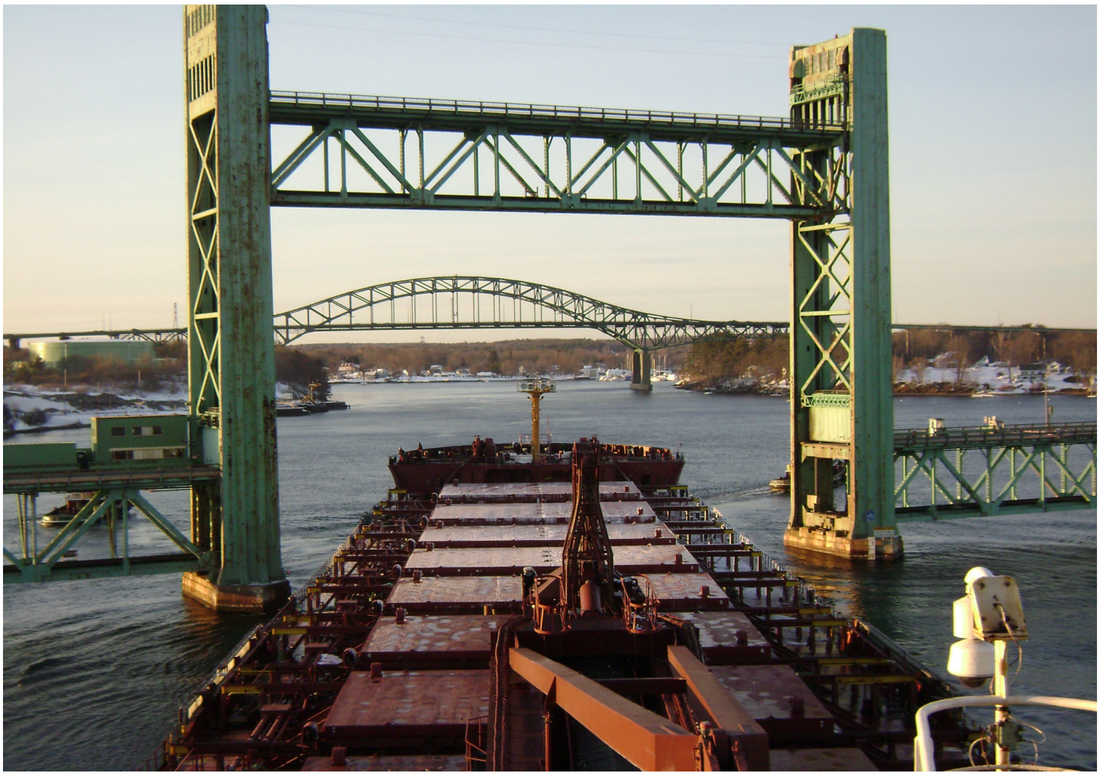
# The Economic Impact of the Piscataqua River and the Ports of Portsmouth and Newington



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June 2012

# Contents

## Executive Summary

The Port of Portsmouth-Newington and the marine terminal operators along the Piscataqua River are a significant contributor to the regional economy in the states of New Hampshire and Maine. In the local economy, 987 jobs paying $90.2 million in salaries, wages, and benefits were directly employed by 16 businesses utilizing the Port of Portsmouth or the Piscataqua River.

Total regional economic impacts of port-related activities include 2,350 jobs and $275 million in value added. Port activity results in 2,100 jobs in New Hampshire and 280 jobs in Maine paying $156 million in salaries, wages, and benefits. For every dollar in value added by port industries, another $0.66 cents is generated in indirect and induced economy activity in New Hampshire and Maine. This activity results in $25 million in state and local taxes in New Hampshire and Maine.

Approximately 90% of the economic impacts from the maritime commerce of the Port and Piscataqua River are experienced in NH and 10% of the economic impacts are experienced in Maine.

**Summary of Economic Impacts of Port of Portsmouth and Piscataqua River**

| Economic Impact | NH | ME | Total |
|---|---|---|---|
| Employment | | | |
| Direct | 987 | 0 | 987 |
| Indirect | 366 | 94 | 460 |
| Induced | 725 | 186 | 911 |
| Total | 2,078 | 280 | 2,357 |
| Labor Income ($millions) | $142.7 | $13.4 | $156.1 |
| Value Added ($millions) | $252.2 | $22.3 | $274.5 |
| State & Local Taxes ($ millions) | $22.8 | $2.5 | $25.3 |

Approximately 60 % of the regional direct, indirect and induced employment and 73% of the economic value added connected to the Port and Piscataqua River occurs within Rockingham County, NH. Strafford County in New Hampshire, and York and Cumberland counties in Maine are also impacted by the Port and Piscataqua River maritime commerce activities. These counties combined with Rockingham account for approximately 90% of all the economic activity.

In 2011, 3.1 million tons of cargo worth $1.7 billion was loaded or discharged at terminals along the Piscataqua River. This was an increase of 2% compared with 2010. A significant portion of the region's energy comes in through the port with fossil fuels (oil, propane, and coal) accounting for $0.9 billion in cargo value. The amount of fuels brought in through the port provides the equivalent of 20% of NH's total energy use.

Trends impacting the Port of Portsmouth are: 1) the dimensions of the pool of global merchant ships are increasing; 2) regionally and nationally, ports are investing in infrastructure to accommodate larger vessels. The average tonnage of a vessel in the global merchant fleet has been increasing at a rate between 6% to 9% since 2005 due to ship replacement. Ports in Chelsea and Portland in northern New England and ports in New York, Florida, Virginia, and Maryland have made significant investments to accommodate these larger vessels.

The Port of Portsmouth has different features that currently limit the size of the ships that can navigate the Port and Piscataqua River. The Sarah Long Bridge is one of the factors that limits the width of ships accessing the marine terminals in the Piscataqua River to 106 feet. This is of concern because eight out of every ten dollars of cargo activity in the Port passes under the Sarah Long Bridge, including all energy shipments. At current shipping levels, up to $1.4 billion in commerce could be at risk over the coming years if the maritime industry cannot service the upriver locations at competitive levels due to constraints caused by the Sarah Long Bridge. In 2011, 132 vessels passed under the Sarah Long Bridge with approximately 1 out of every 5 vessels having the maximum width that could pass through the Bridge. These commodities carried by these vessels include: coal, oil, propane, salt, and gypsum.

At present, the Sarah Long Bridge has the narrowest horizontal clearance in the major northern New England ports. Increasing the horizontal clearance of the Sarah Long Bridge would be expected to have a positive impact on the operations of the Port and the Piscataqua River terminal operators. The exact economic value of a widened bridge is difficult to estimate as the actual impacts depend on the future composition of the pool of merchant vessels servicing northern New England. However, given the high level of commerce transacted through the Sarah Long Bridge (with the associated economic value added to the regional economy) and the overall trends in the shipping market, there is strong qualitative evidence to justify investment in the Sarah Long Bridge as a means to ensure the viability of the industries operating along the Piscataqua River.

# Introduction

This study was sponsored by the Piscataqua River Economic Development Committee to understand the economic impact of maritime commerce on the region. The research team consisted of Matthew Magnusson, Charles Colgan, and Ross Gittell (see Appendix B for additional discussion of the credentials of the research team). The team performed a thorough and comprehensive evaluation of the total economic impact (direct, indirect and induced) of the Portsmouth Harbor and marine terminals along the Piscataqua River in Portsmouth and Newington. The analysis included: employment, tax revenue implications, and other associated value added benefits of commercial shipping in the region and how those benefits are multiplied out through the wider regional economy. The port's economic influence is primarily felt in New Hampshire but extends into southern Maine and northeastern Massachusetts.

A prime motivator for this study was to document current trends in shipping activity for the port and of specific interest was providing a better understanding of how the Sarah Long bridge impacts shipping activity in the region—as its current dimensions limit the width of vessels that can transit the Piscataqua river.

## Harbor Background

Portsmouth Harbor, located at the mouth of the Piscataqua River, is New Hampshire's only ice-free, year-round, deep water port. The harbor is located 45 miles northeast of Boston, Massachusetts and 37 miles southwest of Portland, Maine. The Piscataqua River has a federally maintained navigation channel of 35 feet at mean low water and a minimum width of 400 feet; the river runs 13 miles and forms a portion of the boundary between the States of Maine and New Hampshire. Towns immediately bordering the river include Portsmouth, Newcastle and Newington in New Hampshire and Kittery and Eliot in Maine.

The harbor has one of the fastest flowing currents of commercial harbors in the northeastern United States with tidal currents reaching speeds up to 5 knots (5.75 miles per hour). Several features of the river— including the current, the width of the Sarah Long Bridge, and undersized turn basins for commercial shipping— contribute to reducing the size of ships that can navigate into the harbor and Piscataqua River. These features restrict the full potential of the river for maritime commerce. The U.S. Army Corp of Engineers by agreement with New Hampshire's Division of Ports and Harbors has initiated a project to widen the existing turning basin at the upstream end of the federal channel. [1] The Harbor does not have commercial facilities available for extensive repairs, dry docking or merchant vessel haul out. The Market Street terminal has available dock space for minor repairs on vessels at berth in the harbor. The harbor also is the home of the Portsmouth Naval Shipyard. The economic impacts of the Portsmouth Naval Shipyard **were not** included in this analysis.

The Portsmouth Harbor and the Piscataqua River is host to seven terminals, five of which are located upriver of the Sarah Long bridge (see Table 1).

[1] US Army Corps of Engineers, New England District – Project Information Sheet; Portsmouth Harbor and Piscataqua River, New Hampshire & Maine Feasibility Study for Navigation Improvement.

***The State of New Hampshire's, Pease Development Authority (PDA) Division of Ports and Harbors (DPH) Market Street terminal*** is the only public access, general cargo terminal on the River. The Market Street terminal offers: [2]

- 8 acres of paved outside lay down area
- Onsite rail access
- 600 ft berth, 35 ft/MLW
- 312 ft berth, 22 ft/MLW
- 1/2 mile from I-95
- 2 miles from Pease International Tradeport
- 3 NM from open sea

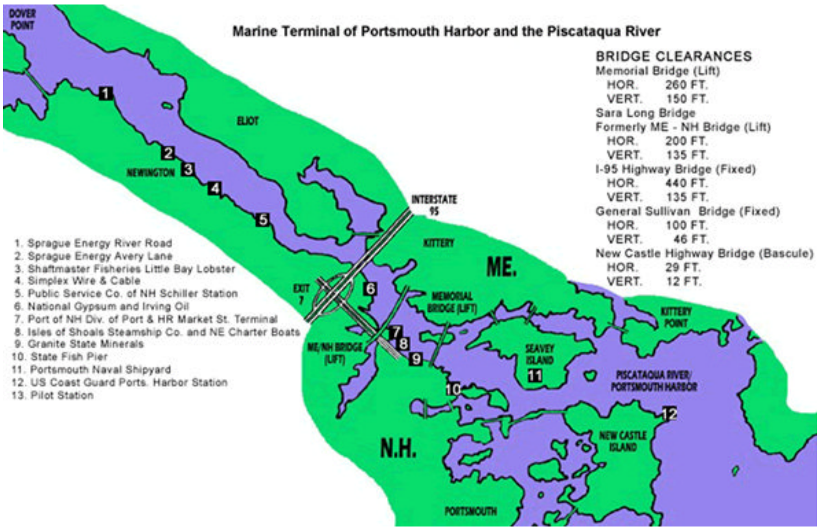
**Table 1: Marine Terminals of the Port of Portsmouth and Newington**

| Terminal | Position Relative to Sarah Long Bridge | Cargos Handled |
|---|---|---|
| Granite State Minerals | Downriver | • Road Salt |
| New Hampshire State Pier (Market Street Terminal) | Down River | • Bulk cargo<br>  ○ Scrap steel<br>  ○ De-icing salt<br>  ○ Gypsum<br>• General cargo<br>  ○ Industrial and machinery parts<br>  ○ Construction materials<br>• Project cargo<br>  ○ power plant components, wind turbine components, vacuum tanks<br>• Container cargo |
| National Gypsum/Irving Oil | Upriver | • Bulk Cargo<br>  ○ Gypsum<br>• Fossil Fuels<br>  ○ Kerosene<br>  ○ Oil |
| Public Service of New Hampshire | Upriver | • Fossil Fuels<br>  ○ Coal<br>  ○ Oil |
| Tyco Wire and Cable | Upriver | • Specialty Cargo<br>  ○ Cable |
| Sprague Avery Lane/ Sea-3 Newington | Upriver | • Liquid Cargo<br>  ○ Liquid Asphalt<br>• Fossil Fuels<br>  ○ Oil<br>  ○ Propane |
| Spraque River Road | Upriver | • Bulk Cargo<br>  ○ Road Salt<br>  ○ Cement<br>  ○ Flyash<br>  ○ Gypsum<br>• Liquid Cargo<br>  ○ Tallow<br>• Fossil Fuels<br>  ○ Kerosene |

[2] "Terminal Information," State of New Hampshire Pease Development Authority Division of Ports and Harbors, Available online at http://www.portofnh.org/terminal.html

| | | |
|---|---|---|
| | | ○ Oil |

**Figure 1: Marine Terminals of the Portsmouth Harbor and the Piscataqua River**




Source: NH Division of Ports and Harbors

The marine terminals are all located on the New Hampshire side of the river, but other marine entities upriver of the Sarah Long Bridge include a commercial offshore lobstering fleet, three boat yards, a marine laboratory, a marine construction company, and an aquaculture facility. The Maine side of the Piscataqua River does not have any major commercial/industrial facilities and is primarily residential use.

## Businesses at the Port and Piscataqua River

There are 16 organizations that were considered in determining the direct economic impact of the Port and Piscataqua River (see the section "Overview of Economic Impact Analysis" for a more detailed discussion of direct economic impact).

**Table 2: Businesses and Organizations at the Port of Portsmouth or Along the Piscataqua River**

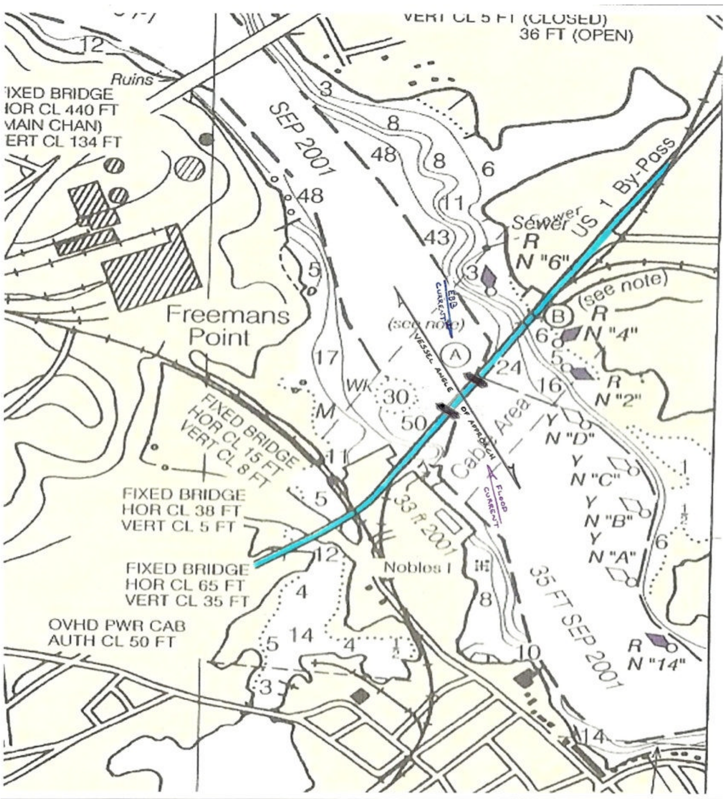
| Company | NAICS Industry Classification Code | Industry Description | Primary Good or Service |
|---|---|---|---|
| Public Service of New Hampshire | 221 | Utilities | Electricity Generation |
| Georgia Pacific | 327 | Nonmetallic Mineral Product Manufacturing | Wallboard |
| National Gypsum | 327 | Nonmetallic Mineral Product Manufacturing | Wallboard |
| Westinghouse Electric | 333 | Machinery Manufacturing | Nuclear Powerplant Components |
| TE SubCom | 335 | Electrical Equipment, Appliance, and Component Manufacturing | Fiber Optic Cable |
| Grimmel Industries | 423 | Merchant Wholesalers, Durable Goods | Scrap Metal |
| Granite State Minerals | 424 | Merchant Wholesalers, Nondurable Goods | Road Salt |
| International Salt Co. | 424 | Merchant Wholesalers, Nondurable Goods | Road Salt |
| Irving Oil Commercial GP | 424 | Merchant Wholesalers, Nondurable Goods | Petroleum Products |
| Sea 3, Inc. | 424 | Merchant Wholesalers, Nondurable Goods | Propane |
| Shaftmaster Fisheries/Little Bay Lobster | 424 | Merchant Wholesalers, Nondurable Goods | Seafood |
| Sprague Energy | 424 | Merchant Wholesalers, Nondurable Goods | Petroleum Products; Cargo Handling for Other Businesses |
| Isle of Shoals Steamship Co. | 487 | Scenic and Sightseeing Transportation | Cruises |
| Moran Tugs | 488 | Support Activities for Transportation | Tug & Barge Services |
| Portsmouth Pilots | 488 | Support Activities for Transportation | Harbor Piloting |
| Pease Development Authority | 921 | Executive, Legislative, and Other General Government Support | Port Management |

## Sarah Mildred Long Bridge and the Port

The Sarah Mildred Long Bridge is a double deck steel lift bridge that carries the Route 1 Bypass and a railroad bed across the Piscataqua River connecting the towns of Portsmouth, NH and Kittery, ME.  The length of the bridge is 2,804 feet and is maintained by the Maine-New Hampshire Interstate Bridge Authority.   In 2006, the average daily traffic on the bridge was 15,000 vehicles.  The bridge is viewed as having major historical significance.

The Sarah Long bridge has a horizontal clearance of 200 feet; however, the opening is positioned at an angle to the flow of current and this—plus the bridge opening's width— limits that maximum vessel beam (width) that can pass through the bridge at 106 feet.

**Figure 2: Map of Sarah Long Bridge and the Piscataqua River**




Source: National Oceanic and Atmospheric Association

The bridge, originally known as the "Maine-New Hampshire Bridge", opened in 1940 to alleviate motor vehicle traffic on the nearby Memorial Bridge while still accommodating the Boston and Maine Railroad. The bridge also replaced a nearby railroad trestle that collapsed in 1939. While the bridge at one point experience significant rail traffic, the rail tracks on the Maine side of the bridge currently only connect with the Portsmouth Naval Shipyard and is used for infrequent transportation of nuclear materials or heavy loads.

In 1987, the bridge was renamed in honor of Sarah M. Long, who as an employee of the Maine-New Hampshire Interstate Bridge Authority had given 50 years of service. More recently, in 2011, New Hampshire and Maine entered into a joint-agreement to repair the Sarah Long Bridge, as part of an overall repair program for Piscataqua River bridges connecting New Hampshire and Maine; the other two bridges that were part of this agreement are the Memorial Bridge, and the Interstate 95 High Level Bridge. Maine was to take the lead on a rehabilitation of the Sarah Long Bridge repairing the existing structure at an estimated cost of $119 million.

However, concerns have been raised by the PDA Division of Ports and Harbors, the businesses that operate along the Piscataqua River, and the Portsmouth Pilots that the repair investment would not change the bridge dimensions. Currently, to allow a ship to pass through the bridge, wider ships require that the assisting tugboats cast off from the boat as the width of bridge is too narrow to accommodate tugs alongside, the tugboats then reattach to the vessel after it has passed through the bridge. HNTB Inc., the engineering firm contracted for the project estimated that building a new bridge with a wider span would add $40 million to $65 million to the $119 million cost.[3]

**Figure 3: Photograph of a Wide Vessel Passing through the Sarah Long Bridge**

Source: Portsmouth Pilots

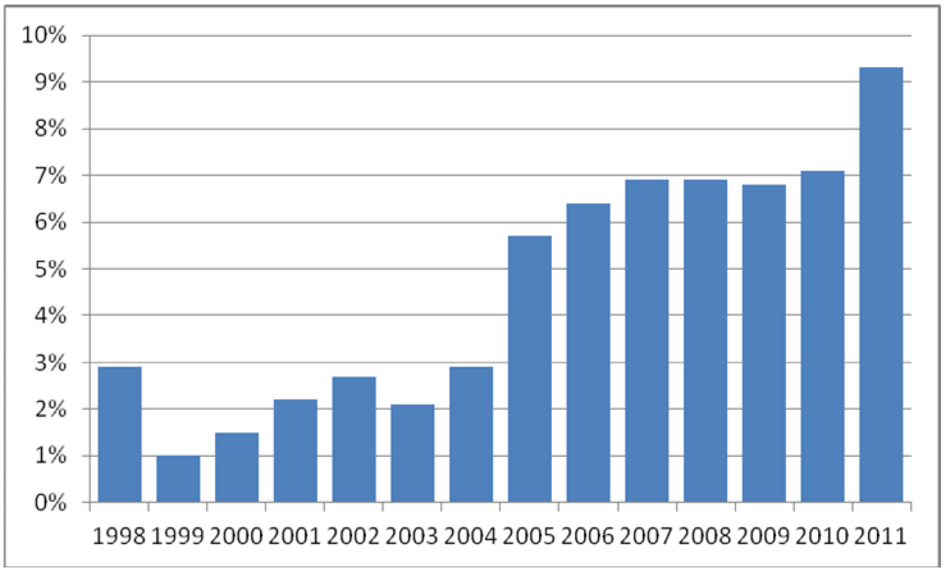
[3] "MaineDOT: New Sarah Long Bridge idea is still on the table," Fosters Daily Democrat, March 7,2012, Available online at http://fosters.com/apps/pbcs.dll/article?AID=/20120307/GJNEWS_01/703079926/0/twitter

## Waterborne Commerce Market

Approximately 90% of world trade is carried by ship. In 2010, there were 20,000 commercial vessels globally having a dead weight tonnage (DWT) of 10,000 tons or greater for a combined global shipping capacity of 1.2 billion tons.[45] Total foreign waterborne trade in the U.S. was 1.3 billion tons of cargo worth $1.4 trillion.

There has been a long-term trend of a steady increase in ship sizes as carriers attempt to gain efficiencies through larger vessels. The Institute of Shipping Economics and Logistics attributes the observed increase in average vessel size as being both the result of new larger ship designs and also fleet consolidation into already existing larger ship designs. The Institute projects this trend to continue into the future. [6]

**Figure 4: Annual % Change in Average Vessel Tonnage for World Merchant Fleet**




Source: Institute of Shipping Economics & Logistics

A historical driver of vessel sizes has been the Panama Canal. The Panama Canal is a major conduit for international maritime commerce. In 2009, canal cargo traffic reached 299 million tons. The current locks in the canal can accommodate a ship up to 110 feet in width and 965 feet in length. "Panamax" is a term used for ships that are designed to be meet the maximum threshold on ship dimensions to use the canal. Those dimensions are 950 feet in length and 106 feet in width and DWT ranges between 65 and 85 thousand tons. The canal is upgrading to a new set of locks that are due to be available in 2015. These new locks can accommodate a ship up to 1,400 feet long, 180 feet wide, and 50 feet deep.

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[4] Dead weight tonnage (DWT) refers to the maximum load that a ship can safely transport.
[5] "Fleet Statistics (10,000 Deadweight Tons or Greater)," U.S. Dept. of Transportation: Maritime Administration, Available online at http://www.marad.dot.gov/library_landing_page/data_and_statistics/Data_and_Statistics.htm
[6] "Shipping Statistics and Market Review," Institute of Shipping Economics & Logistics, Vol. 55 No ½-2011.

Several ports, including the ports of New York, Norfolk, Virginia, and Baltimore, Maryland have already increased their navigable depth to at least 50 feet to accommodate these changes, and the Port of Miami has recently approved the "Deep Dredge" to make it the closest deep water port to the Panama Canal in the US. The Port Authority of New York and New Jersey is planning to raise the clearance of the Bayonne Bridge to 215 feet (66 m), at a cost of $1 billion, to allow for anticipated larger ships to reach container port facilities in New Jersey.

The dynamics moving towards accommodating larger ships is not limited to large U.S. ports. In the northeast, both Chelsea Harbor and Portland have invested in infrastructure to accommodate larger size ships. A structurally deficient Chelsea St. Bridge connecting East Boston and Chelsea in Massachussetts was replaced with a wider 450 foot draw bridge. The $125 million project was completed May 15, 2012 and provides 175 feet of vertical clearance when raised. The wider space between bridge piers will allow for newer, double-hulled fuel tankers to use the channel.[7] In Portland, the Million Dollar Bridge across the Fore River in Portland was replaced by the Casco Bay Bridge to increase the opening for ship traffic from 95 to 285 feet.

**Table 3: Northern New England Bridge Dimensions on Major Commercial Waterways**

| Bridge | Location | Width (Working Width) | Year of Width Upgrade |
|---|---|---|---|
| Casco Bay Bridge | Portland, Maine | 285 ft (285 ft) | 1997 |
| Chelsea St. Bridge | Chelsea, Massachusetts | 450 ft (450 ft) | 2012 |
| Sarah Long Bridge | Kittery, Maine / Portsmouth, New Hampshire | 200 ft (110 ft) | n/a |

The recent replacement of the Casco Bay Bridge (Portland, ME) and Chelsea St. Bridge (Boston, MA) leaves the Sarah Long Bridge with the narrowest horizontal clearance in the major northern New England ports. As far back as 1984, the Army Corp of Engineers identified a trend towards larger ships and discussed that it will be challenging for the Portsmouth Harbor to remain competitive or for consumers to capture the associated savings in waterborne transportation costs associated with larger size ships without additional infrastructure investment.[8]

In Northeastern markets, there is already a fleet of vessels operating in other ports with wider beams of 118 feet.[9] In 2011, the largest commercial vessel to enter Portsmouth Harbor was the *CSL Atlas*, a bulk carrier, with a DWT of 67,364 a length of 747 feet and a width of 106 feet carrying a load of gypsum to the Sprague River Road terminal. The largest commercial vessel to enter Portsmouth Harbor since 2005, was the *Sheila Ann*, also a bulk carrier, with a DWT of 70,037 a length of 740 feet and width of 106 feet. The widest ship that has navigated the Piscataqua is 106 feet which is due in part to restrictions caused by the Sarah Long Bridge.

[7] New Chelsea St. Bridge is boon to drivers, fuel tankers," Boston Globe, May 15, 2012, available online at http://www.boston.com/news/local/massachusetts/articles/2012/05/15/new_125_million_chelsea_street_bridge_opens/

[8] "Portsmouth Harbor & Piscataqua River: Feasibility Report for Navigation Improvement Including Environmental Assessment," US Army Corp of Engineers, March 1984.

[9] Conversations with shipping agents that service the Northern New England market.

## Regional Shipping Activity

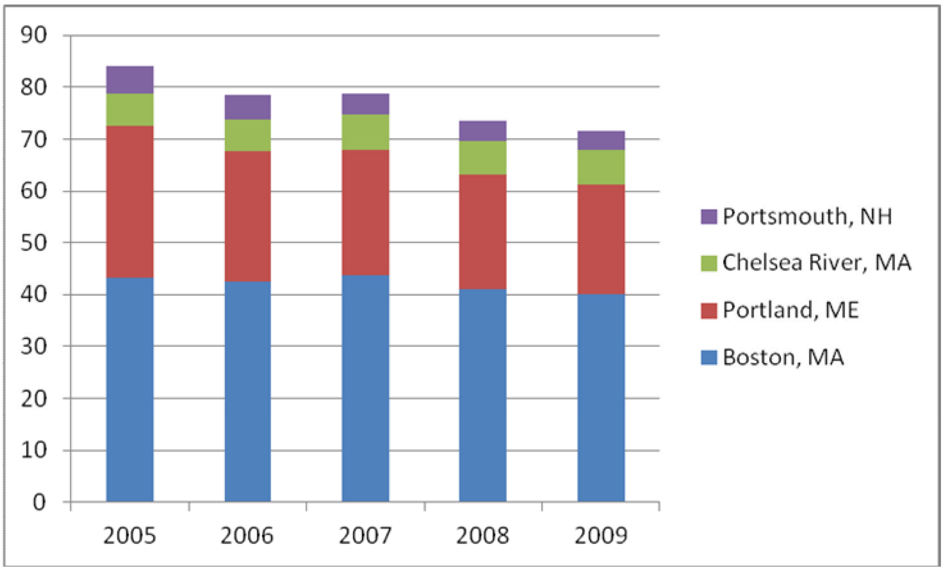
Shipping activity has been in decline in northern New England since 2005. Regional shipping tonnage has decreased from 83.9 million tons in 2005 to 71.6 million tons in 2009 (a decline of 15%).[10] The decline in cargo activity has been observed in Portsmouth Harbor and in the neighboring ports of Boston and Chelsea Harbor, MA and Portland ME. A more detailed discussion of shipping activity in the Portsmouth Harbor and Piscataqua River is included in the next section.

**Table 4: Northern New England Port Shipping Activity in Millions of Tons**

| Ports | 2005 | 2006 | 2007 | 2008 | 2009 | % Change 2005 - 2009 |
|---|---|---|---|---|---|---|
| Boston, MA | 43.1 | 42.5 | 43.6 | 41.1 | 40.1 | -7% |
| Chelsea River, MA | 6.2 | 5.9 | 6.8 | 6.4 | 6.9 | 11% |
| Portland, ME | 29.3 | 25.2 | 24.3 | 22.1 | 21.0 | -28% |
| Portsmouth, NH | 5.3 | 4.8 | 4.0 | 3.8 | 3.6 | -32% |
| Total | 83.9 | 78.5 | 78.7 | 73.4 | 71.6 | -15% |

Source: U.S Army Corps of Engineers

**Figure 5: Northern New England Port Shipping Activity in Millions of Tons**




Source: U.S Army Corps of Engineers

10 Waterborne commerce statistics were only available through 2009 for northern New England ports, "Waterborne Commerce Statistics Center," US Army Corp of Engineers, available online at http://www.ndc.iwr.usace.army.mil/wcsc/webpub09/webpubpart-1.htm

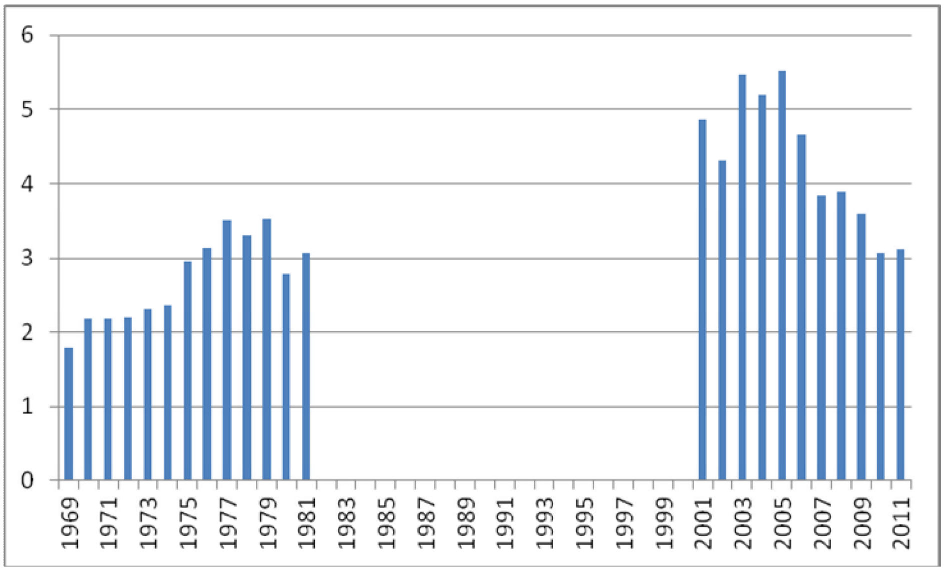
**Table 5: Annual Percent Change in Shipping Tonnage at Northern New England Ports**

| | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|
| Boston, MA | -1% | 3% | -6% | -2% |
| Portland, ME | -14% | -4% | -9% | -5% |
| Chelsea River, MA | -6% | 15% | -6% | 8% |
| Portsmouth, NH | -8% | -17% | -5% | -7% |
| Total | -6% | 0% | -7% | -3% |

## Portsmouth Harbor Shipping Activity

The terminals along the Portsmouth Harbor and the Piscataqua River generate between 150 and 250 inbound commercial vessel transits per year. Historically, waterborne commerce was 1.8 million tons in 1969 rising up to 3.1 million tons in 1981. Shipping activity hit a peak at 5.5 million tons in 2005, followed by a decline to 3.0 million tons in 2010.[11]

**Figure 6: Historical Cargo Tonnage for Port of Portsmouth and Piscataqua River 1969-1981 and 2001-2011 (tons)***



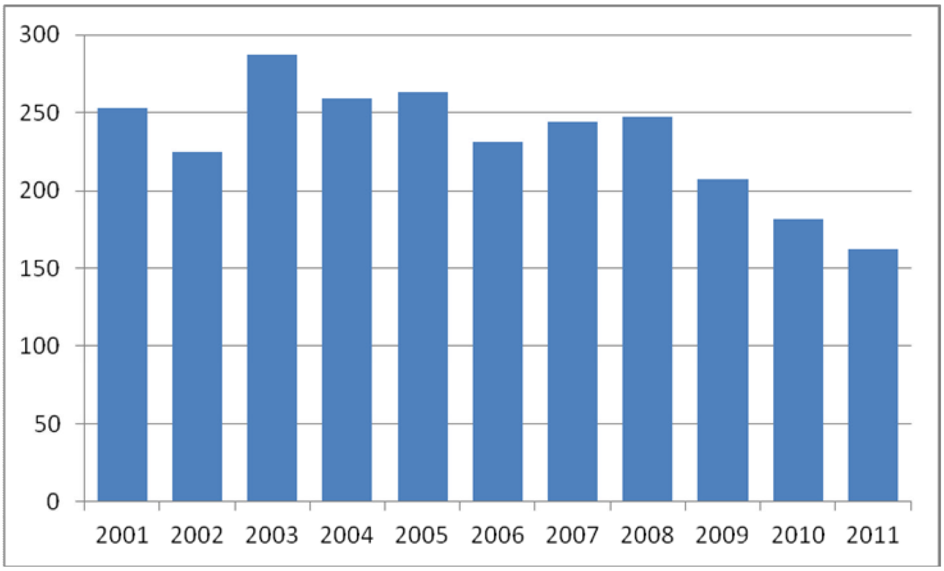

Source: Army Corp of Engineers, NH Port Authority
***Data was not available from 1982 to 2000 at the time of the study**.

In 2011, the Port of Portsmouth and the Piscatqua River Terminal Operators handled $1.7 billion in cargo weighing 3.1 million tons. This was a 2% increase in tonnage from 2010. Total inbound

[11] Shipping records were only available from 1969 – 1981 and 2001 – 2011 at the time data was collected.

commercial vessel trips loading or discharging at a marine terminals was 162 an 11% decline from the 182 vessels in 2010. Peak vessel traffic was 287 recorded in 2003.

**Figure 7: Annual Commercial Shipping Vessel Activity in Port of Portsmouth or Piscataqua River**




Source: Portsmouth Pilots

In 2011, the principal commodity moved on the existing waterway was fossil-fuel based products (oil, propane, and coal) which comprise approximately 50% of the marine commerce shipped through the harbor by weight and 55% of its value. Bulk goods (primarily road salt, gypsum, and steel scrap) accounted for 40% of the weight and 8% of the value. General cargo and liquid cargo accounted for 7% of cargo by weight but 37% of cargo value.

The significant majority of weight and value of cargo is in-bound. The chief products shipped out of Portsmouth are general cargo, tallow, and steel scrap. The port has occasionally engaged in small-scale containerized shipping; however, there was no container activity in 2010 or 2011. The cargo mix has remained relatively constant since at least the 1970s. Disclosure requirements protecting individual terminal operators prevent a more detailed discussion of shipping activity.

**Figure 8: Cargo Tonnage in Portsmouth Harbor and Piscataqua River in 2011**

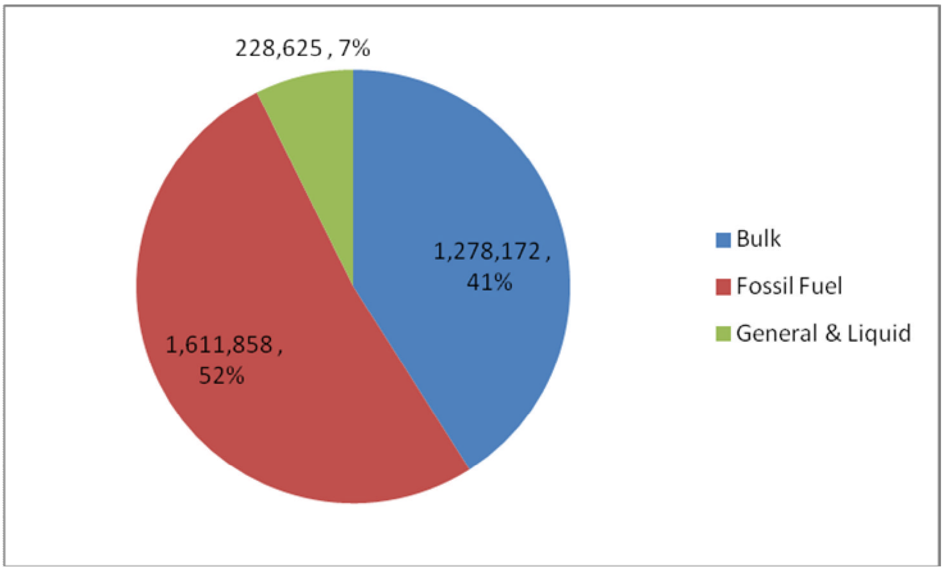
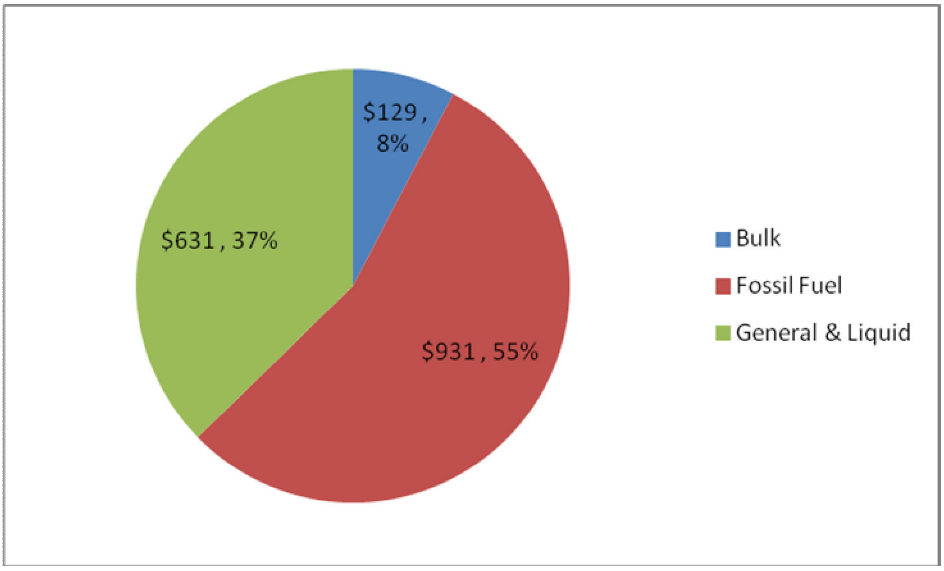



**Figure 9: Cargo Value in Portsmouth Harbor and Piscataqua River in 2011 ($ millions)**




A significant portion of the region's energy comes in through the port with fossil fuel based cargo (oil, propane, and coal) accounting for $0.9 billion in cargo value. The amount of energy brought in thru the port is an estimated 60 trillion BTU— the equivalent to 20% of NH's total energy use and accounted for almost all of NH's distillate oil use.[12]

[12] In 2009, NH consumed 303 trillion BTU of energy from all sources. Disclosure requirements prevent a more detailed discussion of fossil fuel transactions by terminal operators.

Of note, is the Port of Portsmouth's flexibility in cargo handling capabilities. In the summer of 2011, 33 wind turbines bound for the Granite Reliable Power Project in Coos, NH were shipped and received at the Market Street terminal. It also highlights that there is the opportunity for the Port to be involved in new technologies and that it can be involved in other aspects of the regional energy economy in addition to imports of fossil fuel energy sources.

**Figure 10: Photograph of Wind Turbines Shipped in 2011 to Market Street Terminal**


A significant portion of the commerce transacted in the Piscataqua River passes underneath the Sarah Long Bridge. In 2011, eight out of every ten dollars worth of cargo ($1.4 billion total) passed under the Sarah Long Bridge. Out of a total of 162 vessels trips to the Portsmouth Harbor, 132 ships passed through the Sarah Long Bridge. These vessels had an average length of 544 feet and width of 83.4 feet. Of those vessels, 23 (approximately 1 out of every 5) were the maximum width the Sarah Long Bridge can accommodate (106 feet) with an average length of 658 feet. Cargo carried by the vessels with 106 foot width included: oil, coal, propane, salt, and gypsum.

## Overview of Economic Impact Analysis

The technique used to estimate the economic activity in this study is called economic impact analysis. Economic impact analysis describes the current economic activity in a study area (such as a county, group of counties, state, or group of states) and it can be useful in estimating how a change—such as the loss of an existing industry or the addition of a new industry—would be expected to affect the wider local or regional economy in the study area. Impact analysis begins with evaluating the output of businesses included in the analysis. These expenditures (referred to as direct expenditures) trigger a series of additional spending flows throughout other sectors of the local economy as businesses spend on 1) payroll and benefits, and 2) supplies, equipment, and service contracts with local vendors (referred to as indirect expenditures). The purchase of goods and services from local vendors supports the hiring of workers at those firms and also provides funds to enable those firms to purchase additional goods and services from suppliers situated further down the supply chain.

The activity at companies involved in direct or indirect expenditures results in their employees earning salaries and wages. A portion of their wages will be spent on local goods and services at different industries including: health care, retail, and leisure (referred to as household spending or induced expenditures). This round of spending by employees helps support workers in those industries who then will spend portions of their incomes locally and employees triggers another round of spending, etc.

This entire chain of spending is referred to as the "ripple" or "multiplier" effect. The rounds of spending and re-spending do not continue indefinitely but typically diminish rapidly. The impacts of the initial economic activity rapidly leave or "leak" out of the local economy through the imports of goods and services produced in other regions, savings, spending in areas outside the local economy, and taxes.

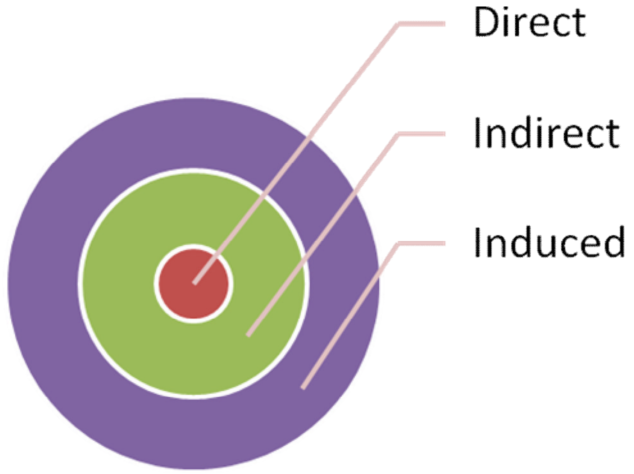
Economic impact analysis estimates the total impact of an economic activity as the combination of effects of the three different levels of economic activity (direct, indirect, and induced).

- **Direct effects** are the employment, output and income triggered by the first round of spending of an economic activity
- **Indirect effects** are the employment, output, and income in subsequent rounds of re-spending that arise through inter-industry purchases (purchases from local supplier industries)
- **Induced effects** –also called household spending effect— are created from the payrolls of workers in direct and indirect industry sectors spend on local goods and services.

**Equation 1: Total Economic Impacts**

$$Impacts_{Total} = Impacts_{Direct} + Impacts_{Indirect} + Impacts_{Induced}$$

**Figure 11: Direct, Indirect, & Induced Economic**




**Impacts**

## Study Methodology

To analyze the impacts of the port's direct economic activities, the IMPLAN model was used. The IMPLAN model is a widely used economic evaluation tool (discussed in greater technical detail in the section below) was used to determine total economic impact on the region from Port businesses. IMPLAN 3.0 (2010 data) was used to model direct, indirect, and induced economic impacts.

In this analysis, the impact of the Port of Portsmouth and Picataqua River terminal activities on the regional economy is broken down into three distinct aspects.

1. **Direct** – In this study, direct impacts were defined as the employment and business activities for the 16 terminal operators and businesses along the Piscataqua river or located nearby to the Piscataqua that rely on commercial waterborne commerce for inputs in their operations.
2. **Indirect** - Indirect impacts are the employment and economic activity brought on by the expenditures of the 16 organizations identified as direct. For example, the economic activity of machine shops or wholesalers. Indirect activity also includes local purchases of equipment, supplies, and professional services.
3. **Induced** - Induced impacts are the employment and economic activity brought on through the expenditure of income and earnings in the broader economy by individuals directly and indirectly employed by industries servicing the terminal operators and other direct industries. This can include expenditures on goods and services including: food, clothes, utilities, transportation, recreation, medical care, and childcare.

In addition, the goods provided through maritime commerce—such as gypsum for wall board, rock salt for deicing roads, and oil for heating homes—are sold to businesses within the region, which supports another round of economic activity in businesses not located directly on the Piscataqua river, but dependent on the goods brought in through maritime commerce. This analysis discusses these impacts in general, but does not analyze the economic impacts of the industries that are the customers of the 16 direct industries as the Port of Portsmouth is not the sole mechanism of cargo delivery. Goods that are currently transported through the Port of Portsmouth could arrive through other nearby ports or other delivery mechanisms (rail or truck) to reach distribution or retail businesses. There would be an increase in cost expected through other delivery channels (based on the premise that in a competitive market if there were lower cost ways for goods to arrive to retailers and distributors than they would bypass the Port for those alternative delivery mechanisms). However, it was beyond the scope of this study to evaluate the cost differential of alternative transportation arrangements.

To gather data for input to the model, a survey form (survey form is provided in Appendix C) was sent to the 16 organizations that operate facilities along the Piscataqua or who are located in close proximity and receive raw materials for their operations from water-based transportation. Of the 16 organizations, 12 completed the survey; 2 partially completed the survey; and 2 did not respond to the survey. The survey asked questions on employment, local (Maine and New Hampshire) suppliers and customers, and waterborne cargo questions. The data provided by the organizations was cross referenced against logs maintained by the Port Authority of vessels which documents cargo type and tonnage. For the organizations that did not provide any or incomplete employment information, the IMPLAN model was used to estimate employment and wage impacts.

The analysis was run to link the port's activity to the State of New Hampshire and to Rockingham County. Based on data obtained from survey recipients, indirect and induced economy activity from the IMPLAN model were applied to Maine, New Hampshire, and other states based on 1) employee residence, 2) supplier location and expenditures at the state level. The apportionment of indirect and induced impacts was assumed to be 78% for New Hampshire and 20% for Maine with the remaining 2% being allocated to other New England states. This assumption was relatively consistent across several survey respondents, but the quality, quantity of information varied across survey participants. Also several participants did not provide detailed supplier data. Therefore these estimates are believed to be reasonable within the limits of the data provided by the port users.

## Port Economic Impact

In 2011, the sixteen port-based businesses employed 987 paying $90.2 million in total compensation (includes salaries, wages, and benefits) or $91,286 per worker. For every dollar in value added by port industries, another $0.66 cents is generated in indirect and induced economy activity in New Hampshire and Maine. The total economic impact to the regional economy (Maine and New Hampshire) is $274.5 million in value added (see Appendix A for definition of value added) with a total employment impact of 2,357 paying $156 million in salaries, wages, and benefits.

**Table 6: Total Economic Impact of Port of Portsmouth & Piscataqua River Terminal Operators on the Regional Economy (New Hampshire & Maine)**

| Impact Type | Employment | Labor Income | Value Added |
|---|---|---|---|
| Direct Effect | 987 | $90.2 | $165.4 |
| Indirect Effect | 460 | $27.4 | $41.7 |
| Induced Effect | 911 | $38.5 | $67.4 |
| Total Effect | 2,357 | $156.1 | $274.5 |

Out of the total economic impact in New Hampshire and Maine, approximately 90% of the employment, income and value added benefits are experienced in New Hampshire and 10% are experienced in Maine.

**Table 7: Proportion of Regional Economic Impact in New Hampshire & Maine**

| State | Employment | Labor Income | Value Added |
|---|---|---|---|
| New Hampshire | 88% | 91% | 92% |
| Maine | 12% | 9% | 8% |

The direct economic impact is experienced in Rockingham County, NH accounting for $165 million in value added. The total employment impact in NH is 2,078 paying $142.6 million in wages.

**Table 8: Economic Impacts in New Hampshire from the Port of Portsmouth and Piscataqua River Terminals**

| Impact Type | Employment | Labor Income | Value Added |
|---|---|---|---|
| Direct Effect | 987 | $90.2 | $165.4 |
| Indirect Effect | 366 | $21.8 | $33.2 |
| Induced Effect | 725 | $30.7 | $53.7 |

| | | | |
|---|---|---|---|
| Total Effect | 2,078 | $142.7 | $252.2 |

Strafford and Rockingham county in New Hampshire experience the greatest economic activity in NH from the Port of Portmouth and the Piscataqua River terminals accounting for 1,900 in employment (over 90% of the employment generated in NH) and $237 million of value added (almost 95% of the value added in NH).

**Table 9: Economic Impacts in New Hampshire Counties from the Port of Portsmouth and Piscataqua River Terminals**

| | Economic Activity | | | Percentage of Economic Activity | | |
|---|---|---|---|---|---|---|
| **County** | **Employment** | **Wages** | **Value Added** | **Employment** | **Wages** | **Value Added** |
| Rockingham | 1,428 | $ 112.7 | $ 201.7 | 69% | 79% | 80% |
| Strafford | 473 | $ 20.5 | $ 35.5 | 23% | 14% | 14% |
| Hillsborough | 82 | $ 4.7 | $ 7.2 | 4% | 3% | 3% |
| Belknap | 51 | $ 2.8 | $ 4.4 | 2% | 2% | 2% |
| Merrimack | 21 | $ 1.0 | $ 1.7 | 1% | 1% | 1% |
| Carroll | 22 | $ 0.9 | $ 1.6 | 1% | 1% | 1% |
| Grafton | 1 | $ 0.0 | $ 0.1 | 0% | 0% | 0% |
| Sullivan | 1 | $ 0.0 | $ 0.1 | 0% | 0% | 0% |
| Total | 2,078 | $ 142.7 | $ 252.2 | 100% | 100% | 100% |

Maine does not experience any direct economic impacts from the Port of Portsmouth or the Piscataqua River terminal operators and businesses as they are all located on the NH side of the Piscataqua River. However, 197 workers who live in Maine either work at the Port of Portsmouth, at the terminal operators, or at businesses directly connected to cargo received by the terminal operators—this is 20% of the overall workforce associated with the port. Their wages support expenditures in Maine that add value to the Maine economy. In addition, the businesses at the Port and Piscataqua River purchase goods and services from Maine-based businesses that also support the Maine economy.

**Table 10: Economic Impacts in Maine from the Port of Portsmouth and Piscataqua River Terminals**

| Impact Type | Employment | Labor Income ($ millions) | Value Added ($ millions) |
|---|---|---|---|
| Direct Effect | 0 | $ - | $ - |
| Indirect Effect | 94 | $5.6 | $8.5 |
| Induced Effect | 186 | $7.9 | $13.8 |
| Total Effect | 280 | $13.5 | $22.3 |

York and Cumberland county in Maine experience the greatest economic activity in NH from the Port of Portsmouth and the Piscataqua River terminals accounting for 246 in employment ( almost 90% of the employment generated in Maine) and $19 million of value added ( almost 90% of the value added in Maine).

**Table 11: Economic Impacts in Maine Counties from the Port of Portsmouth and Piscataqua River Terminals**

| | Economic Activity | | | Percentage of Economic Value | | |
|---|---|---|---|---|---|---|
| County | Employment | Wages | Value Added | Employment | Wages | Value Added |
| York | 180 | $ 7.7 | $ 13.4 | 64% | 57% | 60% |
| Cumberland | 66 | $ 3.9 | $ 5.9 | 24% | 29% | 27% |
| Penobscot | 20 | $ 1.2 | $ 1.8 | 7% | 9% | 8% |
| Androscoggin | 5 | $ 0.3 | $ 0.4 | 2% | 2% | 2% |
| Kennebec | 4 | $ 0.2 | $ 0.3 | 2% | 1% | 1% |
| Knox | 2 | $ 0.1 | $ 0.2 | 1% | 1% | 1% |
| Oxford | 2 | $ 0.1 | $ 0.1 | 1% | 1% | 1% |
| Sagadahoc | 1 | $ 0.1 | $ 0.1 | 0% | 0% | 0% |
| Total | 280 | $ 13.5 | $ 22.3 | 100% | 100% | 100% |

The economic activities of the Port of Portsmouth and the Piscataqua River terminals generated state and local taxes of $25.3 million across New Hampshire and Maine. New Hampshire received $22.8 million in state and local taxes (90%) and Maine received $2.5 million in state and local taxes (10%).

While not quantified in this study, the majority of the cargo brought in to the Port is sold to local retailers or directly to end users.

## 1995 Economic Impact Study

An economic impact study of the Port was conducted in 1998 by Rousseau and Lindsey of the Department of Resource Economics and Development at the University of New Hampshire. They conducted a similar survey of the Port-associated businesses and found that the total economic impact in 1995 was $140 million ($206.6 million in 2011 dollars).[13] The fifteen companies included in the study employed 1,289 paying $54.3 million in payroll and benefits ($72.3 million in 2011 dollars). The total tax impacts on the regional economy were estimated to be between $4.4 million and $5.5 million ($6.5 - $8.1 million in 2011 dollars). As is true today, the principal types of cargo included: coal, oil, propane, gypsum, and road salt; total cargo tonnage was reported to be over 4 million tons.

[13] Rousseau, M. A., and Lindsay, B. E., "Economic Impact of the New Hampshire Seaport Terminal Industry on the Regional Economy for 1995," Dept. of Resource Economics and Development, University of New Hampshire, March 1998.

**Table 12: Results of 1995 Economic Study of the Port of Portsmouth**

| | 1995 Impact Study | 2011 Impact Study | % Difference |
|---|---|---|---|
| Direct Employment | 1,289 | 987 | -23% |
| Businesses in Study | 15 | 16 | 7% |
| Direct Payroll & Benefits ($2011 millions) | $80.1 | $90.2 | 13% |
| Total Economic Impact – Value Added ($2011 millions) | $206.6 | $274.5 | 33% |
| Total Cargo (Millions Tons) | 4.0 | 3.1 | -23% |

Between 1995 and 2011 employment at Port-based businesses decreased 23% from 1,289 to 987; cargo tonnage decreased a similar percentage from 4 million to 3.1 million tons. Even though overall employment decreased by approximately 300, wages and benefits increased by 13% and estimated total impact (as measured through value-added) increased 33%.

## Economic Impact of Sarah Long Bridge

This analysis did not analyze the economic impact of a widened bridge as there was insufficient information on potential cost implications to provide a meaningful analysis. This would have required the development of a regional transportation model which was beyond the scope of this study. However, cargo statistics provide a useful indicator with eight out of every ten dollars of cargo value passing under the bridge on an annual basis. This highlights the economic importance of the Sarah Long Bridge and its potential to positively or negatively impact waterborne commerce by the virtue of its dimensions. At current shipping levels, up to $1.4 billion in commerce could be at risk over the coming years if the maritime industry cannot service the upriver locations at competitive levels due to changes in the shipping market.

While there is uncertainty as to the actual economic impacts of widening the bridge, as it will depend on the future pool of ships available to the Northeast region and overall patterns of domestic and international waterborne commerce, there is an accelerating trend towards larger vessels in the overall merchant fleet. Both at the regional and national level ports have been making infrastructure improvements to handle these larger vessels. Therefore the current width of the Sarah Long Bridge is a constraint to shipping activity in the harbor, which will only be exacerbated with a regional pool of larger vessels. Given the high level of commerce transacted through the Sarah Long Bridge (with the associated economic value added to the regional economy), there is strong qualitative evidence to justify investment in infrastructure to ensure the viability of the industries along the Piscataqua River.

# Conclusion

The Port of Portsmouth and the Piscataqua River have a positive impact on the regional economy contributing $274.5 million to the regional economy and generating 2,350 jobs. The Port has a positive impact on the economies of both New Hampshire and Maine. While the majority of employment and economic value added is in New Hampshire—accounting for approximately 90% of the regional economic benefit; the employment and economic value added in Maine is not insignificant. NH port businesses employ almost 200 workers who live in Maine; these businesses also purchase goods and services from Maine-based businesses which generates economic benefit.

Increasing the horizontal clearance of the Sarah Long Bridge would be expected to have a positive impact on the operations of the Port and the Piscataqua River terminal operators. While the exact value of a widened bridge is difficult to estimate as the actual impacts depend on the pool of ships available to the Northeast region and overall patterns of domestic and international waterborne commerce are highly dynamic, there is an underlying trend towards larger vessels in the overall merchant fleet; regionally and nationally ports have and are making infrastructure improvements to handle these larger vessels. Therefore the current width of the Sarah Long Bridge is a constraint to shipping activity in the harbor, which will only be expected to grow worse with time. Given the high level of commerce transacted upriver of the Sarah Long Bridge it appears to be prudent to make the investment to ensure the viability of the industries along the Piscataqua River.

The consequence of no action on the width of the bridge could at a minimum result in longer term increased costs that put these businesses at a competitive disadvantage in a highly competitive marketplace as other harbors invest in their infrastructure. Given that the majority of materials borne in through maritime commerce for regional consumption, this would be expected to result in an increase in cost to all consumers of those products including: heating oil, propane, road salt, and construction materials.

The worst case scenario would be that failure to make infrastructure investments leaves the Piscataqua River region at such a competitive disadvantage that the cost to attract vessels that can accommodate the harbor restrictions becomes too great, and the river becomes a proverbial "Route 66" for waterborne commerce in the region. While all of the terminals are located on the NH side of the river, the economic activity from these terminals spans both sides of the river and up to $275 million in value added to the region and 2,350 in employment would be at risk.

## Appendix A: IMPLAN Model

IMPLAN (IMpact analysis for PLANing) is a system of software and databases produced by the Minnesota IMPLAN Group (MIG), Inc that is widely used and accepted for local and regional economic modeling. IMPLAN was originally developed in 1976 by the US Forest Service, the Federal Emergency Management Agency, and the Bureau of Land Management to allow for analysis of private and public sector decisions on local, state and regional economic impacts. MIG, Inc. was formed in 1993 to privatize the development and maintenance of IMPLAN data and software. IMPLAN is currently in its third version.

IMPLAN utilizes input-output (I-O) accounts to model how the more than 500 industries that comprise the U.S. economy interact. Input-output (I-O) analysis quantifies the relationships of how industries provide input to and use output from each other. IMPLAN data and accounts follow the accounting conventions used by the U.S. Bureau of Economic Analysis (BEA) when developing an Input-Output (I-O) model of the U.S. economy as well as formats recommended by the United Nations.

Underlying data sources for the IMPLAN model include:

- U.S. Bureau of Labor Statistics (BLS)
    - Census of Wages and Employment (CEW)
- U.S. Department of Census
    - County Business Patterns
    - Annual Survey of Manufacturers (ASM)
    - Construction Spending (Value Put in Place)
- Bureau of Economic Analysis (BEA)
    - Regional Economic Information System (REIS)
    - National Income and Product Accounts (NIPA)
    - Gross State Product (GSP) series
    - Output series

The IMPLAN program uses an ordered series of steps to build the model starting with selection of a study-area. The study-area can be at the county level (including multiple counties), the state level (including multiple states), and the national level. The IMPLAN model allows substitution of data at each stage of the process which can serve to increase the robustness of the model. The model can also have its import and export functions modified and industry groupings changed. IMPLAN also allows for the creation of aggregate models consisting of industries grouped together to streamline the modeling process.

The creation of the study-area database constructs a descriptive and prescriptive model. The descriptive model describes the transfer of money between industries and institutions. This model provides data tables on regional economic accounts that capture local economic interactions. These tables describe the local economy in terms of the flow of dollars from purchasers to producers within the study-area region. The descriptive model also produces trade flows— the movement of goods and services within a study-area and the outside world (regional imports and exports).

The prescriptive model is a set of input-output multipliers that estimate total regional activity based on a change entered into the IMPLAN model. Multiplier analysis is used to estimate the regional economic impacts resulting from a change in final demand. New industries or commodities can be introduced to the local economy, industries or commodities may be removed, and reports can be generated to show the consequences (on output, employment, and value-added) of various impacts. Impacts include: output, labor income, value added, and employment. Impacts can be in terms of direct and indirect effects (commonly known as Type I multipliers), or in terms of direct, indirect, and induced effects.

**Table 13: Implan Summary Measures of Regional Economic Activity**

| **Measure** | **Description** |
|---|---|
| Output | The value of production by industry in a calendar year. Output is measured by sales or receipts and other operating income plus the change in inventory. For retailers and wholesalers output is equal to gross margin not gross sales. |
| Labor Income | All forms of employment income, including employee compensation (wages and benefits) and proprietor income. |
| Value Added | The difference between total output and the cost of intermediate inputs. It is a measure of the contribution to Gross Domestic Product (GDP) and equals output minus intermediate inputs. Value added consists of compensation of employees, taxes on production and imports less subsidies, and gross operating surplus. |
| Employment | The annual average of monthly jobs in an industry and includes both full-time and part-time workers. |

## Appendix B: Study Authors

*Matt Magnusson* is an adjunct lecturer for the University of New Hampshire's Whittemore School of Business and Economics. He is currently working towards earning his PhD in the University of New Hampshire's Natural Resources and Earth Sciences program and has a Masters of Business Administration. He drew on his work in environmental economics to develop models of direct, indirect and induced employment and economic activity for the winter sport tourism industries. Recent relevant research includes: "New Hampshire's Green Economy and Industries: Current Employment and Future Opportunities" performed for the Rockingham Economic Development Committee (REDC), "Economic Impact of Granite Reliable Power Wind Power Project in Coos County, New Hampshire" performed for Granite Reliable Power, LLC and the economic analysis of policies proposed in "The New Hampshire Climate Action Plan" performed for the NH Climate Change Task Force.

*Charles Colgan* is a Professor of Public Policy and Management in the Muskie School where he teaches economics, policy analysis, economic development, and courses in analytic methods. He is chair of the Community Planning & Development Program and Associate Director of the Maine Center for Business and Economic Research He is Maine model manager for the New England Economic Partnership. He also currently holds positions as a Research Fellow at the United States Bureau of Labor Statistics. Prior to coming to USM, he served 12 years in the Maine State Planning Office, including positions as Maine State Economist and Special Assistant to the Governor for International Trade.

*Ross Gittell* is the James R. Carter Professor at the University of New Hampshire's Whittemore School of Business and Economics and Chancellor of the Community College System of NH. Professor Gittell's research has been funded by the National Science Foundation, the Rockefeller Foundation, and the Energy Foundation. Professor Gittell's applied research activities in the New England region include work for the states of New Hampshire and Massachusetts, the New Hampshire Business & Industry Association, the State of New Hampshire's, Department of Environmental Services, the New Hampshire Small Development Center, and the Josiah Bartlett Center for Public Policy. Professor Gittell is Vice President, forecast manager and on the board of the New England Economic Partnership. He is also on the board of the Exeter Trust Company, and Exeter Health Services.

# Appendix C: Survey Form

**Summary**

| | |
|---|---|
| Business Name ( D/B/A) | |
| Address Line 1 | |
| Address Line 2 | |
| City | |
| Zipcode | |
| Contact Person | |
| Contact Phone | |
| Contact Email | |

**Employment**

| | |
|---|---|
| Number of all full and part-time employees employed the last week of 2011 | |
| Do you have a peak season? | |
| If yes, please provide the number of all full and part-time employees during your peak season in 2011 | |
| If yes, please provide a date range for your peak season | |
| Total Compensation for all employees 2011 (Click the down arrow to select the correct range) | |

**Product**

| | |
|---|---|
| Please provide a description of the goods or services that your company provides | |
| Primary NAICS code (if known) | |

**Employees**

Please provide a count of all employees (employed in 2011) by their home address zip code

| Zipcode | Count of Employees (Full and Part-time) |
|---|---|
| | |
| | |
| | |

**Suppliers**

Please provide a list of suppliers located in NH or Maine Only that you purchased over $1,000 from in 2011. Similar supplies should be grouped together on a line if they comes from the same supplier and each supplier should be given a single number. For example if supplier 3 provides fuel oil and also provides heating maintenance then there should be separate lines for oil and service, each designated supplier 3.

| Supplier | Description | Zipcode | Amount Purchased in 2011 |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

**Customers**

Please Provide a list of customers located in NH or Maine Only that you sold over $1,000 of goods to. Similar items should be grouped together on a line if they are sold to the same customer and each customer should be given a single number. For example if customer 2 bought a two different major category of items, each should be lines for customer 2.

| Customer | Description | Zipcode | Amount Sold in 2011 |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

**Cargo Inbound**

Please provide a list of materials (broad categories) brought in by shipping in 2011. Please note that this is only with respect to the Piscataqua River. It does not include shipping by truck or rail nor does it include the use of other ports such as Portland or Boston.

| Material | Measure | Units | Dollar Value (FOB) |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

**Cargo Outbound**

Please provide a list of materials (broad categories) shipped out in 2011. Please note that this is only with respect to the Piscataqua River. It does not include shipping by truck or rail nor does it include the use of other ports such as Portland or Boston.

| Material | Measure | Units | Dollar Value (FOB) |
|---|---|---|---|
| | | | |
| | | | |
| | | | |