinued.

- Induced employment impact - jobs created throughout the local economy because individuals directly employed due to seaport activity spend their wages locally on goods and services such as food, housing and clothing. These jobs are held by residents located throughout the region, since they are estimated based on local and regional purchases.

- Indirect Jobs - jobs created locally due to purchases of goods and services by firms, not individuals. These jobs are estimated directly from local purchases data supplied to Martin Associates by the companies interviewed as part of this study, and include jobs with local office supply firms, maintenance and repair firms, parts and equipment suppliers, etc. It is to be emphasized that special care was taken to avoid double counting, since the current study counts certain jobs as direct (i.e., trucking jobs, jobs with railroads, jobs with insurance companies and admiralty law firms, etc.) which are often classified as indirect by other approaches, notably the input/output model approach.

- Related user employment impact - jobs with Texas shippers and consignees related to cargo moving via the terminals, most notably steel products. While the facilities and services provided at the Port of Brownsville's marine terminals are a crucial part of the infrastructure allowing these jobs to exist, they would not necessarily be immediately displaced if marine activity were to cease.

1.3. Personal Earnings Impact

The personal earnings impact is the measure of employee wages and salaries (excluding benefits) received by individuals directly employed due to seaport activity. Re-spending of these earnings throughout the regional economy for purchases of goods and services is also estimated. This, in turn,

generates additional jobs - the induced employment impact. This re-spending throughout the region is estimated using a regional personal earnings multiplier, which reflects the percentage of purchases by individuals that are made within the Texas economy. The re-spending effect varies by region - a larger re-spending effect occurs in regions that produce a relatively large proportion of the goods and services consumed by residents, while lower re-spending effects are associated with regions that import a relatively large share of consumer goods and services (since personal earnings "leak out" of the region for these out-of-region purchases). The direct earnings are a measure of the local impact since they are received by those directly employed by seaport activity.

1.4. Tax Impact

Tax impacts are tax payments to the state and local governments by firms and by individuals whose jobs are directly dependent upon and supported (induced jobs) by activity at the marine terminals and ship and rig repair operations.

2. IMPACT STRUCTURE

The four types of economic impacts are created throughout various business sectors of the state and local economies. Specifically, four distinct economic sectors are impacted as a result of activity at the marine terminals. These are the:

- Surface Transportation Sector;
- Maritime Services Sector;
- Shippers/Consignees using the Port;
- The Port of Brownsville governing entity.

Within each sector, various participants are involved. Separate impacts are estimated for each of the participants. A discussion of each of the economic impact sectors is provided below, including a description of the major participants in each sector.

2.1. The Surface Transportation Sector

The surface transportation sector consists of both the railroad and trucking industries. The trucking firms and railroads are responsible for moving the various cargoes between the marine terminals and the inland origins and destinations.

2.2. The Maritime Services Sector

This sector consists of numerous firms and participants performing functions related to the following maritime services:

- Cargo Marine Transportation;
- Vessel Operations;
- Cargo Handling;
- Local Service Industries;
- Federal, State and Local Government Agencies.

A brief description of the major participants in each of these five categories is provided below:

- Cargo Marine Transportation

  Participants in this category are involved in arranging for inland and water transportation for export or import freight. The freight forwarder/customshouse broker is the major participant in this category. The freight forwarder/customshouse broker arranges for the freight to be delivered between the terminals and inland destinations, as well as the ocean transportation. This function performed by freight forwarders and customshouse brokers is most prevalent for containerized and general cargo commodities.

- Vessel Operations

  This category consists of several participants. The steamship agents provide a number of services for the vessel as soon as it enters the port; the agents arrange for pilot services and towing, for medical and dental care of the crew, and for ship supplies. The agents are also responsible for vessel documentation. In addition to the steamship agents arranging for vessel services, those providing the services include:

  - Chandlers - supply the vessels with ship supplies (food, clothing, nautical equipment, etc.);

  - Towing firms - provide the tug service to guide the vessel to and from port;

  - Pilots - assist in navigating the vessels to and from the Port of Brownsville marine terminals;

- Bunkering firms - provide fuel to the vessels;
- Marine surveyors - inspect the vessels and the cargo;
- Shipyards/marine construction firms - provide repairs (either emergency or scheduled) as well as marine pier construction and dredging. This category also includes the activity of the local oil rig and ship repair operations.

- Cargo Handling

  This category involves the physical handling of the cargo at the terminals between the land and the vessel. Included in this category are the following participants:

- Longshoremen - include members of the International Longshoremen's Association (ILA), as well as non-ILA dockworkers that are involved in the loading and unloading of cargo from the vessels, as well as handling the cargo prior to loading and after unloading;
- Stevedoring firms - manage the longshoremen and cargo-handling activities. Stevedoring services at the Port of Brownsville terminals are provided by ILA and non-ILA stevedoring companies;
- Terminal operators - are often stevedoring firms who operate the maritime terminals where cargo is loaded and off-loaded;
- Warehouse operators - store cargo after discharge or prior to loading and consolidate cargo units into shipment lots.

- Government Agencies

  This service sector involves federal, state and local government agencies that perform services related to cargo handling and vessel operations at the Port. U.S. Customs, Bureau of Immigration, U.S. Department of Labor, U.S. Department of Agriculture, U.S. Coast Guard, the Army Corps of Engineers, and U.S. Department of Commerce employees are involved. These services are provided by the government offices located in the Brownsville area.

2.3. Shippers/Consignees

Two categories of shippers and consignees are considered in the analysis: those that are totally dependent on the marine terminals and ship and rig repair operations, and those located throughout the regional economy whose business is only related to the Port. Those in the first category would most likely shut down operations if the marine terminals were not available for their use, while those in the second category would ship or receive materials via another port. Related jobs consist of jobs with steel importers as well as users of petroleum products. Dependent shippers/consignees include employees of the ship breaking operations that are dependent upon the movement of scrap by water.

Employment with related shippers and consignees is considered port-related, and not port-generated.

2.4. The Port of Brownsville

The Port of Brownsville governmental entity includes those individuals employed whose purpose is to oversee port activity at the Brownsville Navigation District.

3. SUMMARY OF METHODOLOGY

The purpose of this section is to provide a summary of the methodological approach used to estimate the economic impacts of the vessel and cargo activity at the public marine terminals at the Port of Brownsville.

3.1. Data Collection

The cornerstone of the Martin Associates approach is the collection of detailed baseline impact data from firms providing services at the Port of Brownsville marine terminals and the ship and rig repair operations. To ensure accuracy and defensibility, the baseline impact data was collected from interviews with maritime firms in the Brownsville maritime community, as well as additional interviews with firms included in the statewide economic impact analysis of which a total of 2,106 interviews were conducted for the statewide analysis. In cases in which one firm provides services at multiple ports, care was taken to allocate the level of activity to the Port of Brownsville and Brownsville Navigation District's marine terminals. These firms represent the universe of firms providing services at the Port of Brownsville's marine terminals located within the Port District, as identified by:

- The Port of Brownsville internal customer and tenant lists
- The Port of Brownsville Port Directory
- Martin Associates internal database

- Statewide Economic Impact Analysis Directory

These maritime firms represent a nearly 98 percent coverage of all firms identified in the seaport community for the Port of Brownsville. For the most part, multiple interviews were conducted with several persons in each firm.

3.2. Direct Jobs, Income, Revenue, and Tax Impacts

The results of these interviews were then used to develop the baseline direct job, revenue and income impacts for the economic sectors and job categories associated with the Port of Brownsville's marine terminals, as well as the ship and rig repair operations.

The direct tax impacts are estimated at a state, county and local level based on state and local per capita tax burdens as developed by the Tax Foundation.

This baseline survey data was also used to develop an operational model which can be used to update the impacts of the Port of Brownsville's marine terminals and ship and rig repair operations on an annual basis and to evaluate the impacts of changes in:

- Marine cargo tonnage, by commodity;
- Seaport labor productivity, and work rules;
- Modal distribution of seaport cargo (what percent of the inland transportation of a commodity is truck versus rail), as well as the geographical distribution of each commodity;
- Vessel calls and vessel size;
- New carrier services.

Also, the operational model can be used to evaluate alternative facilities expansion projects and new marine terminal construction, as well as the impacts associated with channel dredging and widening.

3.3. Induced Impacts

Induced impacts are those generated by the purchases of the individuals employed as a result of seaport activity. For example, a portion of the personal earnings received by those directly employed due to activity at the marine terminals is used for purchases of goods and services, both regionally, as well as out-of-the region. These purchases, in turn, create additional jobs in the region which are classified as induced. To estimate these induced jobs, a regional personal earnings multiplier was developed from data provided by the Bureau of Economic Analysis, Regional Income Division. This personal earnings multiplier is used to estimate the total personal earnings generated in the region as a result of the activity at the Port of Brownsville. A portion of this total personal earnings impact is next

allocated to specific local purchases (as determined from consumption data for Brownsville residents, as developed from the U.S. Bureau of Labor Statistics, Consumer Expenditure Survey, 2014). These purchases are next converted into retail and wholesale induced jobs in the regional economy.

Induced jobs are not estimated at lower levels of purchasing rounds (after the wholesale round) since it is not possible to trace with a sufficient degree of accuracy, geographically, where purchases at the remaining levels occur. However, about 80 percent of the consumption will likely occur at the first two rounds of purchases, which are most likely local retail and wholesale purchases.

3.4. Indirect Jobs

Indirect jobs are generated in the local economy as the result of purchases by firms that are directly dependent upon cargo and vessel activity at the marine terminals, including the dependent shippers/consignees. These purchases are for goods and services such as office supplies and equipment, maintenance and repair services, communications and utilities, transportation services and other professional services. To estimate the indirect economic impact, local purchases, by type of purchase, were collected from each of the firms interviewed. These local purchases were then combined with employment to sales ratios in local supplying industries, developed from the U.S. Bureau of Economic Analysis Regional Input-Output Modeling System for the State of Texas. The indirect job ratios also account for the in-state spin-off effects from multiple rounds of supply chains that are required to provide the locally purchased goods and services.

3.5. Related Impacts

Related impacts measure the jobs with shippers and consignees moving cargo through the Port's marine terminals. These impacts are classified as related jobs, since the shippers/consignees using the marine terminals for the movement of cargo can and do use other seaports and marine terminals. Because of the proximity of other ports and the associated steamship service at these ports, such as Corpus Christi, the exporters and importers have some flexibility in port choice. As a result, impacts with the importers and exporters cannot be counted as dependent upon the marine terminals at the Port of Brownsville.

These related impacts are estimated based on the value per ton of each cargo exported and imported via the Port and the associated job to value of output ratio for the associated producing or consuming sector in Texas, as developed from the Bureau of Economic Analysis Regional Input-Output Modeling System (RIMS II) for the State.

4. COMMODITIES INCLUDED IN THE ANALYSIS

A major use of an economic impact analysis is to provide a tool for port development planning. As a port grows, available land and other resources for port facilities become scarce, and decisions must be made as to how to develop the land and utilize the resources in the most efficient manner. Various types of facility configurations are associated with different commodities. For example, containers require a large amount of paved, open storage space, while certain types of break bulk cargoes require covered storage. Perishable commodities require temperature controlled warehouses and some dry bulk cargoes require covered storage and special dust removing equipment, while different types of steel products require either covered or open storage.

An understanding of the commodity's relative economic value in terms of employment and income to the local community, the cost of providing the facilities, and the relative demand for the different commodities is essential in making future port development plans. Because of this need for understanding relative commodity impacts, economic impacts are estimated for the following commodities handled at the public marine terminals.

- Steel Coils
- Steel Plates
- Steel Slabs
- Steel Billets
- Other Steel Products
- Scrap
- Project Cargo
- Other Breakbulk
- Limestone
- Other Dry Bulk
- Petroleum Products
- Other Liquid Bulk

It should be emphasized that commodity-specific impacts are not estimated for each of the economic sectors described in the last section. Specific impacts by commodity could not be allocated to individual commodities with any degree of accuracy for marine construction, ship repair, or the state and federal government. In addition, taxes have not been displayed by specific commodity since these tax impacts will reflect the same distribution over commodities as the employment impact.

II. EMPLOYMENT IMPACTS

In this chapter, the employment generated by **maritime cargo** and ship and oil rig repair/maintenance activity within the Brownsville Navigation District is estimated. The chapter is organized as follows:

- First, the total employment that is in some way related to the activities at the public marine terminals and ship and oil rig repair operations is estimated.
- Second, the subset of total employment that is judged to be totally dependent (i.e., direct jobs) on port activity is analyzed as follows:
    - The direct job impact is estimated in terms of key economic sectors, i.e., surface transportation sector, maritime services sector, ship and oil rig repair operations, etc.
    - The direct job impact is estimated by detailed job category, i.e., trucking, ILA/dockworkers, freight forwarders/customshouse brokers, steamship agents, chandlers, surveyors, etc.
    - The direct job impact is estimated for each of the key commodities/commodity groups.
    - The direct job impact is estimated based on the residency of those directly employed.
- Induced and indirect jobs are estimated.
- Finally, jobs related to the marine activity at the public marine terminals are described.

1. TOTAL MARINE CARGO EMPLOYMENT IMPACT

It is estimated that about 44,036 jobs are directly or indirectly generated by port activities at the marine terminals within the Port of Brownsville Navigation District. Of the 44,036 jobs:

- 3,181 jobs are directly generated by activities at the marine terminals and if such activities should cease, these jobs would be discontinued over the short term.

- 3,001 jobs (induced jobs) are supported by the local purchases of the 3,181 individuals directly generated by port activity at the marine terminals. An additional 1,783 indirect jobs were supported by $158.8 million of purchases in the local and regional economy by firms providing direct cargo handling and vessel services.

- 36,071 jobs are related to cargo exported and imported via the marine terminals. These jobs with Texas exporters and importers are considered to be related to activities at the marine terminals, but the degree of dependence on these terminals is difficult to estimate. **It is to be emphasized that the level of employment with the Texas shippers and consignees is dependent on the demand for the cargo moving via the terminals, not by the use of the marine terminals at the Port of Brownsville.** However, if other terminals were used, it is likely that the costs of shipping and receiving cargo by water would increase, which could have long-term implications on the level of shipments and receipts at the Port of Brownsville.

2. DIRECT MARINE CARGO JOB IMPACTS

In 2015, 8.2 million short tons of domestic and foreign waterborne cargo moved via the public marine terminals in the Port of Brownsville. As a result of this activity, 3,181 full-time jobs were directly created.[1] In this section the jobs are analyzed in terms of:

- Distribution by economic sector and job category;
- Distribution by job category;
- Distribution by commodity group;
- Distribution by county and state of residency.

These distributions are developed in more detail below.

2.1. Job Impacts by Sector

Exhibit II-1 presents the distribution of the 3,181 direct jobs among the following economic sectors:

- Surface transportation sector;
- Maritime service sector;
- The Port of Brownsville Administration.

[1] Jobs are measured in terms of full-time worker equivalents. If a worker is employed only 50 percent of the time by activity at the Port of Brownsville's public marine terminals, then this worker is counted as .5 jobs.

The exhibit indicates that 1,216 direct jobs of total direct jobs are with the ship and oil rig repair and maintenance operations. This excludes the jobs with the fishing and real estate tenants that are not dependent upon marine cargo or ship repair operations which was measured at nearly 1,100 direct jobs in the 2006 Economic Impact Study for the Port of Brownsville. Following the ship and oil rig maintenance and repair operations, trucking activity generates the second largest direct job impacts.

Exhibit II-1
Employment Impacts by Sector and Job Category

PORT OF BROWNSVILLE	TOTAL DIRECT JOBS
SURFACE TRANSPORTATION	
Rail	90
Truck	570
MARITIME SERVICES	
Terminal	277
ILA	142
Tug Assist	42
Pilots	15
Agents	9
Maritime Services/Construction	1,216
Freight Forwarders	38
Warehouse	26
Government	88
Barge/Bunkers	125
Chandler/Surveyors	23
Shipbreaking	421
PORT OF BROWNSVILLE	98
TOTAL	**3,181**

Note: Totals may not add due to rounding. In 2006, nearly 1,100 direct jobs with fishing and non-maritime dependent real estate tenants were included in the impacts, which would increase overall direct jobs to more than 4,200 direct jobs.

2.2. Direct Job Impacts by Commodity

Most of the 3,181 jobs considered to be generated by port activity can be associated with the handling of specific commodities or commodity groups. However, employment categories such as government employees, Port Authority employees and jobs with bunkering firms and the oil rig and ship repair and maintenance operations, marine construction and shipbreaking firms are not identified with a

specific commodity. As a result, employment in these groups (which totaled 1,859) was not allocated to commodity groups.

Exhibit II-2 presents the relative employment impacts in terms of commodity groups.

Exhibit II-2
Distribution of Direct Job Impact by Commodity

PORT OF BROWNSVILLE	TOTAL DIRECT JOBS
Scrap	10
Steel Coils	110
Steel Slabs	292
Steel Billets	11
Other Steel	27
Project Cargo	203
Other Breakbulk	27
Limestone	44
Other Dry Bulk	34
Petroleum Products	297
Other Liquid Bulk	269
Not Allocated	1,859
TOTAL	**3,181**

Note: The shipbreaking industry jobs are included in the Non-Allocated category.

The handling of steel products (coils, slabs, billets and other steel) accounts for the largest direct job impact, followed by the movement of petroleum products. The next largest direct job impact was generated by the movement of other liquid bulk commodities.

2.3. Job Impacts Per Ton

The assessment of the job impacts on a per 1,000 ton basis provides a tool for port planners to use in evaluating the relative importance of different commodities as economic generators. Exhibit II-3 presents the job impacts per 1,000 short tons for each commodity moving via the public marine terminals at the Port of Brownsville.

Exhibit II-3
Job Impacts per 1,000 Short Tons

PORT OF BROWNSVILLE	DIRECT JOBS/1000 TONS
Scrap	0.18
Steel Coils	0.38
Steel Slabs	0.14
Steel Billets	7.73
Other Steel	1.92
Project Cargo	0.44
Other Breakbulk	0.58
Limestone	0.06
Other Dry Bulk	0.11
Petroleum Products	0.10
Other Liquid Bulk	0.26

Note: Shipbreaking is included in the Non-Allocated category and thus is not included in the Scrap calculation in this table.

As this exhibit indicates, steel products, particularly steel billets, generate relatively large impacts per 1,000 tons reflecting the greater use of truck rather than rail for inland distribution, and the more labor intensive ship discharge operation. Despite the fact that petroleum products generate a relatively large total job impact, on a per 1,000 ton basis, petroleum generates 0.10 jobs per 1,000 tons. Dry bulk cargoes, such as limestone, also generate relatively small numbers of jobs per 1,000 tons. The finding that the petroleum and bulk cargoes generate relatively small direct jobs per 1,000 tons of throughput, reflects the fact that the handling of liquid bulk and dry bulk cargoes is much less labor intensive than handling general cargo and further, the supporting infrastructure of agents, freight forwarders and customshouse brokers, warehousing and terminal operators is greater for general cargo such as steel, breakbulk and project cargo.

3. DISTRIBUTION OF DIRECT JOBS BY PLACE OF RESIDENCE

To underscore the geographic scope of the impacts generated by the public marine terminals, Exhibit II-4 presents the distribution of the 3,181 direct jobs by place of residency. The residency analysis is based on the results of the interviews with the maritime firms providing services at the Port of Brownsville.

Exhibit II-4
Distribution of Direct Jobs by Place of Residency

PORT OF BROWNSVILLE		
JURISDICTION	SHARE	TOTAL DIRECT JOBS
Brownsville	28.47%	906
Other Cameron Co.	64.26%	2,044
Hidalgo	1.12%	36
Willacy	1.27%	40
Other TX	3.38%	108
Other US	0.00%	0
MEXICO	1.50%	48
TOTAL	**100.00%**	**3,181**

Note: Totals may not add due to rounding.

4. INDUCED JOBS

The 3,181 directly employed individuals due to activity at the public marine terminals received wages and salaries, a part of which was used to purchase local goods and services such as food, housing, clothing, transportation services, etc. As a result of these local purchases, 3,001 jobs in the regional economy were supported. The majority of the induced jobs are in the food and restaurant sector, followed by jobs in the construction and home furnishings sector, and with local and regional private sector social services, business services and educational services.

5. INDIRECT JOBS

In addition to the induced jobs generated by the purchases by directly employed individuals, the firms providing the direct services and employing the 3,181 direct jobs make local purchases for goods and services. These local purchases by the ***firms*** dependent upon the public marine facilities generate additional local jobs - indirect jobs. Based on interviews with the maritime firms providing services at the Port of Brownsville, these firms made $158.8 million of local and in-state purchases in 2015. These direct local purchases created an additional 1,783 indirect jobs in the local economy.

6. RELATED JOBS

It is estimated that about 36,071 jobs with Texas shippers and consignees are related to steel products received at the marine terminal. Also included are related jobs due to the petroleum and liquid and dry bulk cargo movements at the Port. To estimate these related jobs, Martin Associates developed

ratios of jobs to the value of tonnage for the relevant export and import commodities. The jobs per value of output data for the relevant industries in Texas were developed from the U.S. Bureau of Economic Analysis, RIMS II. The jobs per output value coefficients were multiplied by value per ton and tonnage of each cargo shipped or received via the marine terminals to estimate the related jobs. Care was taken to avoid double counting of the direct, induced and indirect jobs created by moving the cargo over the marine terminals.

It is to be emphasized that these are related jobs, and would not likely disappear if the marine terminals were to close to marine cargo and vessel/barge activity. Given a level of demand for the specific cargo, other ports would be used to move the cargo.

It is to be further emphasized that when the impact models are used for planning purposes, related jobs should not be used to judge the economic benefits of a particular project. Related jobs are not estimated with the same degree of defensibility as are the direct, induced and indirect jobs. Therefore, only these three types of job impacts should be used in evaluating port investments. The purpose of the related jobs estimates is to provide a proxy for the magnitude of the more general economic development impact of the public port facilities.

III. MARINE CARGO REVENUE, INCOME AND TAX IMPACTS

The 8.2 million short tons of cargo handled at the marine terminals in the Brownsville Navigation District generated revenue for firms in each of the economic sectors. For example, revenue is received by the railroads, the trucking companies and pipelines within the surface transportation sector as a result of moving export cargo to the marine terminals and distributing the imported commodities inland after receipt at the marine terminals. The firms in the maritime services sector receive revenue from arranging for transportation services, cargo handling, providing services to vessels in port and repairs to vessels calling the port facilities. The Port of Brownsville receives revenue from terminal and real estate leases, and port charges such as wharfage and dockage assessed on cargo and vessels. In addition, revenue is received by shippers/consignees from the sales of cargo shipped or received via the marine cargo terminals and from the sales of products made with raw materials received through the terminals. Since this chapter is concerned with the revenue generated from providing maritime services, the shipper/consignee revenue (i.e., the value of the cargo shipped or received through the marine terminals, as well as the value of the products produced by the port-dependent shippers/consignees) will be excluded from the remaining discussion.

The revenue generated by port activity consists of many components. For example, gross revenue is used to pay employee salaries and taxes, it is distributed to stockholders of the companies providing the vessel and cargo handling services, and it is used for the purchases of equipment and maintenance services. Of these components, only three can be isolated geographically with any degree of accuracy. These are the personal income component of revenue, which can be traced to geographic locations based on the residence of those receiving the income, the payment of state and local taxes, and the local purchases made by firms dependent upon the maritime activity. The balance of the revenue is distributed in the form of payments to firms located outside the Brownsville region providing goods and services to the five sectors and for the distribution of company profits to shareholders.

The value of output created by users of the Port is attributed to the State of Texas and the local purchases from other firms within the State are also included in the user output measure, as defined by the in-state output coefficients (for the user industries) developed from the U.S. Bureau of Economic Analysis, Regional Input-Output Modeling System (RIMSII).

1. REVENUE IMPACT—TOTAL ECONOMIC ACTIVITY

The revenue impact is a measure of the total economic activity in the State that is generated by the cargo moving via the marine terminals at the Port of Brownsville. In 2015 marine cargo activity at the marine terminals at the Port of Brownsville and the ship and rig repair operations supported a total of $3.0 billion of economic activity in the State of Texas. Of the $3.0 billion, $580.0 million is the direct business revenue received by the firms directly dependent upon the Port and providing maritime

services and inland transportation services to the cargo handled at the marine terminals and the vessels calling the ports, as well as ship and rig repair and maintenance services. An additional $2.1 billion represents the value of the output to the State of Texas that is created due to the cargo moving via the Port of Brownsville. This includes the value added at each stage of producing an export cargo, as well as the value added at each stage of production for the firms using imported raw materials and intermediate products that flow via the marine terminals and are consumed within the State. In addition, $350.2 million of the re-spending of personal income and local consumption purchases are supported in the Texas economy. These components are additive and represent independent monetary impacts supported by the cargo and vessel activity. Other dollar value impact measures are not included in the total economic value since they are interdependent. Direct income is not included since it is part of the direct business impact and similarly, local purchases by the firms are from the direct business revenue generated by port activity, and also used to pay indirect income. Finally, taxes are paid by the individuals from the direct, induced, indirect and related income and the direct business revenue and the related output.

The balance of this section focuses only on the $580.0 million revenue impact generated from the provision of transportation services in support of the cargo and vessel activity at the Port of Brownsville. It is important to emphasize that the direct business revenue does not include the value of the cargo moving via the marine facilities.

1.1. Direct Revenue Impacts by Economic Sector

Exhibit III-1 presents the $580.0 million revenue impact created by port activity in 2015. This revenue includes the revenue received by firms providing services to the commodity and vessel activity at the marine terminals as well as the revenue from the ship and oil rig repair operations. ***Again, it is to be emphasized that the revenue from the value of the cargo moving via the marine terminals is not included as an impact created by the Port of Brownsville, but by the demand for the cargo and included in the related user impact.***

Nearly 50% of the direct revenue is generated by the oil rig and ship repair operations. Shipbreaking operations generate the second largest local revenue impact, followed by trucking operations.

Exhibit III-1
Total Revenue Generated by
Port Activity

PORT OF BROWNSVILLE	REVENUE ($1,000)
SURFACE TRANSPORTATION	
Rail	$29,521
Truck	$51,738
Pipeline	$30,669
MARITIME SERVICES	
Terminal	$34,828
Tug Assist	$9,495
Pilots	$6,427
Agents	$2,121
Maritime Services/Construction	$267,068
Freight Forwarders	$7,638
Warehouse	$6,413
Barge/Bunkers	$14,199
Chandler/Surveyors	$4,399
Shipbreaking	$95,681
PORT OF BROWNSVILLE	$19,830
TOTAL	**$580,026**

1.2. Direct Revenue Impacts by Commodity

Exhibits III-2 and III-3 show the total revenue impact by commodity and the revenue per short ton. It is to be emphasized that the revenue received by shippers/consignees from the sales of the products (value of the commodities) moving via the marine terminals is not included, since product value is determined by the demand for the product, not the use of the marine terminals. The two exhibits show that:

- In terms of total revenue, petroleum products generated the greatest revenue impact followed by steel slabs, project cargo and other liquid bulk.

- In terms of revenue per ton impacts, steel products generated greatest revenue per ton impacts, reflecting the more labor intensive loading and handling, and support services required for the movement of this cargo. Similarly, other breakbulk cargoes generate relatively large revenue per

ton impacts. Dry bulk cargoes, such as limestone and coal tend to generate relatively low revenue per ton impacts.

Exhibit III-2
Revenue Impacts by Commodity

PORT OF BROWNSVILLE	REVENUE ($1,000)
Scrap	$935
Steel Coils	$9,984
Steel Slabs	$36,517
Steel Billets	$77
Other Steel	$2,909
Project Cargo	$27,898
Other Breakbulk	$6,017
Limestone	$5,422
Other Dry Bulk	$5,398
Petroleum Products	$59,269
Other Liquid Bulk	$26,410
Not Allocated	$399,192
TOTAL	**$580,026**

Note: The Not Allocated Revenue reflects the revenue generated by the firms that cannot be allocated to certain commodities, i.e. government agencies, marine construction firms, Brownsville Port Authority, shipbreaking, maritime service firms, etc.

Exhibit III-3
Revenue per Short Ton Impacts

PORT OF BROWNSVILLE	DIRECT REVENUE PER TON
Scrap	$17.62
Steel Coils	$34.58
Steel Slabs	$17.10
Steel Billets	$53.22
Other Steel	$204.36
Project Cargo	$60.09
Other Breakbulk	$130.13
Limestone	$6.82
Coal	$13.50
Other Dry Bulk	$17.13
Petroleum Products	$19.48
Other Liquid Bulk	$25.10

Note: Shipbreaking is included in the Non-Allocated category and thus is not included in the Scrap calculation in this table.

2. PERSONAL EARNINGS IMPACT

In the previous section of this chapter, the total revenue generated by port activity was identified. As described earlier, the personal income received by those directly dependent upon port activity within the Port of Brownsville Navigation District is paid from the business revenue received by the firms supplying direct services at the marine terminals.

The income impact is estimated by multiplying the average annual earnings (excluding benefits) of each port participant, i.e., truckers, steamship agents, pilots, towing firm employees, longshoremen, warehousemen etc., by the corresponding number of direct jobs in each category. The individual annual earnings in each category multiplied by the corresponding job impact resulted in $132.2 million in personal wage and salary earnings.

The impact of the re-spending of this direct income for local purchases is estimated using a personal earnings multiplier. The personal earnings multiplier is based on data supplied by the Bureau of Economic Analysis (BEA), Regional Input-Output Modeling System (RIMS II). The BEA estimates that for every one dollar earned by direct employees generated by activity at the marine terminals, an additional $2.65 of personal income and consumption expenditures would be created as a result of re-

spending the income for purchases of goods and services produced locally. Hence, a personal earnings multiplier of 3.65 was used to estimate the total income and consumption impact of $350.2 million, inclusive of the re-spending and local consumption impact. This additional re-spending of the direct income generates the 3,001 induced job impact, described in the previous chapter.[2]

The 1,783 indirect job holders earned $85.7 million in indirect wages and salaries. Combining the direct, induced and indirect personal income impacts, the total income impact is $568.1 million. The 36,071 jobs with related port users earned about $1.6 billion. When combined with the direct, indirect, induced and re-spending consumption impact, the total income and consumption impact is estimated at $2.2 billion annually.

3. TAX IMPACTS

State and local tax impacts are based on per employee tax burdens which are developed at the county, local and state jurisdictional levels. These taxes per employee burdens are essentially tax indices that are used to allocate total taxes at each level of government to economic activity generated by the marine terminals. To estimate the per employee tax indices, total taxes received at each governmental level in Texas were developed from the Tax Foundation, which reports total state and local taxes from all sources as a percent of total personal income.

Activity at the public marine terminals generated $42.6 million of state, county and local taxes. The tax impact associated with the related users is estimated at $121.7 million, for a total state and local tax impact of $164.4 million.

[2] It is to be emphasized that the re-spending impact of $350.2 million does not represent the earnings of the 3,001 induced jobs. The $350.2 million re-spending impact does include the direct earnings received by the employees holding the induced jobs, but the re-spending impact also includes the revenue received by the firms providing the goods and services to those directly employed.