East Coast Marine Highway Initiative M-95 Study

Final Report

October 2013

Prepared for:

East Coast Marine Highway Initiative Awarding Authority

New Bedford Harbor Development Commission
Maryland Port Administration
New Jersey Department of Transportation
Canaveral Port Authority
I-95 Corridor Coalition

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ABSTRACT

The East Coast Marine Highway Initiative partnership, led by the New Bedford Harbor Development Commission, sponsored a study to craft strategies for the development of financially viable Marine Highway services along the M-95 Marine Highway Corridor. Those services are intended to provide freight shippers with alternatives to truck and rail transportation.

Operational, utilization, and cost parameters for nine potential East Coast Marine Highway services were developed for the study using cargo routing data from the Federal Highways Administration's (FHWA) Freight Analysis Framework (FAF3). Based on the estimated average cost per load, four of the nine potential services were selected for further assessment of viability. Those services were: a short-haul loop linking New England and Mid-Atlantic ports, with a focus on New Bedford and Baltimore; two long-haul East Coast routes linking New York or Delaware River markets with Port Canaveral and Miami, FL; and a "pendulum" serving both short and long-haul markets, linking New England, Delaware River/Chesapeake Bay, and South East ports.

Analysis of the profit and loss summaries created for each of the four service options found that the identified M-95 services face market, operational, and regulatory challenges to becoming financially self-sustaining. However, the study found that there are service characteristics that would increase the likelihood of a service becoming self-sustaining, including:

1) Encompass a wide geographic scope (e.g. East and Gulf Coast);
2) Transport heavier weight and/or hazardous cargos that garner higher rates for existing transport modes;
3) Provide service between a maximum of three ports; and
4) Utilize right-sized vessels, such as a potential dual-use vessel.

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TABLE OF CONTENTS

APPENDICES

INDEX OF TABLES AND FIGURES

TABLES

FIGURES

GLOSSARY OF ACRONYMS

3PL .... Third Party Logistics
AFL .... American Feeder Lines
AMH .... America's Marine Highway
ATB .... Articulated Tug Barge
CAA .... Clean Air Act
CHE .... Container Handling Equipment
CO .... Carbon Monoxide
COB .... Container on Barge
COFC .... Container on Flat Car
CWA .... Clean Water Act
DOD .... Department of Defense
DOT .... Department of Transportation
DPH .... Department of Public Health
ECA .... Emission Control Area
ECMHI .... East Coast Marine Highway Initiative
ECMHIAA .... East Coast Marine Highway Initiative Awarding Authority
EFH .... Essential Fish Habitat
EIS .... Environmental Impact Statement
EPA .... Environmental Protection Agency
EU .... European Union
FAF .... Freight Analysis Framework
FEC .... Florida East Coast
FHWA .... Federal Highway Administration
FOE .... Friends of the Earth
GHG .... Greenhouse Gas
GIS .... Geographic Information System
GM .... General Manager
GMU .... George Mason University
HAPC .... Habitat Areas of Particular Concern
HMT .... Harbor Maintenance Tax
ILA .... International Longshoremen's Association
IML .... Intermodal Marine Lines
IMO .... International Maritime Organization
ISO .... International Organization for Standardization
ITV .... Internal Transfer Vehicle
LNG .... Liquefied Natural Gas
Lo/Lo .... Load on/Load off
M-95 .... Marine Highway 95
MARAD .... U.S. Maritime Administration
MDO .... Marine Diesel Oil
MGO .... Marine Gas Oil
MOTBY .... Military Ocean Terminal at Bayonne
MOTS .... Motorways of the Sea
MPA .... Maryland Port Administration
MPO .... Metropolitan Planning Organizations
NAAQS .... National Ambient Air Quality Standards
NAFTA .... North American Free Trade Agreement
NBHDC .... New Bedford Harbor Development Commission

NEPA ....National Environmental Policy Act
NJDOT.........................New Jersey Department of Transportation
NMFS...........................National Marine Fisheries Service
NO_2..............................Nitrogen Dioxide
NO_x..............................Nitrogen Oxide
NOAA ....National Oceanic and Atmospheric Administration
NY/NJ ....New York/ New Jersey
NYMTC ....New York Metropolitan Transportation Council
O_3 ....Ozone
O/D ....Origin/Destination
OTC ....Ozone Transport Commission
OTR.............................Ozone Transport Region
P&L ....Profit and Loss
PCB..............................Polychlorinated Biphenyl
PM ....Particulate Matter
PM_{10}............................Particulate Matter Less Than or Equal to 10 Microns in Diameter
$PM_{2.5}$ ....Particulate Matter Less Than or Equal to 2.5 Microns in Diameter
REC ....Renewable Energy Credentials
Ro/Ro ....Roll on/Roll off
RoCon ....Ro/Ro and Container
SCTG...........................Standard Classification of Transported Goods
SHPO ....State Historic Preservation Office
SJPC.............................South Jersey Port Corporation
SMZ.............................Special Management Zones
SO_2...............................Sulfur Dioxide
SPC ....Shortsea Promotion Centres
STC..............................Sustainable Transportation Credit
TEU ....Twenty-foot Equivalent Unit
TOFC...........................Trailer on Flat Car
TWIC ....Transportation Worker Identification Credential
USACE........................U.S. Army Corps of Engineers
USCG...........................U.S. Coast Guard
USFWS.......................U.S. Fish and Wildlife Service
VMT ....Vehicle Miles Traveled
VOC ....Volatile Organic Compounds

GLOSSARY OF ABBREVIATIONS

@SEA..........................At Sea
Aux..............................Auxiliary
Avg..............................Average
Balt..............................Baltimore
Bathy...........................Bathymetry
Cap..............................Capacity
Capt.............................Capture Rate
Charl............................Charleston
Comp...........................Competitive
Cons.............................Consumption
Del... ....Delaware
Dest.............................Destination
Disch............................Discharge
Dk................................Deck
Est. ....Estimated
et seq...........................Et Sequens (and the following)
Ft.................................Foot or Feet
Gal. ....Gallon
Hrs...............................Hours
Kg.................................Kilogram
Kt.................................Knots
Lat...............................Latitude
Ld(s)............................Load(s)
Long............................Longitude
m..................................Meter
Maneuv.......................Maneuvering
Max.............................Maximum
M.E. ....Main Engine
Med.............................Medium
Mfg..............................Manufacturing
Mgmt...........................Management
MidAtl.........................Mid Atlantic
Misc.............................Miscellaneous
Mkt..............................Market
Mt................................Metric Ton
Mty..............................Empty
NB................................Northbound
NewEngl.....................New England
Nm...............................Nautical Miles
Norf.............................Norfolk
NwB or NwBdfrd....New Bedford
Oper............................Operating
Opt..............................Option
P. or Pt. ....Port
p.a...............................Per Annum
Phil..............................Philadelphia
Prods...........................Products
Prtlnd. ....Portland
PSF..............................Pounds per Square Foot
Rem. ....Remaining
Rev..............................Revenue
Riv...............................River
SB................................Southbound
SE or SEast..............Southeast
sf..................................Square foot
SM ....Sea Margin
Svce............................Service
Util..............................Utilization
Var..............................Variable
Voy..............................Voyage
Vsl...............................Vessel
Wilm. ....Wilmington
Wk..............................Week
Yr.................................Year

EXECUTIVE SUMMARY

In less than ten years, an estimated three billion more tons of freight will be carried by 1.8 million more trucks on roadways in the United States.

Truck and rail freight volumes will continue to grow along with the rising U.S. population and economy, and a strengthening global trade market.[1] Reliance on an overburdened U.S. land-based freight transportation system with limited additional capacity will impact the future movement of goods in domestic and global supply chains, productivity and competitiveness of the U.S. economy, and sustainability of the environment.

Domestic marine transportation services can play an important role in enhancing the capacity and performance of the U.S. freight transportation system. The growing recognition of the need to expand the marine freight network to relieve landside congestion has led to the development of the America's Marine Highway (AMH) Program. The AMH Program promotes the development of Marine Highway services, or short sea shipping, as an integral component of a broader multimodal network and an even larger continental transportation system that can deliver a variety of potential benefits, including:

- **Mobility** – relief from congestion and bottlenecks on roads and bridges and a reduction in vehicle miles traveled (VMT) on the nation's transportation system.
- **Environment –** lower air emissions and noise pollution from reduced VMT and train-miles and more modern, fuel-efficient vessels, as well as reduced fossil fuel consumption.
- **Public safety** – greater safety for the traveling public, stemming from fewer hazardous materials transported on roadways and less vehicular accidents as a result of reduced VMT.
- **Maintenance savings**– less need for maintenance of marine services and infrastructure relative to other modes. Diverted traffic also reduces the need for highway maintenance.
- **Efficiency –** cross utilization of available transportation resources and system capacity for the betterment of the entire freight system.
- **Jobs –** new business to the nation's commercial shipyards in the construction of Marine Highway vessels and more high paying jobs in the shipbuilding, stevedoring, warehousing and service industries.
- **Resiliency –** reduced vulnerability to major supply chain disruptions from human or natural incidents by ensuring that more alternative routes exist for carrying cargo within the domestic distribution system.
- **Security** – additional U.S. flagged vessels and crews in commercial shipping to support the nation's merchant marine force and ready reserve fleet.

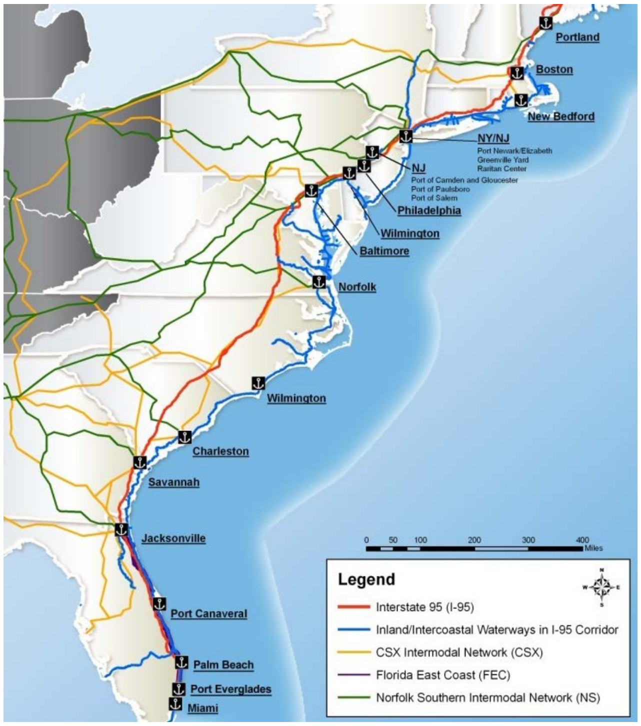
To realize the benefits associated with domestic marine transportation services and as part of the AMH program, the Ports of New Bedford, MA; Baltimore, MD; and Canaveral, FL; the New Jersey Department of Transportation (NJDOT); and the I-95 Corridor Coalition formed a cooperative East Coast Marine Highway Initiative Awarding Authority (ECMHIAA) and, with support from the U.S. Department of Transportation (DOT) and its Maritime Administration (MARAD), sponsored the East Coast Marine Highway Initiative (ECMHI) using FY2010 Marine Highway Grant funds.

The ECMHI seeks to advance services on the DOT-designated M-95 Corridor, which parallels Interstate 95. The Corridor (Figure ES-1) is intended to serve as a competitive, reliable and environmentally-responsible alternative to existing surface transportation modes carrying freight on the corridor.

The ECMHIAA commissioned the Parsons Brinckerhoff team to assess opportunities for services in the four representative port areas along the M-95 Corridor (New Bedford, MA; New Jersey; Baltimore, MD; and Port Canaveral, FL), in addition to investigating the opportunity for other services and logistics platforms along the East Coast.

[1] AASHTO Unlocking Freight Report. July 2010, http://ExpandingCapacity.transportation.org.

Figure ES-1: Marine Highway 95 Corridor



Source: Parsons Brinckerhoff

While there have been numerous studies that assess the potential coastal shipping freight market in the Atlantic region, the ECMHIAA recognized the importance of defining the prospective costs, rates and service parameters of an emergent East Coast Marine Highway system that would ideally employ new and, in some cases, faster vessels.

Thus, the intent underlying this study was not primarily to derive a Marine Highway service from demand, but to provide the foundation for educated dialogue between stakeholders that will lead to the creation of a financial and operational environment under which services can thrive.

Literature Review

From the more than 250 documents and data sources reviewed by the study team to identify issues related to service development in the M-95 regional freight network, the following key conclusions emerged:

- **Perception** - Domestic marine transportation operations have been viewed, generally, as uncompetitive to serve the U.S. intermodal freight market. Overcoming that perception is part of the challenge facing the companies and entrepreneurs of new services.
- **Comparative advantage** – The benefits and weaknesses of marine transportation should be acknowledged and addressed if the Marine Highway System is to become a more common element in American intermodal transportation.
- **Market factors** – High volume freight flows are not the sole determinant in judging whether there is a market for Marine Highway services. Logistics decisions emerge from evaluating a number of crucial market and operational factors.
- **Commercial viability** - Marine Highway operations need to provide reliable, cost competitive, financially sustainable, and modally integrated service that meets the frequency needs of a market accustomed to trucking and rail transportation service characteristics.
- **Cabotage requirements** – U.S. laws such as Section 27 of the Merchant Marine Act of 1920, often referred to as the Jones Act, require services between U.S. ports to use U.S.-built, U.S.-owned, and U.S.-crewed vessels. Sources in the literature suggest the cabotage requirements offer clear benefits as well as possible challenges for startup services. [2]
- **Government policy** - Public policy has a role to play for successful U.S. Marine Highway System development.

Stakeholder Outreach

The team extensively interviewed shippers, transportation providers, and agencies to gather informed opinions regarding potential opportunities, considerations and obstacles for services. These stakeholders play key roles in the nation's supply chain, as well as the decision making processes required for services to occur.

The key findings from these discussions included:

- Shippers and transportation providers need to be kept up-to-date and involved in the current state of thinking and modal development as it relates to the Marine Highway system.

[2] This study does not examine the merits of the Jones Act or suggestions that have been made to alter it. Rather this study assumes no change in the U.S. cabotage policy framework.

When informed about emerging vessel designs, the "dual use" concept,[3] and federal studies, private companies became more engaged in discussions regarding potential uses of Marine Highway services.

- Early adopters/initial customers are likely to be those transporting less time sensitive, lower value, heavier products and/or hazardous materials.
  - These shippers focus on the cost, which must equal or be better than intermodal rail rates.
- Customers with more time sensitive and higher value commodity movements will consider services as they become more established. Key parameters that will influence their use of Marine Highway services include:
  - Frequency of service (twice weekly service is the minimum for most shippers)
  - Transit times (must be the same or better than intermodal rail)
  - Reliability (on-time, predictable service was paramount)
  - Service (the responsiveness of carriers and their ability to integrate their services with local pickups and deliveries)
  - Track record (established record of on-time and consistent service)
- Certain shippers of very high value, time sensitive products (e.g., pharmaceuticals) are unlikely to use Marine Highway services.
- While some form of public subsidy may be needed during the start-up phase, services should be self-sustaining.

Market Analysis

The M-95 Corridor serves as a major conduit of international and domestic cargo flows between and among East Coast regions. The wide range of cargos that move through this corridor are influenced by a variety of economic drivers, industry developments and service factors. In order to identify potential cargo volumes for future Marine Highway services, domestic commodity flows along the Atlantic Coast were filtered by:

- **Commodity type** – composed of potential containerized and/or trailerized goods.
- **Distance** - transported more than 400 miles to/from ports and market centers.
- **Density and balance** – higher volume cargo flows that are relatively balanced between regions and the identified ports.

Using these filters, the market analysis concluded that roughly 4.7 million tons of cargo could potentially be diverted to a Marine Highway service. This accounts for approximately 4,500 container or trailer loads per week of highway and intermodal rail freight moving along the I-95 corridor.

Operational Development

Vessel itineraries and service parameters, such as vessel speed, voyage time, service frequency, and terminal location were identified for nine potential Marine Highway services along the East Coast, connecting Mid-Atlantic ports with New England, Florida and/or South Atlantic ports.

Conceptual vessel designs prepared for MARAD under a separate AMH project were evaluated for potential M-95 services. The vessels are intended to be U.S. built, U.S. crewed and serve commercial trade in peacetime and able to support the military's sealift needs in time of national emergency (dual-use).

The service costs associated with cargo handling, service management, the Harbor Maintenance Tax (HMT), and owning and operating suitable vessels that could provide regular service on the selected routes were calculated and evaluated in relation to the estimated potential cargo volumes. Four of the nine service options were selected for further assessment of viability based on the estimated average cost per load:

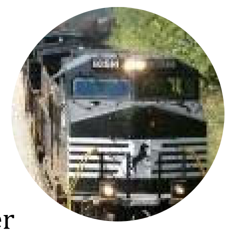
- **Option 1** – a short-haul loop linking New England and Mid-Atlantic ports, with a focus on New Bedford and Baltimore.
- **Options 2 and 3** – two long-haul East Coast routes linking New York or Delaware River markets with Port Canaveral and Miami, FL.

[3] Dual use is defined as ships in the U.S. domestic commercial marine shipping service that have defense features that qualify the vessels to be called into government service in times of a national defense emergency.

- **Option 5** – a "pendulum" serving both short and long-haul markets, linking New England, Delaware River/Chesapeake Bay, and South East ports.

Order of magnitude costs per mode (marine, rail, and truck) were developed for the four services to determine the competitiveness of proposed service alternatives. The costs for different transportation modes varied relative to one another depending upon distance traveled and specific port pairs involved in the service.

- While there were some exceptions to this trend, marine transit tended to be more cost effective than trucking for longer hauls (such as NY/NJ to Miami), with the opposite being the case for shorter hauls.
- Where rail transportation was available, it was typically provided at a cost less than the marine mode. However, rail and marine modal costs for routes greater than 1,000 miles were comparable.



Business Plan and Viability

The business plan and viability analysis evaluated the prospective financial performance of the Marine Highway services by examining and quantifying:

- Competitive rates currently offered for truck and/or intermodal rail service,
- Minimum discount from those rates that would likely be required by M-95 shippers to justify switching to a new transportation mode,
- Corresponding rates an M-95 service could charge, and
- Weekly revenue an M-95 service could achieve predicated on volume and vessel utilization assumptions and sensitivity analysis factors.

A high-level profit and loss summary was created for each of the four service options, under a "base case" and alternative "favorable" and "unfavorable" sensitivities to test the financial impact of cargo handling fees, HMT exemptions, drayage costs, fuel charges, interest rates, etc. on profitability. Three levels of vessel capacity utilization were also considered for each alternative (25 percent of market share up to 90 percent vessel utilization, 65 percent vessel utilization and 90 percent vessel utilization).

The revenue to cost ratio per load for the selected best performing services ranged from 48 to 88 percent depending on the service, volume (utilization) and sensitivity case. Using fully utilized vessels and a favorable sensitivity, the weekly revenue was projected to be 48 percent of the service costs for the relatively short-haul New England – Mid Atlantic service and 49 percent for the extended East Coast pendulum service. The longer-haul services between New York/New Jersey or Delaware River to Florida had projected revenues that represented between 75 percent to 88 percent of costs depending on the vessel, upon applying favorable sensitivity and the highest utilization level.

These findings indicate that the identified M-95 services face challenges to become financially self-sustaining. However, services that are sustainable and commercially-viable (defined as having a revenue to cost ratio of 100 percent or better) may present themselves upon further analysis of the following characteristics:

- Encompasses a wider geographic scope (e.g. East and Gulf Coast),
- Transports heavier weight and/or hazardous cargos that garner higher rates for existing transport modes,
- Provides service between a maximum of three ports, and
- Employs dual-use vessels partially funded by the U.S. government.

The dual-use concept has both national defense benefits and cost-related benefits that would be valuable for developing Marine Highway services.

Environmental Analysis

An environmental screening of key issues that would need to be addressed in a programmatic National Environmental Policy Act (NEPA) analysis under MARAD's AMH Program was performed for the potential M-95 services. Environmental laws applicable to the establishment and operation of M-95 services are aimed at managing and minimizing adverse impacts to resources such as air and water, to protect rare and important species and habitats, to manage development in potentially hazardous areas, to safely manage hazardous substances and cargos, and to protect to human population.
The movement of cargo from land-based routes to coastal routes would have beneficial effects, but

may also have potentially adverse effects on the coastal marine environment. The key corridor-wide issues associated with M-95 services included traffic, underwater noise, air emissions, collisions with marine mammals, dissemination of invasive species and pollutant releases from accidents or routine maintenance.

The following measures could be used to minimize or mitigate adverse impacts resulting from M-95 services:

- **Noise** – Operational and engineered controls can mitigate noise impacts at port communities.
- **Air quality** – Low sulfur fuels and engineered controls (e.g. cold ironing) to reduce air emissions.
- **Threatened and endangered species** – Observance of speed restrictions and reporting requirements would mitigate impacts to threatened and endangered species.
- **Nonindigenous species** – Adherence to federal ballast water management regulations would minimize the dissemination of nonindigenous species.
- **Vessel collisions/accidental releases** - Vessel collisions and subsequent impacts to water quality could be minimized through compliance with ship reporting procedures, International Maritime Organization (IMO) traffic separation schemes and port plans.
- **Wetlands** – Impacts from increased wave action from ship traffic could be minimized/ mitigated with speed restrictions.

CONCLUSION AND FINDINGS

Historically, each emerging freight mode in the U.S. has been conceived from necessity and vision, and then established with some degree of financial investment of public agencies. These initial investments in existing freight modes (rail freight, trucking, air cargo) and favorable governmental policies ultimately led to robust private sector supported operations.

Currently, the Marine Highway system in the U.S. is at a nascent stage of development, having significant potential to address social, economic, and environmental challenges faced by the nation's transportation network.

This report demonstrates that the potential M-95 services examined as part of this study face challenges to implementation at present. Service operating costs exceeded expected revenues by a minimum of $150-200 per load on average along the highest performing routes, under the favorable sensitivity and highest utilization level.

In order to realize the full potential of the ECMHI, Marine Highway services must be cost competitive with existing goods movement options. No single strategy will accomplish this goal; rather the effort will require a comprehensive approach that involves multiple targeted strategies.

The following are cost reduction and/or revenue generating measures that, if implemented, could influence the financial viability of an M-95 service. The percentage allocation of costs is derived from the base case with 90 percent vessel capacity utilization.

- **Reduce cargo handling costs as a share of total operating costs**. Cargo handling accounted for 23-44 percent of total operating costs for the evaluated M-95 services. If these costs were lowered by roughly 25 percent, total service costs could be reduced by about $35 to $75 per load.
- **Reduce vessel capital costs through government cost sharing**- Vessel costs range from 13-25 percent of total service costs depending on the service pattern and vessel. A governmental cost share of one form or another equating to a 50 percent reduction in vessel capital costs would result in a reduction in overall M-95 service costs of 7-13 percent.
- **Increase rates as fuel costs rise over time**. Trucks are at least 70 percent less fuel efficient than domestic waterway vessels and trains are at least 25 percent less fuel efficient based on revenue ton-miles per gallon.[4]

[4] Texas Transportation Institute, Center for Ports and Waterways, A Modal Comparison of Domestic Freight Transportation Effects on the General Public, prepared for the U.S. DOT, MARAD, and National Waterways Foundation, December 2007, p. 42.

If fuel prices increased by 30 percent, shipping rates could be increased by about eight percent, while still remaining competitive with rail and truck.

- **Reduce operating costs through use of liquefied natural gas (LNG) fuel** - The use of LNG fuel can reduce vessel-operating costs by about 30 percent, as well as benefit the environment.
- **Increase M-95 rates in relation to higher transportation rates for competing truck and rail modes** – As a result of truck driver shortages, highway/rail congestion and capacity constraints or other factors, an increase in the rates for competing modes would offer the potential for shipping rates to increase proportionally and still be competitive.
- **Create tax or other incentives to offset costs based on quantifiable public benefits** - M-95 user tax breaks, carbon credits, or other types of governmental funding could be offered to encourage shippers and logistics providers to opt for Marine Highway services. A tax credit of $25 per load, such as the one applied in Virginia, would reduce total M-95 service costs by 2-5 percent.
- **Eliminate HMT on domestic moves of intermodal cargos** - This tax is estimated to represent about three to five percent of the cost of a service in this study, therefore the successful elimination of HMT applicability to cargos shipped aboard a Marine Highway service would result in an equivalent reduction in costs to the shipper.

The future value of services is not only contingent on cost; operational and policy factors also contribute to whether services could ultimately capture the necessary domestic volumes that will allow for viable services.

The criteria that can be used in identifying opportunities to improve freight system performance measures for M-95 include:

- **Volume and Capacity** - Cargo volumes should be sufficient to support frequent services and fully utilized vessels with both headhaul and backhaul cargo.
- **Cargo Type** - To support an initial customer base, service development should start by identifying niche markets and focusing on high weight and low value cargo that is less dependent on fast transit times and high frequency of service.
- **Frequency** – M-95 services should provide at least two published weekly vessel sailings, with three to five sailings being more favorable.
- **Reliability** - Cargo should move through the supply chain in a predictable and reliable manner regardless of weather conditions, seasonal peaks, and other variables.
- **Balance** - Balanced revenue moves contribute significantly to the viability of a service with headhaul cargo demand supported by return loads.
- **Distance** - The further the distance between port pairs, the more a service becomes a viable and cost-effective option. Longer haul services of 1,000 miles or more appear to have the greatest potential for success.
- **Location** - Terminals should be located to maximize service while minimizing costs and should be separate from international marine cargo operations.
- **Vessels** - Competitive coastal Marine Highway services will depend on new ships designed to meet present day and future efficiency and environmental requirements. The Defense and Transportation Departments are collaborating on an initiative that would address, in part, the need for recapitalizing the Ready Reserve Force fleet by encouraging dual-use vessel construction.

- **Partnerships** – Collaboration between federal, state and local public agencies and commercial stakeholders including Class I railroads and trucking companies will be invaluable toward defining common objectives and strategies and identifying appropriate policies to encourage Marine Highway System development.
- **Education** – A marketing/outreach program could educate public and private stakeholders on the AMH Program, the advancement of future vessels, the potential benefits and its significance as part of the future of freight movement.

- **Environment** - The net environmental improvement, based on determinations of social benefit, will be a crucial issue for the development of services.
- **Integrated Door to Door Service** - Marine highway services should be designed to integrate land and water modes.
- **Customer Service** – Marine highway services should equal or improve upon the level of customer service provided by trucking and rail freight providers.

A self-sustaining Marine Highway service would contribute to the public benefits of reduced congestion on roads and highways, fewer greenhouse gas emissions, improved safety, and additional sealift military resources that support national defense. In addition, the initiative has the potential of stimulating the national economy and creating jobs from increased participation in domestic and international trade along Marine Highway Routes.

The advancement and integration of such a service is very much dependent on adjusting the financial conditions and interconnected operating and political environments that could positively affect Marine Highway System development.

To the same extent as it has provided developmental support in the past, the public sector has a vital role in ensuring the viability of domestic marine transportation to the point at which a service is feasible today or in the future.

The nation's transportation infrastructure and supply chain system is critical to the timely flow and continual supply of food, water, medicines, fuel and other commodities to U.S. citizens.

"Some seem to think that the nation is now built for all time and that we can continue to prosper without expanding our transportation system. They are wrong. ... We must invest to maintain and strengthen the American "Transconomy."
— 2010 AASHTO President Larry (Butch) Brown

In the face of the country's current and future transportation and freight mobility needs, domestic marine transportation has a promising role in an integrated and sustainable U.S. transportation system. However, its potential as a national resource is limited if it is not supported and strengthened by the nation's leadership.

INTRODUCTION

Interstate 95, a 1,925 mile-long north-south corridor on the U.S. East Coast, passes through 15 states from Maine to Florida. These states account for 37 percent of the nation's population. The corridor contains 42 of the nation's top 100 metropolitan areas based on population and economic activity and contains over 50 coastal and inland ports. The corridor also contains 22,000 miles of Class I freight railroad track, or 23 percent of the national total. Currently, the I-95 Corridor is one of the most congested and densely populated regions in the U.S., accounting for 35 percent of the nation's vehicle miles and accommodating more than 5.3 billion tons of freight annually.[5]

The U.S. Department of Transportation (DOT) has identified more than a dozen major freight truck bottlenecks along the I-95 corridor, along with significant critical rail/freight congestion along the upper portions of the corridor in the northeastern states. The Federal Highway Administration's (FHWA) projections of future freight volumes along I-95 point to increasing freight congestion challenges, with limited opportunities to increase landside capacity.

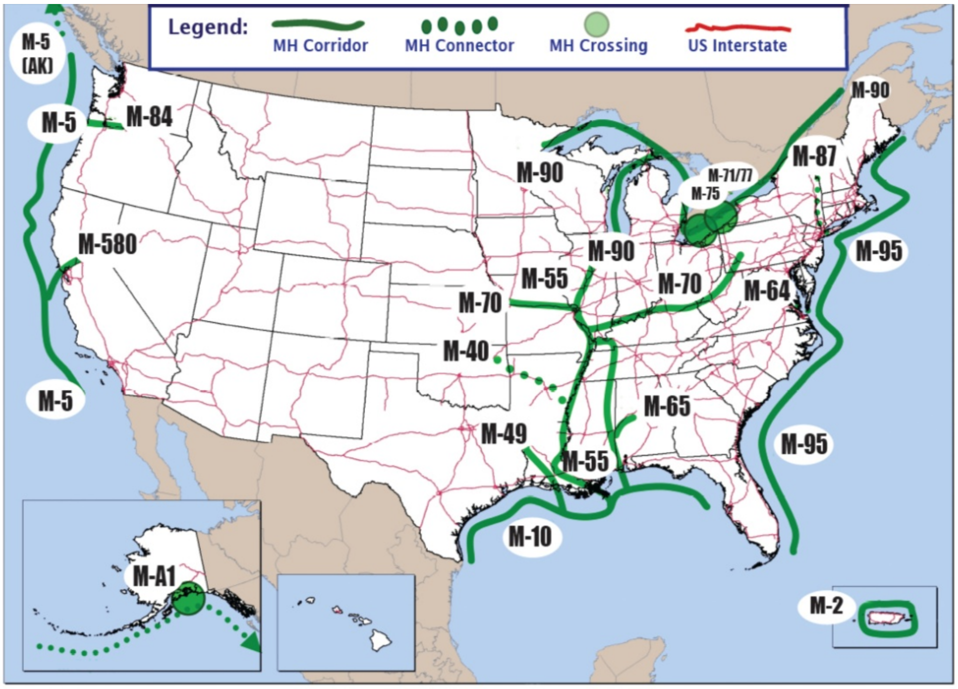
In response to the capacity constraints along inland transportation corridors such as I-95, increasing greenhouse gas emissions, and the state of the nation's infrastructure, particularly highway and bridges maintenance needs, the U.S. DOT has implemented the America's Marine Highway (AMH) Program. The AMH program promotes the utilization of Marine Highway services, or short sea shipping, as an integral component of a broader multimodal network and an even larger continental transportation system for a variety of potential benefits, including:

- **Mobility** – relief from congestion and bottlenecks on roads and bridges and a reduction in vehicle miles traveled (VMT) on the nation's transportation system.
- **Environment –** lower air emissions and noise pollution from reduced VMT and train-miles and more modern, fuel-efficient vessels, as well as reduced fossil fuel consumption.
- **Public safety** – greater safety for the traveling public, stemming from fewer hazardous materials transported on roadways and less vehicular accidents as a result of reduced VMT.
- **Maintenance savings**– less need for maintenance of maritime infrastructure relative to other modes.
- **Jobs –** new business to the nation's commercial shipyards in the construction of vessels and more high paying jobs in the shipbuilding, stevedoring, warehousing and service industries.
- **Resiliency –** reduced vulnerability to major supply chain disruptions from human or natural incidents by ensuring that more alternative routes exist for carrying cargo within the domestic distribution system.
- **Security** – additional U.S. flagged vessels and crews in commercial shipping to support the nation's merchant marine force and ready reserve fleet.
- **Efficiency –** cross utilization of available transportation resources and system capacity for the betterment of the entire freight system.

The program includes 18 Marine Highway Routes throughout the U.S. (refer to Figure I-1 for a map of the corridors) that can serve as extensions of the surface transportation system, including the Marine Highway 95 (M-95) Corridor sponsored by the I-95 Corridor Coalition.

[5] I-95 Corridor Coalition. http://www.i95coalition.org/i95/Home/I95CorridorFacts/tabid/173/Default.aspx

FIGURE I-1: MARINE HIGHWAY ROUTES



Source: MARAD, http://www.marad.dot.gov/image_library/Maps/AMH_Map_Sept_2013.jpg

The DOT-designated M-95 Corridor (refer to Figure I-2) runs parallel to I-95, along the coast of 15 states and includes the Atlantic Ocean, Atlantic Intracoastal Waterway, 15 major commercial ports, navigation channels and harbors. Two federally recognized Marine Highway Initiatives that fall under M-95 include the New Jersey Marine Highway Platform sponsored by the New Jersey Department of Transportation (NJDOT) and the AMH I-95 Corridor Service Project sponsored by the New Bedford Harbor Development Commission (Port of New Bedford, MA), Maryland Port Administration (Port of Baltimore, MD), and Canaveral Port Authority (Port Canaveral, FL).

The New Jersey Marine Highway Platform consists of a network of five maritime hubs located in Jersey City (Upper New York Bay Hub), Elizabeth (Newark Bay Hub), Edison and Linden (Raritan/Linden Hub), Camden, Gloucester, and Paulsboro (C/P/G Hub), and Salem (Salem Hub).[6] These areas include established centers for maritime activity within the state, as well as targeted centers where berth infrastructure is being enhanced or will have to be created, such as Raritan Center and Paulsboro, which could grow into key destinations along the East Coast.

The AMH I-95 Corridor Service Project proposes to use ports and terminals near I-95, specifically focused on the Ports of New Bedford, Baltimore and Canaveral. Each of these ports has specific project initiatives to accommodate a service: expansion of the South Terminal at the Port of New Bedford for supporting mixed use cargo activities including cargo associated with off-shore wind energy development in Massachusetts, improvement of operating efficiencies at North Locust Point Terminal at the Port of Baltimore, and development of a new multipurpose berth and landside terminal in the North Cargo Area complex to support cargo and passenger service at Port Canaveral.[7]

[6] MARAD Application for Designation of the New Jersey Marine Highway Platform as a Marine Highway Project, June 2010, New Jersey Department of Transportation.

[7] MARAD Application for Designation of the AMH I-95 Corridor Service Project as a Marine Highway Project, June 2010, Port of New Bedford, Maryland Port Authority, Port Canaveral.

FIGURE I-2: MARINE HIGHWAY 95 CORRIDOR

Source: Parsons Brinckerhoff

The Ports of New Bedford, Baltimore and Canaveral, the NJDOT, the I-95 Corridor Coalition and the U.S. Maritime Administration (MARAD) have formed a cooperative East Coast Marine Highway Initiative Awarding Authority (ECMHIAA) to realize the viability and benefits of the these two Marine Highway initiatives, which have been combined and jointly referred to as the East Coast Marine Highway Initiative (ECMHI) under this study. The ECMHI seeks to provide a competitive, reliable and environmentally-responsible alternative to the existing surface modes of transportation currently carrying containers and trailer loads on the I-95 corridor.

The ECMHIAA commissioned a consultant team led by Parsons Brinckerhoff to examine opportunities for Marine Highway services in four primary geographic areas along the M-95 Corridor (New Bedford, MA; New Jersey; Baltimore, MD; and Port Canaveral, FL), in addition to investigating the opportunity for other services and logistics platforms along the East Coast.

Project Objectives and Goals

The main objective of this study was to determine potential business opportunities for the ECMHI and craft strategies for the development of Marine Highway services along the I-95 corridor that are intended to become viable transportation alternatives to shippers and service providers.

The principal goals underlying the development of this study included:

- Analyze specific markets and associated economic and operational factors related to the M-95 Corridor.
- Determine total cargo flows along I-95 corridor and assess the potential diversion of this freight onto the proposed services.
- Provide success factors needed to ensure financial and operational factors are properly addressed.
- Develop specific strategic actions to increase the strength and viability of the region's Marine Highway System.
- Encourage the development of freight partnerships between the shipping and logistics community and ports along the I-95 corridor.

Approach & Methodology

The Parsons Brinckerhoff team provided in-depth analysis and business planning services specific to particular port pairs and individual markets along the M-95 Corridor. The study consisted of the following six parts:

- **Literature Review & Stakeholder Outreach –** assembled a comprehensive knowledge bank of information on best practices and lessons learned from previous and ongoing initiatives and identified principal drivers of freight system modal choices by shippers and carriers;
- **Market Analysis –** analyzed market data focused on diverting trucks from I-95, and provided information on how many containers, tractor trailers and other wheeled cargos are divertible to waterways;
- **Operational Development –** developed an operational plan that defines balanced, sustainable services and parameters required to compete with other modes;
- **Business Plan and Viability** – performed business and financial analyses of the proposed services and evaluated them with shipper and transportation provider input to determine what is required to implement a successful M-95 service;
- **Environmental Analysis** – developed a base document that can serve as the foundation for a programmatic National Environmental Policy Act (NEPA) document, which will include the analysis of direct, indirect, and cumulative impacts to the human and natural environment resulting from services along the M-95 Corridor; and
- **Conclusions and Recommendations** – provided an overall assessment of viability and made recommendations toward implementation of financially sustainable M-95 services based on the freight, operational and business analysis.

MARINE HIGHWAY DEFINITION

Terminology associated with the subject of coastal trade, encompassing the all-water movement of cargo and passengers has evolved over the years. Recently the term "short sea shipping" has been replaced in the U.S. by "Marine Highway." The following definition of Marine Highway has been prepared for this study as a means to work from a common understanding. The simple bullets in the definition are distilled from sources identified in Appendix A.

- By Geography
    - U.S. port to U.S. port (within Continental U.S.),
    - Intraport i.e., cross-harbor, or
    - Between U.S. and Canadian ports located on the Great Lakes and St. Lawrence Seaway System.
- By Conveyance
    - Container,
    - Trailer, or
    - Other rolling stock.
- By Cargo
    - Generally intermodal, including bulk moving by above conveyance, or
    - Passengers.*

** Not applicable to this study*

SECTION 1: DATA COLLECTION

The objective of the data collection effort was to gather information from research, interviews and listening sessions to identify topics relevant to Marine Highway service development in the M-95 regional freight network; detail previous work that could inform the study (e.g. best practices and lessons learned); and explore the various possibilities that such services could offer in the future.

1.1. LITERATURE REVIEW

A search was conducted for studies and reports, academic papers, trade publications, government agency and congressional committee records, conference presentations, and other pertinent material available on the subject of Marine Highways, short sea shipping and the U.S. coastwise trade, with special attention paid to the East Coast or M-95 Corridor. Documents were reviewed from sources in the U.S., Canada, Australia (where coastal shipping has also been under study), and Europe (where there is a tradition of short sea shipping and more recently established programs designed to reduce traffic volumes, congestion and emissions as part of transportation and environmental policy).

At the time of this analysis, more than 250 documents and data sources were identified and selected for purposes of this project. The documents focused on the subject of Marine Highways or lend information of value to the conversation. A good number were not specific to East Coast shipping but offered value to this project nonetheless. The full list of primary and other useful sources is provided in Appendix B.

A Marine Highway Library ("The Library") was created using a spreadsheet format for purposes of organizing the documents. The Library, provided in Appendix C, is separated into four general categories by tab: Reports, Studies, Papers; Presentations, Testimony, Data Sources; Program, Projects, Regulation; and Journals, Press. Most documents captured on The Library spreadsheets were produced in the period from 2007 to present.

The greater part of available literature generally agreed as to proven and probable factors of successful Marine Highway services, the social benefits of marine transportation operations, the ways that government can hinder and/or help the start of Marine Highway initiatives, some demands of the marketplace, and impediments to operations in the domestic trades.

1.1.1 IMPEDIMENTS

In its application to MARAD for designation as an East Coast Marine Highway Corridor, the I-95 Corridor Coalition, and the collective state Departments of Transportation, discussed "barriers to the I-95 Marine Highway."[8] Those barriers were broadly described to include "physical and institutional obstacles unique to each access point and the waterways connecting them," that would be inventoried and examined. The availability of suitable vessels was also mentioned in summary fashion along with "labor and regulatory costs." Four years earlier, port and marine terminal operator representatives on the East Coast acknowledged in a survey what they saw as hurdles. "The Jones Act, [Harbor Maintenance Tax] HMT, cost, timeliness and manageability were mentioned as obstacles that must be overcome," was the succinct and not atypical response.[9]

[8] George Schoener, Application for Designation of the I-95 Marine Highway Corridor (I-95 Corridor Coalition, 2010), 21.

[9] Maritime Transportation and Logistics Advisors, Short Sea Shipping Port Probability Study (prepared for Port Canaveral and U.S Maritime Administration, 2005), 19.

Obstacles to the development of Marine Highway services were classed here as impediments in Government Policy and Operations and Market.

GOVERNMENT POLICY

The requirements of the **United States' cabotage law**[10] as it applies to the movement of cargo between U.S. ports, commonly referred to as the Jones Act,[11] were the most prominent elements of government policy mentioned as impacting Marine Highway services or coastwise shipping development.[12] Cabotage requirements for domestic coastwise goods movement consist of three basic characteristics specific to vessels carrying cargo from one U.S. port to another U.S. port: U.S. citizen-owned, U.S.-built, and U.S. citizen-crewed.

In the context of Marine Highway service development, the U.S.-build mandate was perhaps the most often mentioned requirement but not to the exclusion of the crew mandate. Both were identified as factors that affect the pricing of domestic shipping services. It was the relative cost of domestic shipping (versus rail and trucking shipping rates) that the shipper community i.e., the cargo interests, pointed to as the reason they were unlikely to use marine transportation. These domestic shipping requirements were so commonly cited by critics that the perception of domestic shipping services as not cost-competitive appeared to be a problem unto its own.

The cost differentials between the U.S.-flag fleet and companies that use foreign-built ships, operating under flags of convenience with foreign crews is not a focus of this study.[13] Because those foreign companies do not provide services between U.S. ports, any differential in the cost of vessel operations in international trade does not adequately answer whether U.S. domestic shipping services could be competitive in the American logistics marketplace where the competition or customers would be trucking or rail services.

Prominent in any discussion of government imposed impediments was the **Harbor Maintenance Tax**. The HMT is unique to marine transportation and is paid by the cargo owner in support of the government maintenance of Federal navigation channels.[14] The added cost to transporting cargo is determined by the value of the cargo. Ocean carrier and port operators identified the HMT as among the costs that are principal obstacles to development of Marine Highway services.[15] As one

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[10] Cabotage law, restricting the carriage of goods and persons within a nation's borders, is applied in various forms and in application to various modes of transportation in North America, Europe and other parts of the world.

[11] The "Jones Act" is the popular name for the statute Merchant Marine Act of 1920, Section 27 that defines U.S. domestic maritime commerce qualified vessels.

[12] Cambridge Systematics, Short-Sea and Coastal Shipping Options Study (I-95 Corridor Coalition, 2005), C-6.

[13] This study does assess the cost factors that can impact the competitiveness of Marine Highway services with other modes of transportation. These include the per-unit and overall vessel capital costs, operations costs, as well as the intermodal transfer and handling costs.

[14] The HMT is a 0.125 percent ad valorem charge on cargo in import and domestic moves, and in Foreign Trade Zones as well as on the value of a cruise passenger ticket. The HMT does not apply to cargo moved on the inland waterway system where navigation infrastructure is supported, in part, through a federal fuel tax. The subject is discussed further in the Policy section below.

[15] Global Insight and Reeve & Associates, Four Corridors Case Studies of Short Sea Services (U.S. DOT, 2006), 9.

report put it, the HMT "is clearly a factor militating against the use of short sea for some companies. The result is continued use of trucking…"[16]

In addition to the HMT charge on the cargo is the **Tonnage Tax** provision as enacted in 2004 and applied to certain vessels.[17] That provision extends to U.S.-Flag operators beneficial tax treatment as an alternative to paying the income tax on revenue from a ship in international trade. The purpose is to reduce costs associated with those U.S.-Flag vessels that compete against foreign flag operations. The Tonnage Tax privilege does not extend to vessels operating in the protected U.S. coastwise trade. However, Puerto Rico is included in the Tonnage Tax law as if it were not part of the protected U.S. coastwise trade. Thus the impediment in question is that a vessel that serves Puerto Rico, and which may otherwise be well suited to coastwise Marine Highway service, is not allowed to carry cargo between U.S. coastline ports without jeopardizing its favorable tax status.[18]

While created to facilitate the construction of vessels in the U.S., **Title XI loan guarantees**, the principal Federal vessel financing assistance program was also viewed to some extent as an impediment to Marine Highway service development. Assistance through the program is considered out of reach for coastwise shipping start-ups. Financial requirements placed on applicants are more easily met by established vessel operators or for vessel types more commonly built in U.S. yards, such as tankers and barges. It was suggested that the application and compliance processes could be simplified and the debt to equity ratio requirements relaxed.[19]

The discussion of obstacles in public policy need not be limited to the Federal government. An example was **community opposition**. In its study of waterborne transportation mobility options for the Long Island Sound interstate region the New York Metropolitan Transportation Council (NYMTC) determined that locations on Long Island were generally scored as "unacceptable" by communities for purposes of freight ferry and other marine freight operations other than the more familiar, combination passenger, auto and truck ferry.[20] Even that transportation challenged part of New York—an island—would appear to tolerate few if any freight operations beyond the facilities and operations that presently exist. As for studying non-road alternatives for regional container movement, NYMTC deferred to other initiatives under consideration in the metropolitan region, one of which was the Bi-State Freight Ferries Study referred to in this report.

Another impediment on the government side of the ledger might be characterized as a **lack of planning**. Only some state departments of transportation and metropolitan planning organizations have in-house expertise on the marine transportation system or the capability to factor potential marine alternatives into transportation plans.[21]

16 Mary R. Brooks, J. Richard Hodgson and James D. Frost, Short Sea Shipping on the East Coast of North America (Transport Canada, 2006). ii.

17 American Jobs Creation Act of 2004 (P.L. 108-357), Section 248.

18 Roberta Weisbrod, "Military Uses of the Marine Highway" (Summary of a TRB panel discussion, 2011), 7.

19 James Kruse and Nathan Hutson, *North American Marine Highways* (Transportation Research Board, 2010), 43.

20 Cambridge Systematics, Long Island Sound Waterborne Transportation Plan (New York Metropolitan Transportation Council, 2004).

21 U.S. Maritime Administration, *America's Marine Highway: Report to Congress* (U.S. DOT, 2010), 60.

Customs also appeared as an issue—referred to as a perception—on the part of shippers who thought that **cargo clearance** was more difficult for cargo carried through seaports than via trucking at the land border.[22]

In this discussion of government policy impediments, it is worth noting that MARAD is party to a Trilateral Agreement on the subject of Marine Highway development with its counterparts in Mexico and Canada. In its April 2011 *Report to Congress,* MARAD notes that the trilateral steering committee will attempt "to mitigate any impediments to freight and passenger movements by water between the three countries."[23]

OPERATIONS AND MARKET

From a shipper perspective, the **perception** is that domestic marine shipping services are undesirable because they are slow, unreliable or unpredictable. As such they see high value cargo as requiring a greater lead time in transit.[24] The notion of using coastal services was generally dismissed as costly due in part to a lack of available right sized vessel eligible for domestic service as well as vessel operational costs. Whether this view was based on experience or repetition of an oft-heard complaint is a useful question. Regardless, decision-makers in goods movement—even persons in the maritime sector—can be heard to voice skepticism as to the potential for vessels carrying everyday freight in the domestic trade. Even port and marine terminal operators who don't have operational control over vessels expressed doubts about the U.S. cabotage framework as mentioned earlier.[25] Without contrary indicators, most especially the operation of a competitive intermodal service, perceptions can remain unchanged.

While not often mentioned as a ranking problem faced by start-ups, **the availability of necessary port infrastructure** was referenced in some of the sources. Smaller ports, in particular, could require new cranes or structures in order to start to serve roll on/roll off (Ro/Ro) or lift on/lift off (Lo/Lo) domestic shipping.[26] Those smaller ports could be attractive especially in the handling of domestic freight outside of the busier international ports, where truck lines could be common and cargo clearance requirements must be met. The U.S. DOT recognized the infrastructure issue as valid and has issued competitive grants to ports that plan Marine Highway service operations.[27]

Related to the adequacy of port infrastructure were concerns as to the **potential for port delays**. Motor carriers are the common element in the domestic carriage of freight including when one leg of the journey is on a Marine Highway Corridor. Where ports experience congestion and delays inside and outside the terminal, gate truck moves are slowed and driver revenue opportunity is reduced. This might be a condition most associated with international gateway ports where, as noted earlier, heavy volumes are known to occur and cargo clearance is required. The perception or expectation of delays at ports could steer motor carriers and logistics firms from considering the marine option.[28]

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22 Brooks, Hodgson and Frost, ii. +

23 U.S. Maritime Administration, 47.

24 CPCS Transcom Limited, Potential Hub-and-Spoke Container Transhipment Operations in Eastern Canada for Marine Movements of Freight (Transport Canada, 2008), ix.

25 Maritime Transportation and Logistics Advisors, 113.

26 U.S. Maritime Administration, 53

27 See TIGER grant project awards, U.S. DOT. http://www.dot.gov/tiger/ (accessed November 28, 2011).

28 Global Insight and Reeve & Associates.

Port terminal operating hours were also cited as an issue for logistics companies that have the option to move cargo by truck alone and thus could decide against making the trip to a port terminal, such as in the instance of a short haul of international cargo to an "inland port." A motor carrier can operate over the course of 24 hours (observing hours-of-service safety regulations) and elect to avoid peak traffic hours and congested areas. However, marine terminal gate hours typically concentrate operations "during what are also peak congestion hours, which is counter to some of the goals of short sea shipping".[29] Thus motor carriers might be discouraged from using marine services. Flexible or 24-hour gate hours would allow the motor carrier to avoid peak period congestion and could make the marine service more attractive.

The **need for suitable vessels for a particular market** was mentioned in the literature. Consensus was found among source reports that operators must deploy vessels of type and size to suit the particular market in order to improve chances of commercial viability. The targeted market might be adequately served by a towed barge, a small coastal container ship, or truck ferry or other Ro/Ro vessel. Speed, reliability in storm conditions, fuel and other operating costs were among the vessel characteristics that were considered in deploying vessels to a trade. Planning a new domestic shipping service could be further complicated if a company lacks its own suitable fleet and has to charter-in vessels. Ship charter options are limited in the U.S. The existing domestic container and Ro/Ro fleet is not well suited to Marine Highway service, and the larger population of foreign-built ships is not eligible for U.S. coastwise service. This can present a challenge to Marine Highway service operators whose charter options are few, if any, as they look to establish a service and demonstrate a market that then can lead to financing of suitable vessel construction.

A survey of ports and terminal operators identified concerns that large container vessels already are making **direct calls** in the largest markets on the U.S. East Coast, thus seeming to rule out feeder service to some American ports.[30]

Another topic which was often addressed in the literature was **port costs**.[31] The majority of the observations were found with reference to West Coast public ports. Port costs were identified as a key consideration for the planning of Marine Highway services, especially in the decision whether to go with a Ro/Ro operation or a Lo/Lo operation that would entail added handling costs. Each move to load and unload a shipping container can add as much as $100 or more to transportation costs.[32]

Yet another operational impediment might be identified as **logistics inertia**. While the supply chain is always adjusting to reflect developments in the marketplace, technology and economics, satisfaction on the part of those who control the freight with existing practices can be difficult to overcome. Getting shippers, carriers, or third-party logistics providers (3PLs) to commit freight to a new operator in a new service is a challenge, especially if there is low familiarity or skepticism with the domestic marine mode.

29 Surface Congestion Reduction Analysis & Modeling Team, 22.

30 CPCS Transcom Limited, ix. (Note: While the complaint identified in this study of Canada and the US East Coast probably was voiced by persons in Canada, it could easily be an issue for proposed feeder services wholly within the United States.)

31 Kruse and Hutson, 36.

32 Cambridge Systematics, *Short-Sea and Coastal Shipping Options Study*, C-7. (Note: Today $250 is typically cited as the container lift cost at union terminals.)

The last impediment to be mentioned here was as much market-oriented as operational in nature. It was the **inadequacy of freight flow data** that is essential to defining the market. It particularly was an obstacle to the development of services in markets where the market is not defined by existing marine transportation services. Publicly available commodity flow data are not detailed enough to fully assess the potential short-sea shipping market.[33]

1.1.2 Benefits

Often Marine Highway literature, particularly advocacy writing, discusses externalities associated with land modes, such as pollution and congestion. While a few refer to the impacts of marine transportation, the literature more often than not referred to comparative advantages of water transportation and why it might be a more favorable modal approach for its social benefits. That said, the externalities often associated with marine transportation were not ignored as is discussed later in this section.

A 2004 study concluded that while “on a financial basis only, it would be difficult to establish new and commercially viable coastal services” on the routes studied, “a proper reflection of the actual external benefits generated by coastal services appears to be a decisive component to develop this transportation mode.” It suggested that on the long haul that was studied, the water route was shown to have 45 percent of total costs better than trucking, and on the short haul the alternate marine service would better trucking by 35 percent.[34]

Marine highway services were considered in a study of goods movement scenarios along routes in Canada and the U.S. The impact of the marine mode was found to be “generally lower than the rail and road transportation modes, when a port-to-port comparison is considered.” In three of four scenarios, the shortsea shipping mode had the lowest environmental and social costs by a “significant amount.”[35]

As a side note, MARAD has contracted for an environmental benchmarks study. The study is being coordinated with the Environmental Protection Agency (EPA) and “will identify practical activities that marine highway operators can undertake to exceed minimal compliance” with environmental law and regulation. It will be used to encourage and recognize best practices.[36] Doing so could make a service more attractive to shippers, as it was concluded in a recent study that a “new attribute of interest deserving study is willingness to pay for emissions reductions.”[37]

First to be mentioned on the subject of externalities was **air emissions and other pollutants**. Pollution produced by vessels and terminal and drayage equipment, as well as that of trucking and rail generally, has been the focus of attention by communities, environmental agencies and other organizations including public port authorities. The attention has helped encourage segments of industry to give attention to their relations with the public sector and adopt operational measures that, as it happens, can also improve the bottom line. Major ports on the East Coast followed their West Coast counterparts in adopting initiatives, and even aggressive measures, to acknowledge and mitigate the effects of vessel and terminal activity and associated land transportation.

33 Cambridge Systematics, Short-Sea and Coastal Shipping Options Study, 5-2.

34 National Ports and Waterways Institute.

35 Genivar, Evaluation of Environmental and Social Impacts and Benefits of Shortsea Shipping in Canada (Transport Canada, 2010).

36 U.S. Maritime Administration, 46.

37 Sean Puckett, David Hensher, Mary Brooks and Valerie Trifts, “Preferences for Alternative Short Sea Shipping Opportunities” (Institute of Transport and Logistics Studies, 2011), 10.

Reduced fuel consumption, both in terms of its relationship to emissions production and the national security issue (i.e., national dependency on overseas petroleum sources, especially unfriendly nations) was seen as a benefit of marine transportation and a favorable point of comparison among the modes.[38]

The source documents referred to the **efficient carrying capacity of ships and barges** and the relative advantage, measured on a tonnage basis, of marine transportation over the land modes as regards fuel consumption and emissions.

A trucking executive who has advocated the development of an integrated Marine Highway System in California noted that truck operations would improve by shifting to short hauls to and from port. Emissions from his operations would additionally improve by shifting to LNG as fuel for his tractors.[39]

According to one of the few reports to focus specifically on the subject of externalities and benefits, albeit not comprehensively, the structural and social external impacts can include more than environmental effects. The benefits mentioned included **relieving congestion** and thereby reducing costs associated with system capacity expansion and the need for road maintenance; relieving traffic density on some rail segments; diminishing safety problems related to trucking; introducing a new component to the national intermodal network with associated **improvements in reliability** and security; and creating a **modern U.S. merchant fleet and workforce** that would aid in defense and other emergencies.[40]

With respect to the mention of workforce, little analysis was found in the source material to quantify the **job creation potential** associated with service development. The establishment of new business and job opportunities in many aspects of the American maritime sector would be an obvious benefit for purposes of national defense and the national economy. The Maritime Administration report to Congress cites how "earnings for water transportation positions are higher than most other occupations."41 That is true in the shipbuilding industry, which is an essential element of the industrial base and central to a flourishing domestic marine shipping sector. The Maritime Administration report goes on to cite recent year employment figures approximating 266,000 jobs in the water transportation, port-related, and shipbuilding and repair fields.

Benefits of routing goods on the water included **improved system security**, first in the sense of transportation system resilience. Inland and coastal waterways "may provide important transportation system redundancy benefits."[42] That could be especially valuable where interstate routes include bridge and tunnel crossings and are susceptible to sabotage or, in the instance of infrastructure failure could become severe blockages or chokepoints for goods and passenger movement. Another way the Marine Highway System was viewed as providing potential security

[38] U.S. Maritime Administration, p. 21

[39] Ron Silva, "Transport Short Sea Shipping Vision" (Westar Transport, 2006)

[40] National Ports and Waterways Institute, The Public Benefits of the Short-Sea Intermodal System (Short Sea Cooperative Program, 2004)

[41] U.S. Maritime Administration, 12.

[42] Cambridge Systematics, Short-Sea and Coastal Shipping Options Study

benefits was that the diversion of niche cargos, such as hazardous materials, to marine routes would allow tighter enforcement and inspection control of those cargos.[43]

Marine transportation could be a suitable and attractive alternative or supplement to the use of freight rail in routing **hazardous materials** i.e., away from populations, and taking **heavy cargo off public roads**.[44]

Avoidance of highway maintenance costs and **delayed demand for adding capacity** to the highway system could be very attractive. Several traffic lanes may be served by new or enhanced operations.[45] Using different terms, MARAD refers to the "many thousands of miles of uncongested capacity" as a means to "cost-effective capacity expansion" of the transportation system.[46]

Quantified cost-savings were identified in Marine Highway project proposals that were submitted to MARAD, with reference to uncompensated wear on roads by trucking and how marine routes can provide public benefit in avoided highway maintenance.[47] There is no single, officially designated methodology employed for evaluating services for social benefits, although there are several calculators, with differing inputs and outputs that can serve as models.[48]

The adequacy of available information and analysis on the question of externalities and benefits was discussed in several source documents. One report explained that externalities associated with marine transportation that were not accounted for in its analysis included those "impacts for which methodologies are not suggested in literature," such as operational water pollution, invasive species and anti-fouling paint.[49] Another source on public benefits acknowledges that while truck-related

43 Allison de Cerreno, Martin Robins, Pippa Woods, Ann Strauss-Wieder and Rayan Yeung, Bi-State Domestic Freight Ferries Study (Port Authority of New York & New Jersey, 2006). (Note: The source also acknowledges (It also noted that communities affected by the Marine Highway service routing might exhibit concerns with a concentration of such freight.)

44 As source documents note, the northbound flow of chemicals and other hazardous materials from the Gulf to the Mid-Atlantic region is significant.

45 Cambridge Systematics, *Short-Sea and Coastal Shipping Options Study.* (Note: The relative open capacity of marine lanes contrasted with the reduced capacity of congested highways and corridors is often mentioned by Marine Highway advocates. It is mentioned along with calculations that, in general, Marine Highway operations can provide comparable capacity that is less costly than the construction of new road lanes. It is analysis that deserves quantification to judge the quality of that assumed benefit.)

46 U.S. Maritime Administration, 18.

47 See as an example: Ports of Galveston, South Carolina State Ports Authority, " Atlantic and Gulf Coast Short Sea / Feeder Service" (Proposal to the U.S. Maritime Administration, 2010)

48 Such calculators can be very valuable in determining public benefits of transportation projects, especially now that metrics are coming into greater use in government assistance decision-making. Quantification of social benefits is possible through benefit calculators, such as the Marco Polo calculator used in Europe for evaluating projects for European Union program support. The Environmental Protection Agency (EPA) developed the SmartWay calculator for evaluating transportation services and equipment but it does not at present include marine transportation metrics. American Feeder Lines developed its own calculator, borrowing from and improving upon those previously mentioned. The Marine Highway Cooperative, an industry and U.S. Maritime Administration group, released in April 2011, a benefits calculator that was developed under contract by AECOM.

49 Genivar, v.

externalities were included in its analysis, the study's assumptions included, generously, that negative impacts of marine transportation alternatives were "low in comparison with trucking."[50]

The most pointed discussion of this subject was contributed by environmental organizations that call for **environmental analysis of Marine Highway projects**, including more than what a private vessel operator ordinarily would undertake to meet permit requirements. They also argued for programmatic environmental analysis in conjunction with the U.S. DOT's Marine Highway Program. Organizations including Friends of the Earth (FOE), filed public comments in the AMH Program rulemaking saying that "the Maritime Administration must first analyze environmental impact related to increased short sea shipping traffic and propose alternatives and mitigation strategies as mandated by NEPA and the EPA, as well as comply with applicable obligations under the Clean Air Act and state laws."[51] But as the FOE filing notes, this "is not to say that the Program should be scuttled out of hand, but to elucidate that substantial environmental scrutiny is warranted."[52]

1.1.3 Markets and Operations

The proposal of the I-95 Corridor Coalition to MARAD in seeking to have the waters off the East Coast designated a Marine Highway Corridor referred to the organization's long term vision that "calls for diversification of transportation investments to make the best use of maritime and landside infrastructure."

The underlying conviction of the East Coast state transportation agencies is that growth in traffic on the I-95 Interstate Highway corridor will continue and that, over time, "no single mode will be able to handle the growth, and even if every mode maintains market share it has today, the entire industry is facing daunting challenges."[53] The Coalition's densely populated Atlantic region is a "logical place" for expanded short-sea operations.[54] It is a common view shared to our north where Canada-U.S. coastal trade was examined. While a good start, it does not promise a market for Marine Highway services, particularly over the near term, before the time when the freight sector faces "daunting challenges." The question of what the market indicates as to its present day acceptance of marine alternatives for domestic goods movement, or its demand in the next years, could be found in some source documents. It was determined there are many existing "short-sea

50 National Ports and Waterways Institute. (Note: The author later noted that "this study should be considered the first step and basically the initial research in this critical transportation planning area." The I-95 Corridor Coalition recommendation for the M-95 Corridor also suggested the need for greater evaluation of the potential benefits associated with Marine Highway services.)

51 Docket No. MARAD-2008-0096

52 While environmental groups have been critical of marine transportation for the quality of air emissions and other externalities, including incidences of marine mammal strikes by vessels, they also have acknowledged potential and actual benefits of the mode. The Friends of the Earth paper that comments specifically on the planned Green Trade Corridor project in Northern California. ("Expanding Short Sea Shipping in California", 2010.) It recommends the adoption of clean technologies and fuels, and less impactful operational practices while in transit and in port. Similarly the study, "America's Deep Blue Highway," which was endorsed by Environmental Defense Fund President Fred Krupp, makes a strong case both for cleaner fuels and for Marine Highway service development. Another EDF related publication, "The Good Haul," highlights specific Marine Highway projects and plans as exemplary developments in goods movement.

53 George Schoener, 1.

54 Cambridge Systematics, Short-Sea and Coastal Shipping Options Study, 5-4.

shipping" operators and services, broadly defined, and they handle about two percent of the overall value of freight shipments into and out of the Atlantic region.[55]

The view of the East Coast as a high volume goods movement corridor and good prospect for Marine Highway service is especially confirmed when Gulf to North Atlantic flows were considered. The 2006 "Four Corridors Case Studies" report offered useful findings and conclusions.[56] Northbound coastal shipping market volume was almost twice that of southbound. The largest inter-regional flow was Gulf Coast to the NY/NJ Port Authority three-state region. Other northbound lanes that also have substantial volumes per year include South Atlantic to NY/NJ Port Authority region. And while the transit time of short sea to the other modes was competitive and the economics had an advantage over rail intermodal and truck, the "primary difficulty" faced by the short sea service in the South Atlantic to North Atlantic Corridor was the "relatively low density of freight." The report concluded that with increasing congestion in the I-95 Corridor, a Canaveral-New Haven short sea service may be able to offer shippers greater schedule reliability and a shorter transit time "in the future."[57]

Several years ago a study on behalf of Canaveral Port Authority found that international and domestic cargo volumes would not support short sea operations at that time but subsequently concluded, as noted in a 2004 study, "that the rapid economic growth of the Central Florida region may have increased demand to levels that could support a domestic short sea service."[58] Vessel operators were among those interviewed for that same study. They were involved in coastwise, ferry or short sea services and a majority of them 1) were operating short sea, coastal or ferry projects, 2) considered services as probable or desirable, 3) thought short sea shipping or ferry service will become industry standard, and 4) thought there was demand for East-Central Florida Short Sea hub port location such as Port Canaveral.

According to the 2005 market study for the I-95 Corridor Coalition, imports to the I-95 Corridor region vastly exceeded exports in the Atlantic region. Not surprisingly, trucks move a larger share of freight (by weight or volume) than marine transportation, and goods moving on the highway are more diverse in nature and of higher value per ton than the goods moving by water. Some goods (e.g., wood, textiles and leather) within the I-95 region may be better suited to short sea shipping operations than others, while several commodities may be served by new or enhanced short sea shipping operations e.g., bulk commodities, pharmaceutical and chemical products.

However dense consumer markets, huge population centers and congested mega-regions did not constitute a sure market for such freight alternatives.[59] A cross-harbor New York/New Jersey freight ferry would not provide the time and/or cost savings necessary to attract general goods movement given current "tolerable" levels of congestion and shipper preference.[60]

55 Cambridge Systematics, Short-Sea and Coastal Shipping Options Study, 5-1.

56 The four corridors studied were Gulf to Atlantic Corridor (Beaumont, TX to Camden, NJ), Atlantic Coast Corridor (Port Canaveral, FL to New Haven, CT), Great Lakes Corridor, and Pacific Coast Corridor. The corridor case studies conclude that vessel capital and crew costs and terminal expenses must be at "best in class" (optimum) levels in order to be price competitive with trucking and rail on a door-to-door basis in all but the Pacific Corridor.

57 Global Insight and Reeve & Associates, 46-47

58 Maritime Transportation and Logistics Advisors, 21.

58 (accessed November 28, 2011). The Atlantic coastal "megaregions" are identified as being the Northeast (Washington, DC to Portland, ME) and Florida.

59 Wieder and Yeung, i.60 Cambridge Systematics, Long Island Sound Waterborne Transportation Plan, Task 2 (New York Metropolitan Transportation Council, 2004), 4-23.

In a separate study for a Long Island Sound Waterborne Transportation Plan, the NYMTC admitted that given that the volumes of people and goods moving within the metropolitan region are "staggeringly large" and the marine transportation plan addresses a "limited subset of the overall transportation system", it will not "by any stretch of the imagination, 'solve the problem'."[61] The NYMTC study had a limited focus on goods movement, deferring for the most part to other freight oriented agencies and studies. It described the overall objective with regard to freight movement between New England and New York/New Jersey as one to "intercept" trucks by using waterborne services and thus remove them from major New York City area corridors such as the Tappan Zee and George Washington bridges. The study observed that the "New York City-Long Island Sound region is not currently a strong market for freight transportation by ferry." Ultimately, it concluded, there are no obvious services where a dedicated truck ferry would fill in a "missing link" in the regional transportation system, other than between the north shore of Long Island and south shore of Connecticut.[62]

The I-95 Corridor Coalition market study found that, in some instances where road and water share a commodity type, there was **potential for modal shift** to water from road if affordable and reliable service were available. Road and water handled comparable shares of two "imported" (from other U.S. regions) commodity types: chemical products and pharmaceutical (14 percent by road and ten percent by water) and stone, minerals and ores (6 percent by road, and 4 percent by water). Road and water handled comparable shares of two "exported" (to other U.S. regions) commodity types: stones, minerals and ores (13 percent by road and 36 percent by water); and coal and petroleum (9 percent by road and 24 percent by water). Commodity types where water already had a substantial share e.g., imported coal and petroleum, were less likely to experience a modal shift.[63]

The **cost of transportation services** was the foremost consideration when evaluating the potential viability of Marine Highway service to a market already served by trucking or rail. A service between two port pairs will likely require an additional stevedoring operation (unless the move is direct vessel to vessel), which will add time and expense. Moreover, several studies indicated that services may even have to do better than simply match truck rates in order to compensate for one or more days of additional transit time on the water.[64] Competitive handling costs at ports would also be required.[65] However there were indications that improved service would be valued higher than the cost of services. In some cases "premium pricing in exchange for better transit time may be acceptable."[66]

It comes as no surprise that **low margin and heavy commodities** were considered in the literature as a principal market for marine transportation. That is especially the case, as one source noted, when compared to trucking and where rail was not a competitive option. The "Four Corridor

60 Cambridge Systematics, Long Island Sound Waterborne Transportation Plan, Task 2 (New York Metropolitan Transportation Council, 2004), 4-23.
61 Metropolitan Transportation Council, 2004), 5-41.
63 Cambridge Systematics, Short-Sea and Coastal Shipping Options Study, 4-3.
64 TranSystems/Manalytics International, CDI Marine Company, Matthew Tedesco, and Westar Transport, Feasibility Assessment of Short Sea Shipping to Service the Pacific Coast (Center for the Commercial Deployment of Transportation Technologies, 2007), 58. The study of the West Coast market concluded that marine transportation may have to better truck rates by as much as ten percent.
65 Kruse and Hutson, 47.
66 Mary Brooks, Richard Hodgson and James Frost, Short Sea Shipping on the East Coast of North America, (Transport Canada, 2006), ii.

Study" concluded that the short sea option may be competitive for less time-sensitive, lower value cargos that can be diverted by a significant price differential vice trucking.[67] The I-95 Corridor Coalition study put it plainly: the water mode clearly is favored by high weight – low value cargo.[68] The commodities that most readily would shift from road or rail to water were the heavy cargos, hazmat and project, dimensional cargo that is less time sensitive and of lower value.

Short sea service can be particularly competitive for **heavy and hazmat shipments**. Chemical and petroleum flows from the Beaumont, Texas region account for 61 percent of total truckload moves to the Camden, New Jersey region. The Gulf Coast/North Atlantic Corridor case study showed that relatively large vessels could be deployed with high enough frequency of service and be competitive with trucking.[69]

An interesting perspective on **flexibility in key market decision points** was offered in a study that identified how shippers may be open to trade-offs. As already noted, the cost to the customer is a prime factor in the logistics decision, but there is evidence that "companies may compete in many ways and there is room in any transport market for competition based on more than just price."[70] "Shippers demonstrated a strong willingness to pay for higher frequencies of departure, with a mean value of over $1,100 per additional departure per week corresponding to a given service…"

> *"Ultimately, the distribution of WTP for gains in the frequency of departure reveals opportunities for freight transport service providers to be aware of the existence of real trade-offs being made across market alternatives…and that these trade-offs are evaluated in considerably different ways by different shippers… For example, a new short sea shipping service could exploit this knowledge by targeting its service to compete strongly on attributes over which it has an advantage, offering sufficient value for those attributes to overcome any systematic disadvantages to road…like departure frequency."*[71]

Indeed **frequency of service** was a high ranking consideration of logistics managers. Freight that is accustomed to trucking being available, say, on a daily basis, will have low or no tolerance for weekly marine service. This can be an especially difficult challenge for start-up services whose financial resources may not be able to support three or even two runs per week. The desirability of Marine Highway service providing daily or near-daily service was often mentioned in the literature so to offer motor carriers with an attractive route alternative for the long haul. There were instances where vessel operators were not able to improve upon their once or twice weekly services due to a lack of equipment or operating capital and so they failed, unable to respond to known customer and market demands.

Service reliability also was a high ranking quality that Marine Highway operators are obliged to provide in order to attract and retain customers. Reliability is important to overcome the general view that shipping—barging, especially—is not predictably on time. Interviews with shippers revealed that reliability and predictability is nearly as important as transit time. The exception to the expectation for schedule reliability can be the non-time-sensitive, low value commodities.

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67 Global Insight and Reeve & Associates, 46.

68 Cambridge Systematics, Short-Sea and Coastal Shipping Options Study, 4-3.

69 Global Insight and Reeve & Associates, 50.

70 Puckett, Hensher, Brooks and Trifts, 10.

71 Ibid., 9.

Studies generally agreed that the **longer distance freight flows** showed more potential for Marine Highway service development, especially if the cargo was not time-sensitive; however, the literature was not unanimous in that regard. The decision analysis tool used in George Mason University's (GMU) *Marine Highway System* study indicated that routes need to be longer than the studied James River route used by the "64 Express" container-on-barge service. Longer routes had the advantage of a ship's higher efficiency as compared to trucking. The GMU report indicated that the short route studied in simulation showed more consistent trip times for trucking on the highway.[72] The study concluded that in comparing a long with a short route, longer routes may provide more promising results for operations with 400-600 miles being around the break-even point.[73] However, a different conclusion was found in the "North American Marine Highways" report.

> *One of the more interesting findings from this research effort is that the conventional wisdom regarding the necessary distance for [North American Marine Highway] options...is not correct. On the contrary, successful operations have functioned on routes as short as "across the bay" and as long as more than 1,000 miles. More importantly, the researchers concluded that there is no critical distance for determining whether a particular venture will be successful. The specific geographic features of each service must be considered, including the alternative landside distances and connections.*[74]

Some sources concluded that the **distance of interior moves**—which is to say between the cargo origins and destinations and the ports—should be fairly short. Seventy-five miles is the suggested distance in one or more reports.

Consensus can be found in placing importance on offering integrated services. A **door-to-door Marine Highway service integrated with trucking** would be more marketable than a strictly port-to-port operation. Some suggest it as an essential element in designing a competitive service. Shipping lines in interviews said short sea service must offer significant door-to-door cost advantage.[75] Shippers also suggested that delivery schedules must be integrated into existing or planned distribution channels.[76]

One source offers that a large trucking company with broad geographic scope would be a good partner, as it would have equipment available in multiple locations.[77] Much of the success of a service will be determined by the willingness of trucking to partner with the potential marine highway operator.[78] Another report included the suggestion that marine highway services employ their own drayage personnel to reduce costs.[79] Such observations and suggestions reinforce the

72 That conclusion is not shared by a transportation planner who is very familiar with the "64 Express" pilot service and was asked for comment knowing the reliably difficult traffic congestion on route I-64 between Hampton Roads and Richmond.

73 Ibid., 24.

74 Kruse and Hutson, 12.

75 CPCS Transcom Limited, ix.

76 Ibid., xi.

77 Kruse and Hutson, 26.

78 Mary Brooks, Richard Hodgson and James Frost, iii.

79 Dan Bagnell, Carin Saunders, Ron Silva and Matthew Tedesco, "Operational Development of Marine Highways to Serve the US Pacific Coast," Transportation Research Journal: Journal of the Transportation Research Board, No. 2100 (2009): 85.

notion that the more an operation is modally integrated and seamless, the more it will be attractive to the shipper or carrier that decides how best to transport its cargo.

As one might expect, the **motor carrier perspective** has a lot to offer as to operations.[80] Trucking companies agreed that the shipping rate needs to be low enough to reduce overall door-to-door expenses. They suggested creation of an owner-operator network to connect operators at load and discharge ports, establishing good communications between truck driver and vessel to enable timely information as to estimated delivery time, and the provision of trailers are part of a Ro/Ro operation.[81] Motor carriers and intermodal marketing companies showed interest in how short sea shipping might help alleviate such operation issues as driver shortages, fuel and labor costs.[82] Beyond such curiosity persons representing intermodal trucking, at company and trade group levels, have voiced support for the development of marine highway services. They noted with confidence the indispensable role of trucking in moving goods to and from port, as well as the potential for longer distance water services to help address challenges, such as the driver shortage and driver preferences for shorter trips, multiple turns and less time away from home.[83]

Route congestion was a consideration, although not high ranking among the major market factors, particularly in the New York metropolitan region.[84] In a study of Atlantic Canada and U.S. East Coast markets, scheduling requirements "indicated that 25 percent of shippers were unlikely to switch to short-sea shipping unless trucking service deteriorates drastically."[85] It went on to note that most companies report experiencing road congestion and half of them said it was serious enough to consider switching. Another report observed that when providing direct point-to-point routing around road bottlenecks and congestion, short sea can be "highly competitive" in terms of cost and transit time.[86]

On the question of **ramp versus lift cargo loading**, there appeared to be general agreement that Ro/Ro is better suited for these services, especially as regards to the movement of domestic goods, which likely would not be shipped in containers. This subject of loading/unloading method was a

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80 It is worth noting that an active advocate of establishing an integrated Marine Highway service in California is Ron Silva, owner of the Westar trucking company. Silva's "vision" is the full integration of marine and land components (partnership or single ownership) based on a rationalization of equipment and driver assets.

81 Dan Bagnell, Carin Saunders, Ron Silva and Matthew Tedesco, 85.

82 Global Insight and Reeve & Associates, 25.

83 Curtis Whalen, Executive Director, Intermodal Motor Carriers Conference of the American Trucking Association has regularly said in public presentations that his industry is welcoming of the Marine Highway initiative and was reported as speculating that trucking companies "could very well participate on the equity of some short-sea shipping projects." (Matt Hilburn, "Resurgence," Seapower , May 1, 2006.) John Crane of J.A Crane Co, Inc., a Baltimore based trucking company, spoke at a September 27, 2011, Marine Highway Workshop, sponsored by the Maritime Administration. He said that present day challenges of trucking in attracting and retaining drivers is one of the reasons he supports the development of Marine Highway services.

84 "While European and US studies show a bias against short sea shipping a labeling effect was found (albeit weakly significant) indicating a preference for integrated short sea shipping over options labeled 'truck'. This bias in the opposite direction as seen in other studies was explained by Brooks and Trifts as reflecting the market reality; anecdotal evidence from those answer the survey indicated respondents were frustrated with the level of road congestion on the corridor, and particularly in the Hudson River Lower Manhattan vicinity." Sean Puckett, David Hensher, Mary Brooks and Valerie Trifts, 10.

85 Mary Brooks, Richard Hodgson and James Frost, ii.

86 Global Insight and Reeve & Associates, 11

key one because of the cost factor, on one hand, and the revenue factor, on the other, and is discussed in a new report.[87] Among the advantages of Ro/Ro operations are the avoidance of lift costs in port and the presumption of lower stevedoring costs in a ramp operation.[88] However that is not to suggest Lo/Lo operations would not work in all instances. Indeed, some of the U.S. DOT designated Marine Highway projects make the case for, even insist on, the Lo/Lo model.[89] The discounting of lift costs can be important to making a standard container operation competitive.[90]

Another operational issue was **vessel standardization**. Multiple sources suggested the need for model designs or standards for vessels that are right-sized and eligible for use in domestic shipping services. That is driven by the view, as mentioned earlier, that vessels must be suited for the market. Importantly, it also would mean increased productivity through economies of scale at U.S. shipyards with the series construction of vessels that would result in a lowering of vessel costs to operators. This issue of standardization is being pursued in deliberate fashion by MARAD, working with the Department of the Navy, and in cooperation with the naval architect and shipyard sectors.[91] A first report of that project describes and evaluates 11 concept level vessel designs taking into consideration likely services, cargo volumes, and types as well as likely rates for such services.[92]

The question of what **operational characteristics** of vessels and other logistics options might be best tuned to serve the market requirements has been the subject of detailed study.[93] A Marine Highway System evaluation parametric model was developed to assess the variety of logistics elements that can make services more competitive, how changes in vessel operations would affect the freight rate, and other such questions.

It is worth noting that while the adequacy and **condition of infrastructure** does appear in some of the literature as a potential obstacle or factor in developing Marine Highway services, a major examination of obstacles noted a "remarkable finding" that terminal facilities and equipment were rarely mentioned as serious impediments.[94]

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87 U.S. Maritime Administration, *American Marine Highway Design Project,* 2011, 32. http://www.marad.dot.gov/documents/AMH_Report_Final_Report_10282011_updated.pdf

88 The Four Corridor Study found that when comparing Ro/Ro operation costs with Lo/Lo in the Atlantic Corridor case study (p. 54) the ramp operation showed a $104 lower cost while in the instance of the Gulf/Atlantic Corridor study the cost difference was "relatively close" at $14 (p. 53).

89 Eight projects of approximately 33 proposals were selected and designated "Marine Highway Project." Five of those designated projects are Lo/Lo operations, four being COB and the other using container ships. A fifth COB project, the Green Trade Corridor Project in California's Bay Area, is under development with Federal capital funding support.

90 Kruse and Hutson, 36.

91 U.S. Maritime Administration, pp. 30,44,54

92 U.S. Maritime Administration, *American Marine Highway Design Project,* 2011, 34. The vessel types represented in the report are Ro/Ro, Lo/Lo, Ro/Con (combination Ro/Ro and Lo/Lo), Ro/Pax (combination roll-on/roll-off and passenger), and ATB (articulated tug and barge). The report recommendations include a more detailed evaluation of market and routes and the selection of "the most likely two or three designs" determined to be most suited to market requirements.

93 Dan Bagnell, Carin Saunders, Ron Silva and Matthew Tedesco.

94 Kruse and Hutson, 4.

1.1.4 GOVERNMENT POLICY AND ACTIVITY

The Marine Highway System development discussion is a public policy discussion, even while recognizing the indispensable private sector roles and market factors. Government policy and programs have regulated, guided, fed and supported, frustrated and protected shipping activity in the U.S. from the nation's early days. Today's Marine Highway System development effort is, in part, a **government initiative**. Congress included a maritime section in the Energy Independence and Security Act of 2007 as an acknowledgment of the carrying efficiencies of marine transportation and energy savings that could be realized with a greater use of the mode in domestic goods movement.[95] It was statutory affirmation of a developing initiative within the DOT and provided the initiative with a programmatic structure. On implementation in 2009, the "short sea transportation" program was labeled the America's Marine Highway program.[96]

The role of government in this subject area is debated and while there is acknowledgement that Marine Highway operations should be self-sustaining, particularly over the long term, there are individuals who suggest the need for **initial government support**. In his remarks to the Marine Board of the Transportation Research Board, Henry Marcus, PhD., of MIT drew an analogy to the initiation of the Interstate Highway System and the establishment of rail and air transportation, all of which required some form of national assistance.[97] He also noted the General Accountability Office report conclusion that externalities are not factored into the cost of freight transportation and suggested that government policy could insist on paying for externalities.[98]

As noted earlier, federal support would not be new to the maritime sector. Offering incentives such as waiving fees and tolls, and a HMT "discount" could assist in a modal shift. Another approach could be to mandate certain percentage of freight use of "greener" modes.[99] A very recent report concluded that "government policy can have a major impact on the viability of AMH services."[100]

The potential public sector **policies and actions** that could be considered to address various obstacles covered quite a range and included factoring-in externalities in tax policy and funding decisions; revisiting vessel manning requirements; fostering the shipbuilding industry to reinvent itself by the building of "a new fleet of environmentally friendly coastal ships," thereby enabling the shipbuilding industry to "reinvent itself"; flexible highway spending in order to pursue the "best alternative" and where it can have "beneficial effect on the highway system." Local government could have a role as well by providing local tax relief for domestic terminal development and the establishment of short overweight corridors between ports and distribution centers.[101]

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95 The Short Sea Transportation provisions of PL 110-140 (sections 55601-55605 of Title 46 USC) http://uscode.house.gov/download/pls/46C556.txt (accessed November 28, 2011).

96 America's Marine Highway Program (46 CFR Part 393) http://edocket.access.gpo.gov/2010/pdf/2010-7899.pdf (accessed November 28, 2011).

97 Weisbrod, 7.

98 Marcus referred to "Surface Freight Transportation: A Comparison of the Costs of Road, Rail, and Waterways Freight Shipments That Are Not Passed onto Consumers," January 2011 (GAO-11-134). The report states that "analysis shows that on average, additional freight service provided by trucks generated significantly more costs that are not passed on to consumers of that service than the same amount of freight service provided by either rail or water."

99 Surface Congestion Reduction Analysis & Modeling Team, 24.

100 U.S. Maritime Administration, *American Marine Highway Design Project,* 2011, 31. http://www.marad.dot.gov/documents/AMH_Report_Final_Report_10282011_updated.pdf

101 Kruse and Hutson, 43.

Even more direct government action on behalf of Marine Highway service development could include mitigation of start-up risk particularly to overcome "'chicken-or-the-egg' stalemates," market entry analysis, and market promotion.[102] With regard to the latter, some sources note that the European Union's Marco Polo policy includes the establishment of the previously mentioned Shortsea Promotion Centres in each of the member countries as part of the European Shortsea Network.[103] Further elaboration on the EU's Marco Polo program and its companion program, Motorways of the Sea (MOTS) is provided in Appendix D.

United States **cabotage policy** provides the framework for domestic shipping. If a vessel is to pick up and discharge cargo between U.S. ports, it must meet certain entry level tests. It must be built in the U.S., owned by a U.S. company, and crewed by U.S. citizens. Cabotage law is not unique to the U.S. Most developed nations, including our neighbors to the immediate north and south of our borders, have some form of coastwise shipping criteria to protect elements of their domestic industry.[104] Indeed, a major source document that evaluated obstacles to service development suggested that, over the long term, consideration be given to harmonizing North American customs regulations and cabotage policy.[105]

To some extent, the policy discussion was about the U.S. cabotage requirements. Those requirements have both adherents and critics. This study does not examine the validity of those requirements or suggestions that have been made to change them. Rather this study assumes no change in the cabotage policy framework.

A good many sources identify several of the same issues. More often than not, issues are not fully developed in ways that quantify, for example, the economic effect of a perceived barrier to service development, or how a change in tax policy would "pencil out." Some of the policy ideas were intended as solutions to an identified problem, such as vessel financing. Most issues presented below are in past studies and reports as policy recommendations, which is how they usually appear in the literature. They are grouped here by common theme, the first being an exception.

The Harbor Maintenance Tax is the most often mentioned policy issue. It is named as impacting Marine Highway service development primarily because it adds to the transportation cost. The HMT was established by Congress to offset the annual cost of Federal channel maintenance.[106] The present day assessment on subject cargo is equivalent to $1.25 per $1,000 cargo value.

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102 CPCS Transcom Limited, 101.

103 See the European Shortsea Network website at http://www.shortsea.info/.

104 Kruse and Hutson, 47.

105 Ibid., 50.

106 The Harbor Maintenance Tax was established in P.L. 99-662 (Water Resources Development Act of 1986) and took effect in 1987. It was increased in P.L. 101-508 (Omnibus Budget Reconciliation Act of 1990) to cover 100 percent of the cost of Federal navigation channel maintenance. (Text of HMT law.) Effective 1991 the HMT was applied at a level of 0.125 percent of cargo value on import, export and domestic cargo, foreign trade zone cargo, and cruise ship passenger tickets. In 1998 the Supreme Court found the HMT unconstitutional as it was applied to U.S. exports. The HMT is collected by Customs and Border Protection on trade coastal and certain river ports where U.S. Army Corps of Engineers maintains channels and which are not part of the inland waterway system, which has a separate fuel tax regime. Certain cargo e.g., fish, types of vessels e.g., ferries, and trade routes e.g., Hawaii, are exempt from the HMT. Most HMT receipts on domestic cargo are collected on bulk commodities e.g., petroleum, which dominate U.S. domestic commercial marine shipments. In FY 2009 HMT collections on all domestic cargo amounted to 8 percent of total HMT receipts.

The general view is that when compared to other transportation cost elements, and depending on the market, such added costs can be a disincentive against shifting cargo to marine transportation, especially if the party that controls the cargo is confronted with more than one consideration in making a modal shift decision. In the instance of transshipped imported cargo, one of those added considerations is the fact that the cargo pays the HMT upon entering the country and thus would pay a second time when delivered by feeder vessel to a second port.

Regional differences in views on this subject were seen in proposals to exempt domestic waterborne cargos from the HMT.[107] Legislative bills proposed to exempt cargo would apply to moves between U.S. ports, but they also have included cargo movements between Canada and the U.S. on the Great Lakes/St. Lawrence Seaway System, effectively exempting Canada exports to U.S. ports in that region. A variation on that would exempt shipments from Nova Scotia, which could improve Nova Scotia's ambition to serve as a hub for feeder services.[108] These prompt questions in the Gulf of Mexico region, for example, as to what advantage that gives one region or port range that is not given to another where new short sea shipping operations would also be welcome. It also provides an issue to major border ports such as Seattle and Tacoma that compete on a daily basis with Canadian ports to the north.

The foreign flag container lines are on record as thinking an HMT exemption is not advisable. That view is founded in the concern that by exempting U.S. domestic cargo the burden on imports to pay the bulk of HMT Fund revenues would only increase. The reasoning continues that an exemption would make the HMT more vulnerable to complaints from U.S. trading partners who previously did petition the World Trade Organization when the U.S. Supreme Court ruled in 1998 that the HMT on U.S. exports was unconstitutional.

Providing **shipper incentives**, such as tax credits, was suggested as a way to jump-start interest in Marine Highway services.[109] The subject was mentioned in several source documents. The thought is to incentivize the use of services and establish a market. "Most interviewees believe that if incentives are deemed to be necessary the best approach is to incentivize shippers, not operators."[110]

Initiatives could probably win the support of segments of the maritime community that would benefit directly or indirectly. However, a discussion as to how incentives could be applied will reveal different, perhaps opposing, views even within the maritime community. Some degree of opposition could be expected from other modes that may argue a tax incentive would constitute an unfair subsidy. Other likely opponents to tax incentives would be federal agencies that routinely discourage tax code changes that would lose, not add, revenue.

Little in the way of detailed proposals for shipper incentives has been put forward. One operator of domestic container barge services suggested "a Federal Tax Credit be granted to any

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107 These are in addition to long standing concerns, unrelated to this subject of domestic shipping, for example, in San Pedro Bay and Puget Sound where naturally deep ports do not benefit by harbor maintenance expenditures.

108 As of this writing one bill is introduced in the 112th Congress, it being H.R. 1533, which includes Nova Scotia within the defined geographic coverage of the proposed HMT exemption. Bills containing differing regional approaches appeared in the 111th Congress with the introduction of S. 551, S. 1509, H.R. 638 and H.R. 3486.

109 U.S. Maritime Administration, 64.

110 Kruse and Hutson, 21.

shipper/Railroad/Trucking company/Importer/Shipping line that moves a truck container along a coastal or river route."[111] Another operator proposed in 2011 a Sustainable Transportation Credit (STC) that would give the "service provider a financing tool to reward users of sustainable transportation." The STC would be a saleable tax credit that, for example, could be exchanged for agreements to make use of Marine Highway services that are pre-approved as providing freight system capacity while meeting social benefit criteria such as alternative fuel use, reduced emissions and congestion reduction.[112]

Improving **vessel financing**, such as through adjustments to Title XI requirements, as well as funding the loan guarantee program, investment tax credits, and carbon credits could help operators and start-ups afford the large capital requirements for vessel construction or reconstruction. While existing vessel owners may have no complaint with Title XI requirements in their present form, others point to a need make the program more friendly to Marine Highway start-ups whose smaller vessel requirements and lesser financial resources to meet debt-to-equity program requirements differ from those of other companies. A major source suggested that a "full review and assessment" of Title XI be conducted.[113]

Alterations to accommodate Marine Highway initiatives could be accomplished through legislative or administrative action. Developing and supporting **vessel technology** improvements to achieve greater efficiency and lower environmental impact is sometimes mentioned. Those objectives are addressed, in terms of existing technology, in the vessel designs contained in the 2011 "*American Marine Highway Design Project*" study report by Herbert Engineering for the Maritime Administration.

One of the more focused Federal government agency activities toward the advancement of Marine Highway service development is the so-called **dual use initiative**. Dual use is defined as ships in the domestic marine commercial service that have defense features that qualify the vessels to be called into government service in times of a national defense emergency. The Department of the Navy is working in conjunction with the DOT to identify vessel characteristics that would satisfy both commercial service market requirements and military cargo and situation requirements.[114]

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111 See an interview of Mr. Kevin Mack, a former executive of the company, with the America's Marine Highway website: http://americasmarinehighways.com/userfiles/Kevin%20Mack%203%20AMH%20Questions.pdf. Separately, Columbia Coastal Transport president Mr. Bruce Fenimore wrote "…yet we do not see our segment growing stronger until companies—carriers, shippers and consignees—have some kind of financial incentive or tax credit to make them want to change the way they do business." (Journal of Commerce, "Annual Review + Outlook 2009") The detailed proposal for shipper tax credit was presented at a Journal of Commerce North American Marine Highway Conference in 2008.

112 American Feeder Lines based the STC concept on Renewable Energy Credentials (REC) that at the State level has encouraged the development of renewable energy production. Service details would be evaluated by means of a federally approved benefits calculator such as that used by EU nations under the Marco Polo policy. According the proposal, "STCs are tax credits where the value of the credit is determined by quantifiable and defined reductions in emissions and roadway congestion using the metrics of a standardized calculator. The credits can be used by the originating certified provider of sustainable freight services or transferred to customers of that service, thus encouraging the use of alternative logistics services, lean fuels, and energy saving technologies for the domestic movements of goods. STC, as proposed, would expire after ten years after the date of implementation."

113 Kruse and Hutson, 5.

114 Jonathan Kaskin, Presentation: "Dual Use Ships for American Marine Highway," (U.S. Navy, 2011).

What is driving the dual use concept is the foreseeable need to replace the aging Ready Reserve Force Ro/Ro fleet that is costly to operate and maintain and is lacking characteristics that the military will require in the next decades. A new, efficient fleet would replace one that is both dated in its functionality and costly to maintain. The vessels anticipated for the new fleet could include the "RoCon" type (combination Ro/Ro and Lo/Lo), which is one of the design types described in the recent vessel design report conducted in support of the dual use initiative.[115] If the dual use concept is pursued by the government, the result could provide "national security benefits as well as reduce congestion, pollution road wear and accidents."[116]

In the context of sustainable development objectives, some sources set forth ways that government can foster Marine Highway service development through a **multimodal transportation policy**. Government policy could enhance the promotion of marine transportation as part of an integrated system with rail and road. It can put focus on a "well-integrated intermodal transportation system" by planning for "fluidity" of goods movement and improvement of port facilities. It could identify with industry representatives measures to encourage ship owners to upgrade or renew their fleets and set clear and realistic sustainable development targets. Also important when considering environmental policies and regulation would be assessing the effect of those on the continuing viability of domestic marine transportation.[117]

Similarly the suggestion was made for examining, and rectifying where needed, policy, costing or process circumstances or impediments that disadvantage the marine mode.[118] The same source suggested that government support **research and development** focused on vessel design and cargo handling "directed at identifying parameters that maximize the chances for success of an optimum East Coast integrated short sea shipping service." Such research has been undertaken to some extent in the parametric model developed for the Center for Commercial Deployment of Transportation Technologies.[119]

The I-95 Corridor Coalition observed that state DOTs and Metropolitan Planning Organizations (MPO) can play a critical role in supporting short sea shipping operations, but, while aware of short sea shipping, those transportation planning entities "do not understand its potential implications to transportation or economic development activities."[120] MARAD has a similar view. Marine highway development at a state level is not occurring, in part for lack of information and qualified staff. Ideally each DOT within a MH corridor should have staff who can work with those of other state DOTs.[121] With that in mind, the recommendations contained in the I-95 Corridor Coalition report included **education and outreach** efforts to State DOTs and MPOs, public agency engagement of stakeholders, the conduct of a detailed market assessment (to follow the subject report), inventorying interested ports and their "desirable characteristics;" and development of a geographic information system (GIS) program.

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115 U.S. Maritime Administration, *American Marine Highway Design Project,* 2011. http://www.marad.dot.gov/documents/AMH_Report_Final_Report_10282011_updated.pdf

116 Weisbrod, 2.

117 Genivar, viii.

118 Mary Brooks, Richard Hodgson and James Frost, iii.

119 Dan Bagnell, Carin Saunders, Ron Silva and Matthew Tedesco, "*Operational Development of Marine Highways to Serve the US Pacific Coast," Transportation Research Journal: Journal of the Transportation Research Board, No. 2100* (2009).

120 Cambridge Systematics, *Short-Sea and Coastal Shipping Options Study, 5-3.*

121 Weisbrod, 5.

Transportation conditions and other factors can give reason to transportation and regulatory bodies for coordination of policies to result in a desirable outcome, such as the movement of hazardous material away from populations where possible and off critical infrastructure such as river crossings.[122]

Finally, as noted earlier, the need for **funding of infrastructure improvements** to address terminal facility requirements has been evident in applications for U.S. DOT discretionary grants. Not all port terminals require improvements and new equipment, such as cranes. Those that do are more often terminals that are not international gateways. They may be underutilized or niche port facilities that want to be attractive to new cargo and developing domestic Marine Highway services that will require docks that can accommodate ramps or low volume container transfers, for example.

1.1.5 SUCCESS FACTORS

Inasmuch as this topic of success factors appears in a number of studies, it is included here as well. To a great degree the discussion in source documents on the topic of successful marine transportation services pointed to places outside of North America. Excluding domestic marine services of the sort that are not the subject of this study, such as those in the non-contiguous trades and those carrying commodities in bulk vessels, successes in the U.S. are few in number.

The first success factor might be labeled, however imprecisely, as **finding a natural market**. As already noted, U.S. inland waterway operations, centered on low margin and heavy commodities, are an established mode because they can offer competitive, highly efficient service to a non-time-sensitive market. Another way to define this factor is developing a niche market. The cross-harbor study in the New York City region concluded that typical freight moves are unlikely to make a shift from the congested river crossings and considers developing a niche market as the “best means for ensuring success.” It specified as good prospects hazardous material, over-weight and over-dimensional vehicles, construction materials and equipment, and air cargo movements to/from JFK International Airport.[123]

Also as referenced earlier, a successful Marine Highway service has a **vessel tuned to the market** it serves (or plans to serve). In such cases the vessel—a capital investment—is well sized to the cargo that is being targeted, which often means a vessel of a smaller size. One report concluded: better to start small, and then grow.[124]

The same report offered that a successful service is **focused in its market and geography** and is not trying to be all things to all people. It also advises, and few would probably disagree, against depending on a single shipper.

Door-to-door service is important, according to a California motor carrier fleet owner. As noted earlier, integrating with the other modes—trucking in most instances—is an important factor and a recurring theme, along with becoming intermodal providers.[125] A vessel operator that is corporately integrated with trucking—a single, multimodal company—can be considered ideal. Another study observes that successful EU short sea shipping initiatives were “based upon solid

122 de Cerreno, Robins, Woods, Strauss-Wieder and Yeung, 16.

123 de Cerreno, Robins, Woods, Strauss-Wieder and Yeung, i.

124 Kruse and Hutson, 47.

125 Ibid., 2.

business plans that foremost considered both rail and trucking as partners and quality of service improvements." Also, carrier support of initiatives attracts cargo revenue.[126]

The sources have noted how successful operators in Europe and other parts of the world, where the short sea trade is accepted practice and suitable vessels are in good supply, employ **chartered vessels** to match the market. When employing charters, the operator is not hampered by the sunk costs of vessels built by the operator to serve a market that is subject to change.[127] Most short sea feeder operators outside the U.S. market, charter their vessels to ensure maximum flexibility and ability to respond to market conditions and demand.[128] It is an option with limited potential in the U.S. where a limited number of ships qualified for domestic service are available for charter and are suitable for Marine Highway services.

Last, the European continent is an example of a thriving short sea market and successful services in part for reasons of geography.[129] The experience there is not necessarily easily replicable in the U.S. due to differences in geography, the multiplicity of nations and, the extent to which the U.S. has developed its own approach to logistics. However the **European experience** holds some lessons. In an examination of technological practices in Europe for possible application in the U.S., one report states that EU member nations' Shortsea Promotion Centres (SPC) that make up the European Shortsea Network match operators with potential customers and serve as one-stop shops and information clearinghouses.[130]

In terms of policy, one source suggested that government support, such as through the EU Marco Polo program, can lead to successful operations. While not a guarantee of success, government support makes the startup and testing of new services possible. However, pointing to the "very open cabotage regime of Europe", one paper suggests that cabotage "plays a large part in the development of short sea services" i.e., fewer cabotage restrictions make for a "dynamic short sea sector."[131]

From an operational perspective, European vessels and services have inspired some plans for Marine Highway services in the U.S. One U.S. DOT-designated AMH project intends to apply the European container feeder model to the Atlantic and Gulf coasts. Another Florida-based project proposes to operate Ro/Ro service on the M-95, and perhaps also on the M-5 and M-10 corridors, using a vessel design and container cartridge equipment employed in Europe.

126 Maritime Transportation and Logistics Advisors, 18.

127 One source notes the downside to time-charters is that a suitable replacement vessel may not be available at the expiration of a charter and thus the potential for significant service disruption. It also should be mentioned that with respect to the American market, ships eligible for Marine Highway service are in short supply, and for all practical purposes unavailable, if the operator desires to put into service a ship that is fuel efficient and meets current environmental requirements, and thus would enable the operator to compete on cost and other bases. The Kruse-Hutson report for the Transportation Research Board put it in terms of capacity. "Interviewees in both the U.S. and Canada emphasized that the lack of qualified vessels and barges is a serious impediment… Although there may be plenty of water and shore side infrastructure to accommodate the development of this industry, a lack of vessels becomes a capacity issue." Kruse-Hutson added that "Canadian interests seem to be the most concerned."

128 Mary Brooks and James Frost, "Short Sea Developments in Europe: Lessons for Canada" (North American Transportation Competitiveness Research Council, 2009), 10.

129 The geography of that part of the world is considered conducive to freight and passenger use of marine transport. In Europe feeder services are in wide use, domestic marine services to a lesser extent. Note that sometimes "domestic" is defined in the EU context to include two countries.

130 Dr. K. Thirumalai, "Short Sea Shipping: U.S. Team Visit to Germany" (George Mason University, 2010), 10.

131 Brooks and Frost, 10.

Port operators interviewed included labor agreements among success factors (e.g., on cost and productivity) as well as a port's access to highways, close proximity to cargo origin and destinations (O/D), and the availability of sufficient terminal capacity.[132] Another source noted that "[A] viable labor model needs to be developed" and "buy-in from organized labor is critical to creating a cost-competitive" Marine Highway service in terms of vessel and port operations.[133] Yet another report pointed to low transshipment and port handling fees as success factors.[134]

Hub-and-spoke service success factors include having a **critical mass of feeder traffic** to and from the hub, both in terms of consistency and reliability of cargo volume.[135] Also mentioned is a **regulatory environment** that is conducive to investment in marine transport.

1.1.6 Conclusions

The literature review led to some conclusions that were suggested directly by, or were inferred from, principal sources and other material reviewed for this project.

***Great Expectations for and of the East Coast**.* Whether the East Coast, in whole or in part, is in fact the promising market it is suggested as being in the literature, will be closely examined in this study. Over the longer term, those expectations will be realized, or not, by activity on the water. Even in the densely traveled and seemingly, constantly congested New York City metropolitan area the appeal or practicality of a water option is not as obvious, and may not be as practical, as it might at first seem.

Cabotage requirements present both protection and challenges. Among the challenges is the number of qualified vessels for domestic waterborne shipping service. With the exception of tug/barge operations and the transport of bulk commodities, the coastwise merchant fleet has limited availability. This presents challenges to start-up coastal services that find it difficult to afford new vessels suited to the target market.

Job creation for the U.S. maritime sector. An obvious benefit of Marine Highway service development is the opportunity for workforce growth, which would benefit the U.S. domestic shipping industry. There are opportunities for U.S. shipyard work to supply vessels suited for coastwise deployment to meet demands for right-sized vessel capacity, operational efficiency, and fewer emissions. New vessels added to the U.S. domestic fleet will mean shipboard jobs and positions associated with vessel management and attracting cargo.

The Catch-22[136] problem. The complex issues facing companies wanting to start new Marine Highway services include vessel availability for charter to start these services. Without vessels to put in services, shippers and carriers are unlikely to commit cargo. It is difficult to find financing for vessels to operate on a largely unproven service string without committed cargo revenue. It is a Catch-22 situation that may continue until government steps in to support vessel construction, or to provide significant incentives to the prospective customers.

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132 Global Insight and Reeve & Associates, 9.

133 Kruse and Hutson, 35.

134 CPCS Transcom Limited, vi.

135 Ibid.

136 The phrase "Catch-22" is common idiomatic usage meaning "a no-win situation" or "a double bind" of any type. In this case, the situation in which the desired outcome is difficult to attain is due to a set of rules/conditions that created such a situation.

Is the EU's holistic approach to Marine Highway System a model? Short sea policy in Europe has developed over a longer period and to a greater degree than it has here in North America. It is an established system of feeder and domestic services between neighboring nations and within national coastal and inland waters. It is addressed as part of a multimodal policy through national and European Union program and regulatory measures designed to increase modal share for marine transportation and decrease highway use in goods movement. Its programs use a standardized calculator to quantify the relative merits of marine services applying for government grants. While the U.S. is unlike Europe in important ways, some policy and program elements could be emulated here as part of a greater, multimodal transportation policy.

Little attention is paid to passenger service. It is worth observing that hardly any mention was made in the source documents as to passenger service on the Marine Highway Routes. Instead goods movement was the preoccupation of virtually all the various studies and presentations. Passenger and freight modal decision-making, economics, logistics, etc. are very different. The two are treated differently under transportation program law. Indeed the Marine Highway Program is in an early stage, having been first authorized by Congress in 2007, and has had little to offer in the way of capital funding through grants. The Ferry Boat Discretionary Program, which has been authorized since 1991 and funded annually through the FHWA, has a long history of making grants for commuter and other ferry facility and vessel improvements.

Policy is an important factor. Commercial marine operations are by definition in the domain of the private sector. Nonetheless government policy is an important factor, whether in creating conditions impacting the utilization of U.S. domestic assets, addressing impediments, or advancing blue and brown water business development. As of yet, few Marine Highway services have found a place in the market. Thus some of the literature argued that government investment in maritime transportation markets can be warranted. While there are currently no dedicated Federal government financial incentives for Marine Highway services, some State governments and MPOs invest in local Marine Highway services when the return on their investment exceeds the cost. For example, an MPO on the U.S. East Coast used some of their Congestion Mitigation and Air Quality funds to support the operation of a service because it generates public benefits through congestion reduction, road maintenance savings, and air quality improvements. Identifying and quantifying the public benefits of Marine Highway services could be useful in determining the merits of any proposals for government investments, such as are contemplated in the Energy Independence and Security Act of 2007 (PL 110-140).

The Navy Factor. An exploration by the Navy and DOT into what vessel specifications and designs would serve both military sealift and commercial requirements, along with a market study, has already identified one or more vessel types that could end up as the foundation for series construction of a new domestic merchant fleet. Whether a government role is justified for boosting the commercial use of marine transportation through various incentives and program support invites a weighing of pros and cons and a healthy discussion. In contrast the national defense requirements for marine transportation as a rule aren't questioned. The dual use approach for new vessel development is driven more by defense objectives than it is by commercial transportation system objectives.

1.2. Stakeholder Outreach

This section describes activities undertaken by the consultant team in the development of the ECMHI M-95 Study and summarizes the key points that emerged from the outreach efforts. Stakeholder outreach involved the following parallel and integrated efforts:

- Site visits to each of the locations identified by the client agencies as potential terminals for Marine Highway service calls.
- Interviews and discussions within three stakeholder groups: local, state, regional public agencies; port and terminal operators; and shippers and transportation providers.
- In-depth validation exercises with selected shippers to review potential vessel types, port pairs, service parameters and rates.
- Listening sessions with industry public agencies.

The outreach extensively engaged public agencies, transportation providers and shippers to:

- Inventory identified locations for services in terms of existing infrastructure, cargo movements, relationship to the multimodal freight system and surrounding land uses.
- Understand how organizations along the I-95 Corridor perceive and work with waterborne shipping options.
- Determine the information needed by agencies and shippers in order to make informed decisions and plan for Marine Highway services.
- Identify the service parameters and potential markets for Marine Highway services in the I-95 Corridor.
- Gather informed opinions regarding Marine Highway services, including potential obstacles, considerations, and emerging opportunities.

Table 1-1 provides a summary of the interviews conducted with each group. As shown, a total of 44 interviews were completed throughout the study. A full list of the participating organizations is provided in Appendix E.

Table 1-1: Interviews by Stakeholder Type

Organization Type	Number of Interviews
Public Agencies (DOT, MPO, etc.)	15
Port Authorities and Terminal Operators	12
Shippers and Transportation Providers	17
Total	**44**

Source: Parsons Brinckerhoff & A. Strauss-Wieder, Inc.

The information and informed opinions gathered through these efforts were integrated into all aspects of the M-95 analysis. For example, discussions with shippers and transportation providers helped identify service characteristics required by potential early adopters and eliminate certain commodities where shipment requirements cannot be met by Marine Highway services.

The discussions also provided opportunities to educate these stakeholders about the current state of Marine Highway services. In so doing, interest in this emerging mode has been elevated and the stage set for ongoing communications.

1.2.1 SITE VISITS

The team conducted visits to the port sites that were identified as potentially suited to Marine Highway services by the agencies involved with this project (refer to Figure 1-1). The objectives of the site visits included:

- Document the characteristics and conditions at each site.
- Ensure a common understanding of these sites by including local agencies in the visits.
- Identify and discuss the lessons learned from existing and previous operations with local agencies, terminal operators and other businesses at each port site.
- Articulate the practical considerations for potential services.
- Understand the information needed and questions that terminal operators have regarding services.

The maritime facilities in Camden, Gloucester and Salem, New Jersey were not visited as part of the M-95 study as team members, along with staff from the NJDOT and the South Jersey Port Corporation, had recently toured these facilities in detail as part of other New Jersey projects. The team worked with the South Jersey Port Corporation to augment the information already collected as needed for the M-95 project.

The ports visited vary in terms of size and composition of existing maritime activity; include both publicly and privately owned locations; and include existing, under construction, and potential locations. Table 1-2 summarizes the characteristics of each location included in the M-95 project.

TABLE 1-2: CHARACTERISTICS OF M-95 SITES

Port	State	Operator	Cargo Handled	Existing MH/ Domestic Marine Activity	Rail Freight Access
Port of New Bedford	MA	Public	B, BB, RR		Y
Greenville/ Jersey City	NJ	Public	C, B, BB	Cross Harbor Rail Car Float	Y
Port Newark/ Elizabeth	NJ	Public	B, B, BB, RR	Red Hook Barge	Y
Port Raritan	NJ	Private	BB	Breakbulk Barge	Y
Paulsboro Marine Terminal (under construction)	NJ	Public	B, BB, RR	Signed MOU with Intermodal Marine Lines	Y
Camden/ Gloucester	NJ	Public	C, B, BB		Y
Port of Salem	NJ	Public, Private operator	B	Bulk Sand Barge	Being rehabilitated
Port of Baltimore	MD	Public	C, B, BB, RR	Columbia Coastal	Y
Port Canaveral	FL	Public	C, B, BB, RR		N

C=Container, B=Bulk, BB=Breakbulk, RR=Ro/Ro

Source: Parsons Brinckerhoff and A. Strauss-Wieder, Inc.

Figure 1-1: M-95 Site Visit Locations

Source: Parsons Brinckerhoff

The project team recognizes that other potential sites exist along the I-95 Corridor that could be utilized for Marine Highway services. The sites included in the M-95 project represent a cross section of situations and considerations that are applicable to other locations that may develop as services emerge.

Source: Parsons Brinckerhoff

Port of New Bedford

The Port of New Bedford lies along the central coastline of Massachusetts and is operated by the New Bedford Harbor Development Commission (NBHDC). The NBHDC, an Authority created by the state, runs the harbor and waterfront real estate (19 properties).

The port serves as a major commercial fishing port and is capable of handling ferry, cruise, Ro/Ro, and breakbulk vessels and cargos. The commercial port is a multi-use port that handles seafood, food and beverage products, finished goods, and project cargos, among others. The port features several dockside and onsite cold storage and breakbulk facilities, including 4.5 million cubic feet of cold storage (183,000 square feet) and an 80,000 square foot heated warehouse. The New Bedford Central Waterfront consists of several large piers (including State Pier) that are actively utilized by the fishing fleet and a variety of other commercial vessels. The New Bedford North Terminal is home to mill complexes, fish processing and cold storage facilities, marine terminals, and a former rail yard. The New Bedford South Terminal is the hub of the city's seafood processing industry and also includes a large undeveloped, upland site and the Berkshire Hathaway mill complex.

Despite a decrease in commercial fishing activity in recent years, the Port of New Bedford remains one of the most prominent and vital east coast commercial fishing ports. The reliability of labor is good as there are no notable, contemporary labor issues. However, actions taken by NOAA and other federal agencies in recent years impose burdensome regulations on the commercial fishing industry that is forcing wage cuts, job losses, and, in some instances, businesses ceasing their operations.

The port lies far enough north to be affected by frozen waters; however, the entire port is protected by a manmade barrier wall with a 150'-wide floodgate. The barrier and gate system also shelter the port from hurricane and tropical storm damage caused by surging seawaters and tides. The channel depths are 30' in the main channel and maneuvering area with 25' depths available in the anchoring area.

The commercial port lies in close proximity to major highways and is closely located to several metropolitan areas. I-195 is approximately 1.5 miles from the port and Route 140 is about 2.5 miles away. The port has quick and ready roadway access to Worcester (approx. 70 miles), Boston (approx. 60 miles), and Providence (approx. 30 miles).

The port has strategic rail infrastructure in a near-dock location. The onsite rail yard is less than .25 miles from the port's waterfront but currently has train-length limitations. The tail-track and run-around track configuration limits full train lengths to approximately 16 railcars. The Massachusetts Coastal Railroad provides rail service in and around the port and interchanges with CSX at Cotley Junction in East Taunton, which is approximately 20 mile from the port. The Massachusetts Central Railroad also provides interchange service with Massachusetts Coastal for rail access as far away as South Barre, MA.

NEW JERSEY MARINE HIGHWAY PORTS

Greenville Yard/Jersey City: The Greenville Yard area in Jersey City is operated NYNJ Rail, a division of the Port Authority of NY/NJ. Greenville Yard is a rail terminal that currently handles carload traffic for the Cross Harbor car float, the Tropicana Distribution Center (a major regional operation), and other local rail customers. The yard is proximate to the Global Marine Terminal, which is primarily a container operation and additional adjacent acreage that the Port Authority is redeveloping for container operations.

Source: A. Strauss-Wieder, Inc.

Ro/Ro vehicle operations, along with bulk and breakbulk vessel operations also occur in the immediate area, which includes a private scrap marine terminal, a private terminal in adjacent Bayonne in the former military base (MOTBY). The Port Authority recently acquired 130 acres in Bayonne for maritime operations.

This location is unique within the New York-New Jersey harbor in that it is not constrained by the air draft issues associated with the Bayonne Bridge and has sufficient channel depths to accommodate the latest and largest classes of container vessels. With the new larger Panama Canal locks completed in 2014, this location is essential to continued state of the art container operations in the harbor.

Greenville Yard is in the process of being redeveloped to contain an enhanced car float operation, a new Express Rail intermodal on-dock rail facility to service the Global Terminal container operations, a yard to handle existing local rail customers, and a municipal solid waste barge-to-rail transfer operation. While the location does contain an existing Marine Highway operation – the car float – the remaining acreage is fully committed to existing and planned rail and international cargo movement.

Domestic feeder operations that transport international cargo could potentially call on Global and the new container terminal. It is unclear whether wharf space could be developed in MOTBY for a separate domestic terminal.

Port Newark/ Elizabeth: Port Newark/ Elizabeth is the largest concentration of international container operations on the U.S. East Coast, with 2,230 acres. Operated by the Port of NY/NJ, the three major container terminals at this location are Maher, APM and Port Newark Container Terminals. The Red Hook Barge, which is currently a fee-free lift on/lift off international container barge operation, connects this location with the Red Hook Container Terminal in Brooklyn, NY.

Source: A. Strauss-Wieder, Inc.

This location also includes significant Ro/Ro vehicle operations, as well as bulk and breakbulk operations. Two on-dock rail operations serve the container terminals, along with Corbin Street Yard (where unit double stack trains are assembled for departure). Port Newark/Elizabeth is located adjacent to the New Jersey Turnpike. The rail operations are limited by the Port Authority to international cargo only; domestic cargo cannot use the agency's rail facilities at the port.

The Port Authority is addressing the air draft issues related to the Bayonne Bridge that currently restricts the height of vessels serving Port Newark/Elizabeth. The agency anticipates raising the bridge's roadbed by 2016 to accommodate the new generation of post-Panamax vessels. The agency is also completing a channel deepening program to accommodate these vessels.

While the location does contain an existing Marine Highway operation – the Red Hook barge – and several former operations (the Albany Barge and Columbia Coastal barge services), discussions with the Port Authority and terminal operators indicate that potential services at this site should focus on international feeder service. The caveat is that one ocean carrier representative noted that its ships would have little need for feedering as cargo sorting is done in Asia to enable direct calls in U.S. ports.

Participants in the operator discussion conducted at this site indicated that a domestic only waterborne service should be conducted at a terminal separate from existing international terminals. The reasons included:

- Purely domestic operations would not be subject to Department of Homeland Security requirements for international cargo, along with the associated costs. These costs include but are not limited to having all truck drivers and terminal workers obtain Transportation Worker Identification Credential (TWIC), security infrastructure, and U.S. Customs and inspection services.
- Lift on/lift off operations would need to consider crane availability. When large international vessels call at the port, those vessels will receive priority consideration in the use of the cranes.
- Some Ro/Ro vessels require specialized berths.
- Port operational considerations, including the potential need to handle vessels during overtime hours (because of the higher priority that would be given to the larger international vessels) and current requirements in terms of minimum shift length and gang sizes.

Participants in this discussion also noted that feeder services, such as Columbia Coastal, had been declining because carriers are offering more direct calls to ports along the U.S. East Coast.

Source: A. Strauss-Wieder, Inc.

Port Raritan/Raritan Center: Port Raritan is located within Raritan Center in Edison, NJ. This location was the only one visited that was privately owned and operated. Raritan Center is a major industrial park encompassing 2,350 acres and an extensive mix of modern industrial properties and former Army buildings. The industrial part includes 13 million square feet of industrial space and is served by the Raritan Central Railway, which interchanges with both CSX and Norfolk Southern railroads.

A former military arsenal, Port Raritan is the name now given to the wharf area of the industrial yard. As a military facility, the 2,000 foot wharf was used for heavy loads. Military use ceased in the 1960s and the wharf was subsequently severely damaged by a fire and the natural elements, falling into a state of disrepair. The wharf is on the Raritan River.

Despite the current distressed condition of the wharf, STC Marine commenced limited commercial operations at the wharf in 2010, receiving steel and concrete construction materials by truck and rail, reloading these materials on barges for transport to water's edge construction projects in New Jersey, New York City and Connecticut using a mobile crane to swing the loads over the damaged wharf onto barges.

This site has the potential to be developed for Ro/Ro Marine Highway services, particularly with direct rail services in the wharf area, sufficient upland space, surrounding industrial buildings and easy access to interstate highways. Raritan Center is already considered a multimodal freight village.

Source: South Jersey Port Corporation

Paulsboro Marine Terminal: The Paulsboro Marine Terminal is a new facility being developed by the South Jersey Port Corporation (SJPC). The terminal is anticipated to be completed in 2012. Encompassing nearly 200 acres, the terminal has been designed to accommodate Ro/Ro, breakbulk and bulk cargos. SJPC has signed a memorandum of understanding with Intermodal Marine Terminals to serve the facility in the carrier's proposed New Jersey-Florida service. The location is on the 40 foot deep Delaware River channel and has Class I rail service. A new road is being constructed to more directly tie the site with major highways.

This site has the potential to be developed for Ro/Ro Marine Highway services, particularly with direct rail services in the wharf area, upland space, and improved access to interstate highways. SJPC has indicated that if the terminal attracts both domestic and international carriers, it will divide the operation into separate domestic and international terminals.

Source: A. Strauss-Wieder, Inc.

Camden/Gloucester: The Camden/Gloucester terminals operated by the SJPC include:

- Broadway Terminal, a 106 acre terminal that handles dry bulk and breakbulk cargos (such as steel and wood products), along with food and perishable products.
- Beckett Street Terminal, a 122 acre dry bulk and bulk terminal that handles wood and steel products, cocoa beans, salt and recycled metals.
- Broadway Produce Terminal, a 28 acre terminal designed to handle food and perishable products.

The terminals are all rail served. Holt operates a private terminal nearby in Gloucester, which is currently used by Del Monte for produce movements. All of the terminals are used for international cargo movement and, as such, are subject to all security and operational considerations associated with international trade.

Capacity is available for Marine Highway service operations at this location. However, space may not be available to develop a dedicated domestic only terminal separated from international operations.

Source: South Jersey Port Corporation

Port of Salem: The Port of Salem, which is owned by the SJPC and operated by a private company, encompasses 28 acres and handles bulk movements via barge. While the port has rail access, the terminal does not currently have rail service. Access to the area is by local roads.

Domestic marine services have been advancing for this location, including a sand barge to northern New Jersey.

PORT OF BALTIMORE

The Port of Baltimore, operated by the Maryland Port Administration (MPA), includes:

- Dundalk Marine Terminal, a 570 acre multi-use facility capable of handling Ro/Ro, containers and breakbulk cargo activities.
- Fairfield/Masonville Marine Terminals, with nearly 117 acres focused on Ro/Ro auto processing.
- South Locust Point Marine Terminal, with 79 acres focused on forest products breakbulk movements.
- North Locust Point Marine Terminal, a 90 acre multi-use facility capable of handling breakbulk, liquid bulk, Ro/Ro and containerized cargo.
- Seagirt Marine Terminal, a 284 acre international container terminal, which is operated by Ports America under a 50-year concession with the MPA.

The terminals are rail served and have immediate access to major highways. Columbia Coastal, a coastwise feeder service, currently operates at the port. However, the frequency of barge service has decreased. Similar to Port Newark/Elizabeth, it was noted during the site visit that the demand for feeder services has declined with the increase in direct vessel calls by international carriers.

Source: A. Strauss-Wieder, Inc.

During the site visit, it was noted that:

- Feeder barges had to be worked during time periods subject to overtime rates because of the need to service the international vessels first.
- A required minimum length of shift time and gang size requirements affected the costs associated with operating feeder services.

Dundalk and some of the other facilities have the capacity to handle Marine Highway services, and it may be possible to establish a dedicated domestic terminal in the area. Ro/Ro ramps already exist at this location if required.

PORT CANAVERAL

Source: Port Canaveral

Port Canaveral is operated by the Canaveral Port Authority, an independent government agency established by the State of Florida. The Canaveral Port District is in the central and north areas of Brevard County and divided into five regions. Five elected officials representing the five regions form the Canaveral Port Authority Board of Commissioners, which sets fiscal, regulatory and operational policies for the port.

The port is located on the coastal barrier island along the East Coast of Central Florida and abuts the Atlantic Ocean on the east, the City of Cape Canaveral on the south, the Banana River on the west, and Cape Canaveral Air Force Station on the north. It is composed of two sections – the Harbor and the Barge Canal.

The Canaveral Harbor is a man-made, deep-water Port located on the barrier island north of the City of Cape Canaveral. The port also controls the land on Merritt Island known as the Barge Canal, which includes the man-made canal connecting the Indian and Banana Rivers and State Road 528 also known as the Beachline.

The port is a major destination for cruise vessels and service as a base for U.S. Navy submarines. The commercial port is a multi-use port with tenants handling products such cement, lumber, petroleum, and perishables. The port operates two cargo areas, in addition to six cruise ship terminals. There are four piers in the North Cargo Area and five piers and two tanker berths in the South Cargo Area totaling 6,976 feet of berthing space with depths ranging from -35 to -39 feet, and two Ro/Ro ramps. The port has nine million cubic feet of dockside cold, chilled, and freezer warehousing, 300,000 feet of dockside, fully enclosed, dry, and secured warehousing, and 49 acres of open-air storage.

Future cargo terminal facilities include three new cargo berths (5, 6 and 8) and marine terminals to be located in the North Cargo Area complex scheduled for completion in 2013-14. Either of these terminals could accommodate a future Marine Highway service.

The loading and unloading capabilities of the port include a 40 metric ton mobile harbor crane, a 2,800' long bulk aggregate conveyor system with a discharge rate of 2,200 tons/hour, a 100,000 ton heavy lift capability, and drayage and trucking companies located onsite or nearby. There is no on dock at the present time. Near dock rail is located nine miles from Port Canaveral via the Florida East Coast (FEC) Rail.

Vessel service is available year-round with the exception of closure risk due to hurricanes and tropical storms. The port offers direct access to open waters and its docks are 45 minutes from the sea buoy. Additionally, the port receives regular international vessel calls to/from Central and South America, the Caribbean islands, West Africa, Japan, Canada, and Europe.

Source: Parsons Brinckerhoff

The port is readily accessible by highway. Route 528 runs past the port's gate, which is 15 miles from I-95 and 50 miles from the Orlando metropolitan area. The highway provides a clear route of OD/project cargos and blanket DOT permits are in place. Additionally, Route 528 connects to Route 1, which is nine miles from the port, and I-4, which is about 50 miles away. The closest intermodal rail facility is the Florida East Coast Railway's Titusville yard, 18 miles away from the port via Routes 528 and 1. The Titusville yard is capable of handling trailers and containers on flat car (TOFC and COFC), Stack Car, bottom and top lift, and EMP 53' trailer capabilities. FEC serves all South Florida ports and interchanges with Norfolk Southern and CSX railroads.

1.2.2 Agency Interviews

The interviewed public agencies were selected based on their ability to be representative of the geographical areas in the M-95 Corridor; their range of direct experience regarding and involvement with Marine Highway System related activities; and their varying responsibilities. Some of the public agencies, such as the Richmond Area Metropolitan Planning Authority, the SJPC, and the Maine Ports Authority, are actively engaged in developing a Marine Highway service or developing facilities for such services.

An agency interview discussion guide is provided in Appendix F. Potential Marine Highway services were discussed within the context of the overall freight system, existing and anticipated infrastructure and operating conditions, and information most needed by the organizations.

1.2.3 Private Sector Interviews

The shipper and transportation provider discussions were designed to be *perception* interviews; the interviews were qualitative rather than quantitative. The objectives of talking with shippers, carriers and distributors of goods paralleled the agency perception interviews:

- Understand how shippers perceive and could work with Marine Highway service options (including how those services relate to their current use of road and rail services).
- Identify the information most needed by shippers and freight carriers regarding Marine Highway services.
- Test the interest for different types of commodity movements, ranging from high value, more time sensitive pharmaceutical products to building supplies.
- Obtain informed opinions regarding Marine Highway services.

The questions used to guide the shipper discussions are provided in Appendix F. The team used a similar set of questions to guide the discussions with transportation providers.

1.2.4 Shipper Validation Exercises

Selected shippers were also asked to participate in in-depth validation exercises to discuss the preliminary results of the market, business and financial analyses developed in Section 2 through 4 of this report. The discussions served to inform, validate and augment the quantitative market and business analyses undertaken by the team.

Four companies provided senior logistics executives for these discussions – Walmart, Home Depot, Dal-Tile and Johnson & Johnson. Participants were briefed and queried regarding the emerging vessel types, service parameters, port pairs and rates. Shippers were also asked about their potential interest in Marine Highway service options given the draft service parameters presented.

1.2.5 Listening Sessions

Team members participated in the AMH listening session conducted by MARAD held on September 27, 2011 and hosted an M-95 listening session at the New England Trade Development Summit on October 18, 2011 held by the Port of New Bedford. Information and comments obtained during these discussions were incorporated into the M-95 analysis. The questions used to guide the listening session discussions were developed by MARAD and are provided in Appendix F.
The team also conducted a listening session on January 30 for public agencies along the I-95 corridor. This listening session addressed the desire of public organizations to know more about the current state of potential Marine Highway services, and provided an opportunity to answer questions and receive comments on the project findings.

1.2.6 Stakeholder Outreach Findings

The discussions with industry stakeholders were conducted on a confidential basis, with participants told that individual company responses would remain confidential. Accordingly, the key points emerging from these discussions have been summarized without attribution to specific organizations.

Market/Awareness

- Shippers, transportation providers, and local/state agencies were generally unaware of the current state of Marine Highway service options and modal development. As the team provided information on emerging vessel designs, the "dual use" concept, and the extent of analyses currently underway, both public and private entities became more engaged in the discussions.

- Organizations that were aware of Marine Highway services and are monitoring economic and market trends to potentially take advantage of future shipping opportunities (e.g. fuel costs, highway levels of service, containerization of heavy cargos such as paper, etc.).

- The need for ongoing information regarding the status of Marine Highway services was paramount. The types of information most needed include:
  - What is the status of the services?
  - What types of services (Lo/Lo, Ro/Ro) are under consideration?
  - What types of facilities may be needed (e.g., can existing maritime terminals be used, do separate terminals need to be developed, what types of inland road and rail connections are needed, and what are the terminal characteristics such as size, channel depth, etc.)?
  - Within the context of making investment and policy decisions, what is the best means to evaluate potential services (including considerations and potential criteria)?

Operation

- Three forms of Marine Highway services are currently in operation or under consideration:
  - International cargo feeder services (e.g., Columbia Coastal and American Feeder Lines). This service was perceived as less successful as more ports are experiencing an increase in direct calls, and existing services are decreasing or ceasing operations altogether.
  - Domestic roll on/roll off services (e.g., Intermodal Marine Lines)
  - Shorter haul services in areas with missing links in their freight system and/or congestion (e.g., Richmond container barge, New York Cross Harbor rail carfloat, Red Hook barge).

- Shippers recommended that Marine Highway operations be separate from international maritime operations. Purely domestic operations are not necessarily subject to security requirements and other costs associated with international cargo including:
  - U.S. Department of Homeland Security requirements and associated costs
  - TWIC cards and associated cost
  - Associated port operational costs
  - U.S. Customs and Border Protection

- Shippers needed to be moving cargo on a north-south basis to be interested in Marine Highway services. Shippers with east-west domestic movements were not interested in the M-95 Corridor.

- New vessel designs need to address temperature controlled shipments. Preservation of refrigerated cargo such as fresh fruits and vegetables, and frozen meats and seafood, requires electrical power. Power outlets must be available on new vessels to maintain trailer temperature.

Policy

- Shippers were concerned about the application of the HMT to domestic Marine Highway services, seeing it as increasing the cost of the service and potentially acting as a "double charge" for those feeder services (with the shipper being charged for both the international and domestic waterborne moves).

- Heavy weight permitting restrictions need to be increased in U.S. to match Mexico and Canada.

Success Factors

- Marine highway services are welcomed by shippers if the mode adds needed capacity at a suitable market rate and provides the required level of service.
  - The most essential consideration was the cost of the Marine Highway service. The cost of the service had to at least match and most likely be better than existing modal options for shippers to consider using the service.
  - The next set of crucial criteria is service, frequency and reliability. Potential shippers consider the transit times (e.g., do they meet or better intermodal rail?); the frequency of service (twice weekly service appeared to be the minimum number acceptable for most shippers); and reliability (on-time, predictable service is paramount in supply chain operations).

- Those organizations with direct Marine Highway service development experience suggested that a "step function" of users exist:
  - Early adopters/initial customers are generally movers of less time sensitive and heavier products. Examples of products moved by current services include imported tobacco, paper products, bottled water and ceramic tiles.
  - More customers with time sensitive, perishable and high value commodity movements and a greater variety of goods will consider shipping options as services become more frequent and established, and reliability is confirmed.

- Marine highway service was viewed as both a competitor and a potential complement to rail carload and intermodal services.
  - Shippers and transportation providers noted that services could be useful where missing links in the freight system exist.
  - Railroads are moving away from TOFC to COFC, which is an opportunity for Marine Highway services.
  - Increasing congestion combined with a growing truck driver shortage is leading to increased interest in alternative intermodal options.

- The long term financial viability of Marine Highway services is of concern:
  - It was important that services would be operated by private carriers in revenue service; that the services would not be operated on a subsidized basis.
  - While some form of public subsidy may be needed at the onset of services, services should be self-sustaining. "If the service is not self-sustaining, then the service is at risk."
  - It was noted that subsidized services are more risky – they are subject to continual approval of public funds and more easily cancelled.
  - With the potential exception of early adopters, shippers need to have a realistic assurance that the service will continue for a number of years before committing.

- Marine highway carriers should have knowledge of domestic cargo shipping characteristics:
  - Companies wanted Marine Highway services bundled into shipping services that provided seamless door-to-door movements for shippers.
  - Shippers prefer conveyance types that mirror current domestic movements -53 foot trailers and domestic intermodal.

SECTION 2: MARKET ANALYSIS

This market analysis develops a current profile of the major freight flows between metropolitan areas along the I-95 corridor and determines where volumes might be adequate to support new Marine Highway services. It is difficult to quantify a market for an emerging transportation mode that is highly dependent on service characteristics and costs. To accomplish these objectives, the analysis examines commodity flows between the regions identified in the ECMHI and evaluates the data against potential service operating characteristics to determine which potential services may be viable. The commodity flow analysis does not forecast actual volumes that are likely to be converted to Marine Highway service use, but rather is indicative of potential cargo volumes. It serves as a baseline for the operational and financial analyses that are part of this study, the results of which are presented in Sections 3 and 4.

2.1. POTENTIAL CARGO DEMAND

The first step in identifying potential Marine Highway services was to assess the cargo flows that could support a service. There were three general market segments for evaluating potential market size for an M-95 service including:

- **Long haul international:** transfer of international containerized cargo between major international hub ports and smaller coastal ports in other regions along the East Coast.
- **Short haul international and domestic:** movement of very commodity-specific and/or more niche market cargos within local areas or to contiguous regions.
- **Long haul domestic:** transport of domestic cargos over relatively long distances to and from Atlantic coastal areas by water rather than by truck.

Detailed information as to freight flows via land modes and specific point-to point moves was essential to a market analysis, and the lack of existing services led to limited associated cargo flow data. As a result, the FHWA's Freight Analysis Framework (FAF3) database, released in January 2011, was used to identify major freight flows in the I-95 corridor that were most relevant for this study.

FAF3 provided details on volumes, origins and destinations, commodity types and transportation modes of cargos between major U.S. metropolitan areas, states and international regions for both domestic and international trade. FAF3 historic data includes the most recent year for which comprehensive data are available (2007). Forecasts through 2040 are based on global macroeconomic forecasts prepared by IHS Global Insight and take into account the global downturn of 2008 and 2009. The forecasts do not incorporate shifts in routing or modes such as those that might occur as a result of Panama Canal expansion and should therefore be considered trend or baseline projections.

2.1.1 LONG HAUL INTERNATIONAL CARGO

International cargo flows that potentially could be carried on a Marine Highway service consist of those currently moving along land corridors, (e.g. imports into the Port of NY/NJ that are then moved by truck to Boston). For transshipment-hub and feeder services, most international cargo being shipped through East Coast ports currently moves "East-West", between coastal ports and inland regions more than 100 miles away (e.g. cargo moving between Port of NY/NJ and Chicago) and not "North-South" along the I-95 corridor (e.g. cargo moving between Port of NY/NJ and Florida).

Shipping to Atlantic coastal regions occurs through the principal ports that serve these regions. Where such local ports can handle the ships and the cargo, it generally does not make economic sense to move cargos through more distant ports and then incur the additional cost of rail or truck transportation to move the goods to other ports capable of handling international cargo along the M-95 Corridor.

In the future, the potential international cargo market will most likely change as a result of Panama Canal expansion scheduled for completion in 2014. The expansion will allow use of larger ships that cannot currently transit the Panama Canal, although much larger ships may not be able to initially call on many U.S. East Coast ports due to channel depth or other restrictions. For container ships, the current maximum size vessel that can transit through the Canal will increase from those designed to carry about 5,100 TEUs (current "Panamax" size) to 12,600 TEUs or more. One of the possible impacts of this development is more concentrated calling patterns at larger East Coast hub ports where international goods would then be transferred to coastal feeder vessels destined for smaller ports along the Atlantic seaboard.

TRANSSHIPMENT FEEDER SERVICE ANALYSIS

An examination of costs for operating transshipment services linking long haul international service to Marine Highway feeder service shows that it would be less expensive on a per-container basis to operate a Far-East to U.S. East Coast service using a smaller 8,000 TEU vessel calling on several U.S. East Coast ports than using a larger 11,000 TEU vessel calling at a single port and transshipping cargo to other ports using a feeder service. To illustrate this result, a Mid-Atlantic port (in this case Norfolk) was assumed to be as a transshipment hub for moving containers to New York.

Operating a nine-ship Far East – U.S. East Coast service with three U.S. port calls, e.g. New York, Norfolk, Savannah (or Charleston), using 8,000 TEU capacity ships would produce an average round trip TEU slot cost of about $1,150.

In comparison, operating a nine-ship Far-East to U.S. East Coast service using a larger 11,000 TEU ship calling only at Norfolk could provide a lower $950 per TEU slot cost, a reduction of $200 per TEU from the cost of the smaller ship service noted above.

However, a new, diesel-powered domestic-service qualified feeder ship of 2,000 TEU capacity (turning twice per week between Norfolk and New York) would be operated at an estimated vessel slot cost of about $245 per round-trip TEU, or $45 more than the $200 difference realized by using the larger vessel. In addition, total costs for unloading and loading the container in Norfolk, would amount to about $150 per TEU. Thus the cost for the large ship/feeder ship transshipment option would total $185 more than the smaller ship service.

If larger ships were used for the line-haul portion of the service (i.e. 13,000 TEU capacity rather than 11,000 TEUs), the cost differential would be reduced by about $25 per TEU to a net difference of about $160 per TEU.

Based on the cost differential analysis outlined above, it is not expected that international feeder operations between ports in different regions will provide a viable alternative to direct international services at this time. In addition, it should be noted that if even if such alternative services were viable they would have little impact on diverting cargo from U.S. highways or rail systems. In other words, the primary objective of the Marine Highway Program is not to divert cargo from one vessel to another, rather, it is to increase the utilization of the U.S. freight navigable waterways to reduce environmental and economic impacts associated with congestion. For these reasons, this analysis did not further consider the international feeder service market segment.

TRANSLOADING INTERNATIONAL CARGO

International cargos are also moved domestically after being transloaded, which is the process of transferring cargo from international containers into larger domestic containers/trailers. This transfer operation - for example, from 40-foot international containers into 53-foot domestic containers - generates savings in domestic transportation costs. In recent years, the basic transload operation has evolved into a complex set of cargo manipulation strategies (mix-and-match, merge-in-transit, etc.) that improve supply chain efficiency.

International cargo that has been transloaded into domestic containers and trailers is re-categorized as domestic cargo under the U.S. Commodity Flow Survey statistics and the FAF database and was included in the volumes analyzed in Section 2.1.3.

2.1.2 SHORT HAUL INTERNATIONAL AND DOMESTIC CARGOS

Of the few U.S. Marine Highway freight services in operation, the majority fall in the category of shorter haul barge operations serving the international feeder or domestic cargo market. Currently, container on barge (COB) feeder services are largely dedicated, niche operations that move cargo between two ports over shorter distances (under 250 miles). These services have typically been developed to provide an alternate, uncongested transportation corridor to move freight and are supported by state or federal subsidies.

The following not-definitive list of East Coast Marine Highway and related services serving local regional markets includes five active operations:

- **Columbia Coastal Transport** has operated COB feeder services on the Atlantic coastline. Of the Marine Highway operations it has perhaps the longest history dating approximately 20 years. It presently operates a biweekly service between Baltimore and Norfolk and a weekly service between Philadelphia, Baltimore and Norfolk, having ended its Boston-New York/New Jersey and Portland-New York/New Jersey services as recently as 2008. The latter of those services was the basis for the AMH designated Northeast Marine Highway Expansion project sponsored by Maine DOT, but ceased operation due to increasing direct vessel calls to those ports serviced.

- **The 64 Express** COB feeder service operates on the James River between the ports of Richmond and Hampton Roads as a reliever for the congested I-64 corridor. It is the AMH designated James River Container Expansion Project that began operations in December 2008 as a public/private initiative at the instigation of the Richmond Regional Planning District Commission and Virginia Port Authority. The Norfolk Tug Company operates the scheduled service. From August 2011 to August 2012, volumes have increased significantly, necessitating weekly sailings to increase from once to twice per week. The service is seen as an economic development opportunity and receives public subsidy to support its continual operation.

- **The Red Hook Barge** is an intra-port container shuttle operating between container terminals in Newark, New Jersey and Brooklyn, New York. The operation is owned by the Port Authority of New York and New Jersey and is currently operated by Red Hook Container Terminal Inc. The service has a history of being subsidized to support cargo volumes at the Red Hook Terminal in New York. With recent changes in terminal ownership and operation the barge service may be in a transition period.

- **New York-New Jersey Rail** operates the railcar float service between Jersey City and Brooklyn. The operation, the only trans-Hudson rail freight service in the New York metropolitan region, is owned by the Port Authority of NY/NJ, which took ownership of the New York Cross Harbor Railroad in 2008. The Port Authority's Cross Harbor Freight Program is an ongoing study to culminate in an environmental impact statement (EIS) evaluating various trans-Hudson rail freight options for possible development. The related AMH-designated Trans-Hudson Freight Connector Project would entail an expansion of the current operation to include municipal solid waste.

- **Bay Coast Railroad** operates a 26-mile car float service in the Hampton Roads region between Cape Charles on the Delmarva Peninsula and Little Creek Cove in Norfolk. The service employs two barges and carries a range of cargo types in railcars. The service experienced a shutdown but was able to resume with a $1 million capital grant from the Commonwealth of Virginia and affected counties.

The lessons learned from these services point to important considerations in judging the viability of short haul Marine Highway services including:

- **Niche Cargos**: Shippers of lower value, less time sensitive, heavier weight, or unfinished goods are the most likely users of these services.
- **Price Competitive**: The services must compete with door-to-door trucking rates, which are low because of the shorter distances involved and their lower capital and operating costs.
- **Subsidy Dependent**: Since the rates charged are often lower than the total service costs, these services tend to operate at a loss and require long-term public subsidy.
- **Vulnerable**: As a consequence of being dependent on public funding, these services are susceptible to fiscal and political considerations that could result in an abrupt halt in services.
- **Borne of Out Necessity**: The services are initiated to address a commercial or public need such as bypassing congestion corridors, providing missing links in the local transportation system or to address air quality concerns.
- **Benefit the Public**: In concert with being stimulated by need, the services typically provide quantifiable social or public benefits such as net reductions in emissions, on a tonnage basis, and reductions in required road maintenance both as justification of public support and, in some cases, to appeal to commercial customers who value it in their own marketing.
- **Sponsored by International Hub Port:** Most services require significant financial and marketing support from the host international port, which may include reductions or exemptions on port handling costs.

Container feeder services may expand in the years to come as congestion increases on highways, tunnels and/or bridges in major metropolitan areas. However, the short haul services are defined by induced demand that must be supported in part by public funding, rather than market demand supported by commercial revenues. Given these considerations, domestic short haul services have not been the focus of this study.

2.1.3 Long Haul Domestic

Because of the longer distances involved (and potentially greater environmental impact that could be realized), long haul domestic services are likely to have the greatest potential for spurring increased utilization of the M-95 Marine Highway Corridor.

There are currently two long haul services under development.

- **Intermodal Marine Lines (IML)** plans to operate Ro/Ro services for trailers and containers-on-cassettes, starting on the M-95 Corridor. The IML vessel design is being evaluated as part of the dual use initiative collaboration between the Navy and MARAD.
- **American Feeder Lines (AFL) LLC** plans both feeder and domestic freight Lo/Lo service on the Atlantic and Gulf coasts. It is the basis for the AMH designated Gulf Atlantic Marine Highway Project and will use new vessels designed specifically for coastwise service.

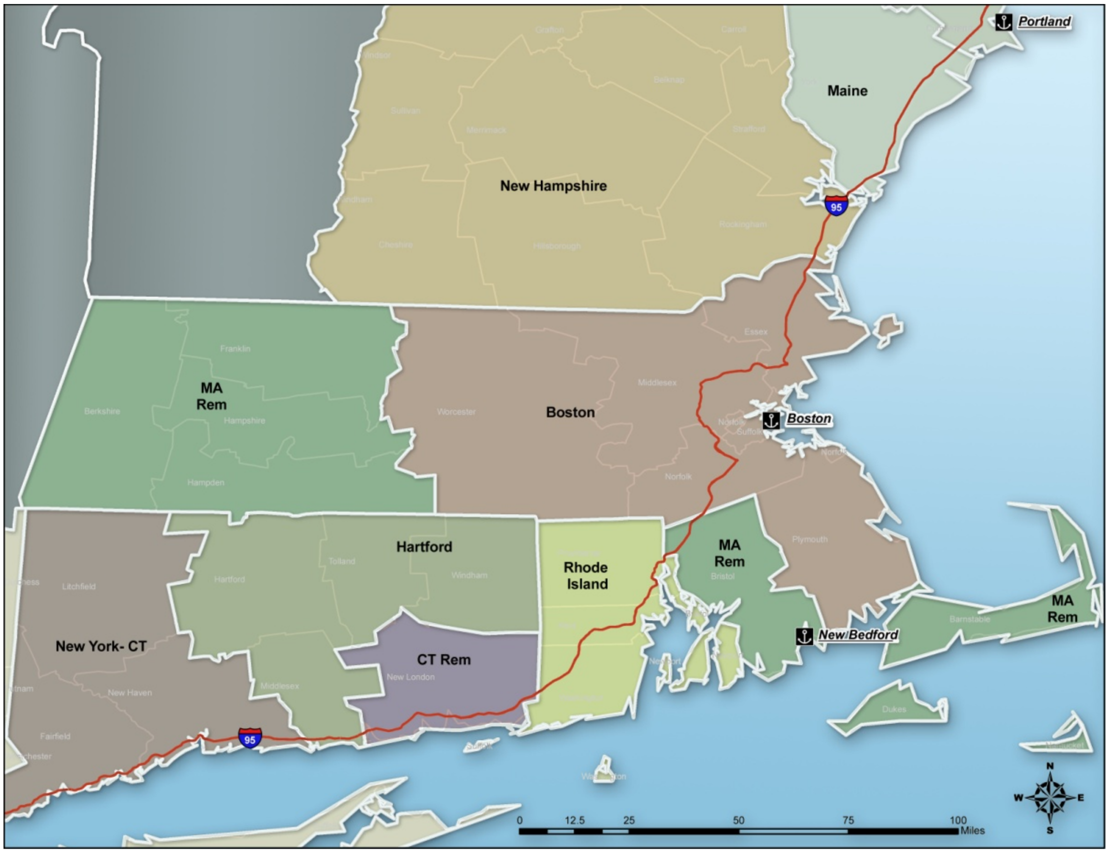
The approach to identifying future potential long haul domestic highway services involved six steps:

1. Identify potential O/D regions along the U.S. East Coast.
2. Determine distances between these regions and the O/D pairs that are long-haul.
3. Filter cargo flows by type of commodity, port distances to/from market centers and distances between O/D pairs.
4. Identify principal ports and services based on density and balance of total flows between regions.
5. Approximate the share of cargo that could be shipped on a Marine Highway service.
6. Estimate the number of loads per week from cargo ton totals.

Origin/Destination Regions

Given the objective of the study, potential O/D regions included those along the Atlantic Coast seaboard from Maine to Florida. Regional definitions used in this study are metropolitan regions as defined in the 2007 Commodity Flow Survey and the FAF database. Appendix G includes detailed information on FAF regional and commodity definitions. Of the 114 total FAF regions in the U.S., 29 regions along the I-95 corridor on the Atlantic Coast were chosen for preliminary analysis of commodity flows. These regions were divided into four market areas: New England, Mid-Atlantic, South Atlantic and Florida.

FIGURE 2-1: NEW ENGLAND MARKET AREA



Source: Parsons Brinckerhoff

The New England Market Area (Figure 2-1) includes eight FAF regions as part of the study:

- Maine
- New Hampshire
- Boston
- Massachusetts Remaining
- Rhode Island
- Connecticut Remaining
- Hartford
- New York-Connecticut

FIGURE 2-2: MID-ATLANTIC MARKET AREA

Source: Parsons Brinckerhoff

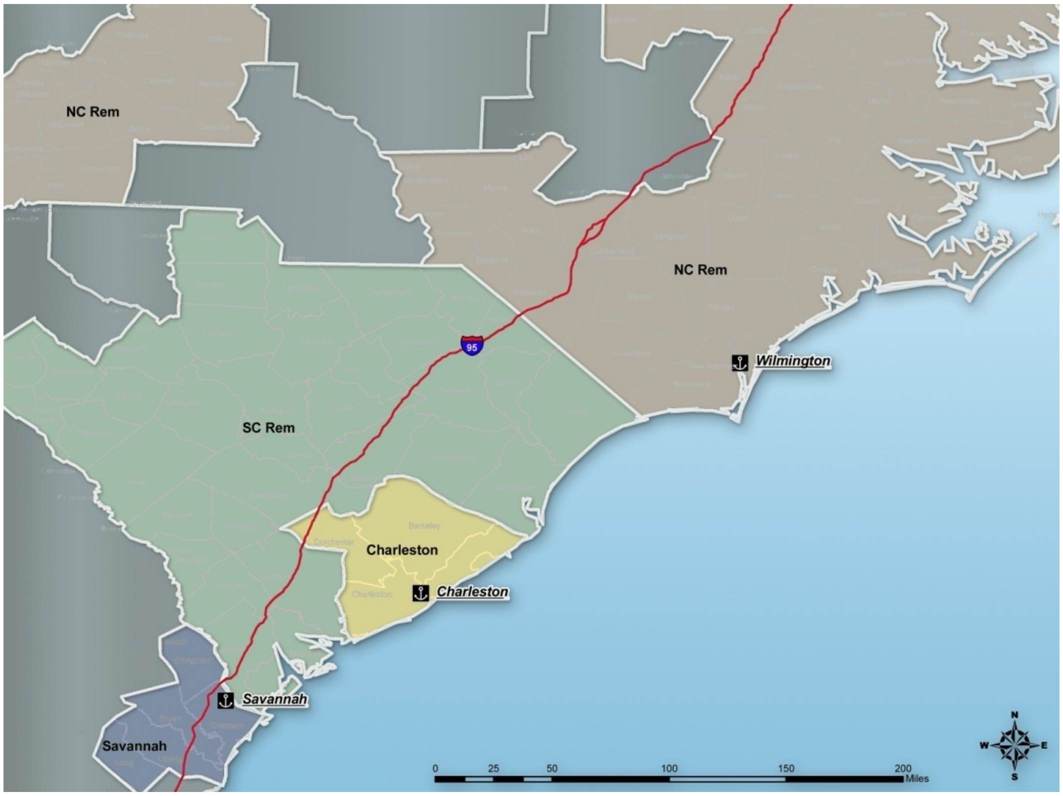
The Mid-Atlantic Market Area (Figure 2-2) includes 13 FAF regions as part of the study:

- New York-NY
- New York-NJ
- New Jersey Remaining
- Philadelphia-NJ
- Philadelphia
- Delaware
- Maryland Remaining
- Baltimore
- Washington DC-MD
- Washington DC
- Washington DC-VA
- Richmond
- Norfolk

The South Atlantic Market Area (Figure 2-3) includes four FAF regions as part of the study:

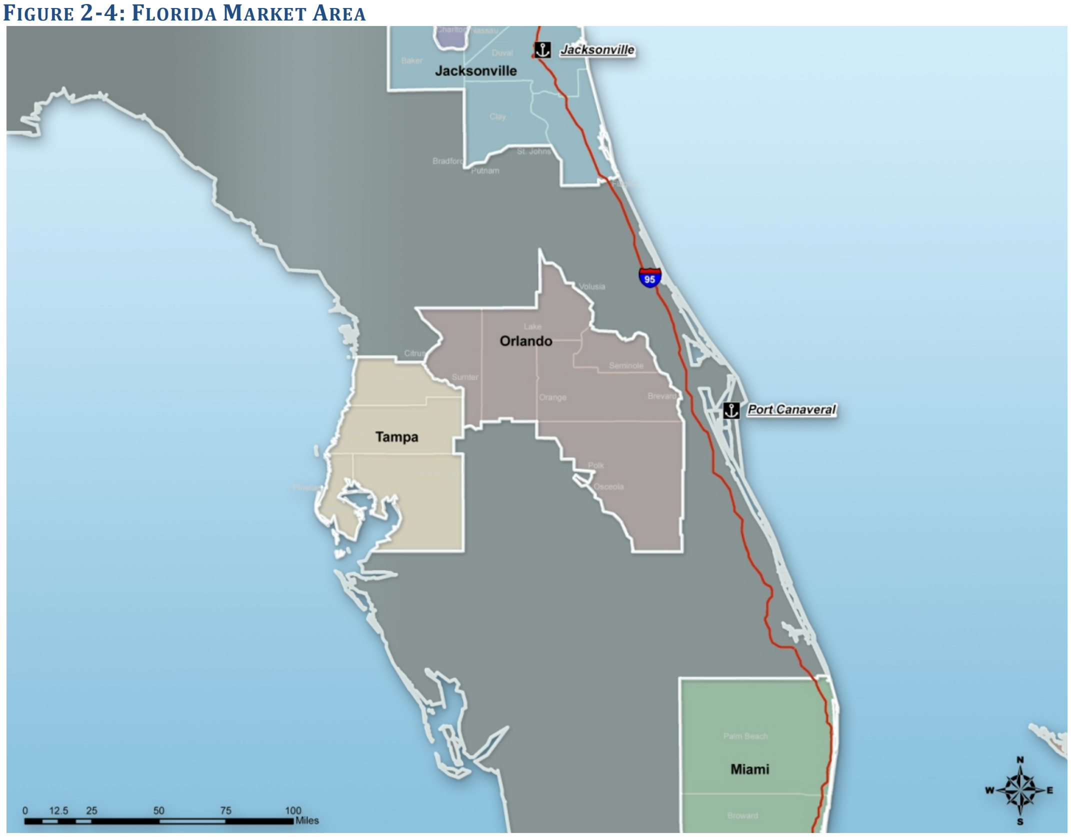
- North Carolina Remaining
- South Carolina Remaining
- Charleston
- Savannah

FIGURE 2-3: SOUTH ATLANTIC MARKET AREA



Source: Parsons Brinckerhoff

FIGURE 2-4: FLORIDA MARKET AREA



Source: Parsons Brinckerhoff

The Florida Market Area (Figure 2-4) includes four FAF regions as part of the study:

- Jacksonville
- Orlando
- Tampa
- Miami

Route Distances

For a Marine Highway service, the additional time and cost for moving goods to and from these regions must be outweighed by lower transportation costs. This is likely to occur for goods transported over longer distances where the proportion of drayage costs is smaller relative to total costs.

For this study, it was assumed that an initial minimum transportation distance of 400 miles was required between regions for an M-95 service to be cost competitive with door-to-door trucking. For example, the distance between New Bedford and Baltimore is approximately 400 miles and between Port Canaveral and Wilmington, NC about 430 miles. It should be noted that much longer distances may actually be necessary for a Marine Highway service to be economically viable.

Filtered Domestic Cargo Volumes

FAF commodity flow data includes both tons and value between each FAF region, the mode of transportation for cargo moved in 2007 and projects cargo flows to 2040 in five-year increments. Approximately two billion tons of domestic cargo were transported by truck and rail within the 29 FAF regions on the East Coast during 2007. Some commodities are less likely to be diverted to a Marine Highway service and were therefore removed from the market analysis. The cargo tonnage was filtered into a subset of total commodity flows that are most likely moved in containers and trailers. The cargo flows were further filtered if the O/D pairs were less than 400 miles apart.

Relevant Cargo Flows by Type of Commodity

The FAF cargo flow database includes 43 commodity groups using the Standard Classification of Transported Goods (SCTG) coding system (refer to Appendix G for a description and complete list). Of these commodity groups, 22 were selected as representing commodities most likely to be transported in containers or in trailers for a potential Marine Highway service (see Table 2-1). Excluded were bulk commodities such as petroleum, sand, gravel, ores and logs, as well as miscellaneous or unknown categories.

Table 2-1: Container/Trailer SCTG Commodity Groups

Code	Commodity	Code	Commodity
03	Other agricultural products	27	Newsprint/paper
05	Meat/seafood	28	Paper articles
06	Milled grain products	29	Printed products
07	Other foodstuffs	30	Textiles/leather
08	Alcoholic beverages	33	Articles-base metal
09	Tobacco products	34	Machinery
20	Basic chemicals	35	Electronics
21	Pharmaceuticals	36	Motorized vehicles
23	Chemical products	38	Precision instruments
24	Plastics/rubber	39	Furniture
26	Wood products	40	Misc. mfg. products

Source: Parsons Brinckerhoff

Tonnage for 2007 for the commodity groups listed in Table 2-1 was aggregated for each of the long haul O/D pairs into an origin/destination flow matrix as shown in Figure 2-5. In addition, close-by regions that could be served by the same port were grouped together. For example the New York metropolitan areas in New York and New Jersey are grouped together.

The result of these two filtering processes amounted to approximately 18.9 million tons of potential M-95 cargo volumes or nine percent of the total tonnage transported between and within the selected FAF regions. The matrix shows the total annual cargo tons for commodities likely moved in containers or trailer loads from origins (shown in rows) and destinations (in columns) for long-haul cargo movement along the I-95 corridor. The empty cells in the matrix from the upper left corner to the lower right corner represent O/D pairs where the distance is less than 400 miles.

The matrix includes highlighted areas representing concentrations of cargo in origin or destination regions that suggest potential origin or destination regions for possible Marine Highway services. For example the Baltimore to Maine highlighted region shows 314,000 tons in 2007. The highlighted cells also identify the reverse flows that could potentially provide balanced service flows.

ADDITIONAL CARGO VOLUMES

Due to geographic constraints on the scope of this study, only a portion of the total potential cargo volumes generated for a Marine Highway service were captured from the commodity flow analysis. Discussions with shippers and transportation provides revealed that additional volumes could be gained by extending the geographic catchment area (e.g. the U.S. Gulf Coast) and by considering rail carload/bulk commodities that might be converted to intermodal rail in the future. For example, shippers of bulk products have indicated that rail boxcar shortages in the past have caused logistical and economic challenges that were alleviated by moving the cargo in containers via intermodal rail or by other cost-effective transportation modes, including Marine Highway services.

FIGURE 2-5: ANNUAL TONNAGE BETWEEN POTENTIAL ORIGIN AND DESTINATION REGIONS (IN THOUSANDS OF TONS FOR 2007)

Cont/Veh	Total	ME	NH	Boston	MA Rem	RI	CT Rem	Hartford	NY-CT	NY-NY	NY-NJ	NJ Rem	Phil-NJ	Phil	DE	MD Rem	Balt.	DC-MD	DC	DC-VA	Richmond	Norfolk	NC Rem	SC Rem	Charleston	Savannah	Jacksonville	Orlando	Tampa	Miami
Total	18,905	782	440	1,448	421	149	36	267	428	1,069	1,449	33	688	2,041	132	409	464	234	37	581	365	206	2,499	883	130	130	328	794	1,012	2,330
ME	1,300												306	460	9	13	62	66	2	37	59	6	90	42	0	3	22	5	22	94
NH	197												12	30	4	11	18	6	4	7	16	17	21	9	0	0	6	7	17	14
Boston	603															69	88	17	6	68	68	15	53	20	6	5	16	23	59	91
MA Rem	135															6	19	13	1	8	15	7	17	12	2	3	4	10	4	15
RI	138															1	22	2	1	9	6	59	6	7	1	1	3	9	7	5
CT Rem	62															29	2	0	1	10	10	4	3	2	0	0	0	0	0	1
Hartford	143																				28	15	12	21	2	1	6	23	11	23
NY-CT	118																					6	22	28	3	16	5	8	9	20
NY-NY	1,239																						165	50	6	12	46	184	281	494
NY-NJ	758																						148	75	14	15	48	94	86	277
NJ Rem	48																						7	36	0	0	1	2	1	1
Phil-NJ	571	76	66																				123	22	3	5	6	22	27	222
Phil	2,061	127	88																				1,429	95	9	5	21	73	28	186
DE	291	60	16																				94	17	14	25	3	17	30	14
MD Rem	398	9	18	79	78	9	2																156	10	1	1	2	10	11	13
Balt.	1,433	314	84	348	65	39	9																	295	1	17	9	12	156	85
DC-MD	66	2	2	22	1	6	1																	3	1	1	5	1	18	4
DC	2	0	0	1	0	0	0																	0	0	0	0	0	0	0
DC-VA	182	3	4	16	2	8	0																	15	1	1	43	8	14	67
Richmond	473	11	23	155	6	11	9	26																	64	8	53	24	23	61
Norfolk	317	6	2	30	19	15	2	4	7																	1	30	95	19	86
NC Rem	2,950	64	53	349	89	13	2	135	62	369	470	5	205	298	64	122												166	189	298
SC Rem	2,152	52	61	121	106	6	6	51	73	214	173	4	117	449	36	70	150	67	8	197										190
Charleston	248	10	1	46	3	19	2	3	1	5	46	0	8	2	0	6	3	1	0	76	9									6
Savannah	653	35	8	78	0	0	3	1	5	67	36	2	27	135	0	55	11	4	0	22	87	16								62
Jacksonville	176	4	3	46	1	0	0	2	2	16	23	3	2	18	3	1	15	1	0	11	21	6								
Orlando	288	4	2	27	13	1	0	5	0	73	38	1	2	9	2	10	5	5	2	22	12	15	41							
Tampa	664	3	1	72	33	16	0	21	7	186	53	1	2	47	1	12	18	12	4	89	12	21	55							
Miami	1,241	4	9	59	4	3	0	20	272	140	62	18	7	263	13	5	52	40	8	26	22	20	58	124	2	11				

Origin/Destination pairs <400 miles

Source: Parsons Brinckerhoff Analysis of FAF3 Data

Commodity by Tons and Value

Commodities have significantly different values as can be seen in the example of flows between Baltimore and Massachusetts (Boston and Massachusetts Remaining) shown in Table 2-2. For the total of the 22 selected commodity groups, the average value per kilogram was $2.12 in 2007, but the value for electronics products was $63.74 per kilogram on the high end and $0.63 per kilogram for wood products on the low end. While it is expected that higher value products such as electronics and pharmaceuticals are unlikely to be transported by potential Marine Highway services rather than much faster truck services, the overall tonnage (and loads) of these products comprised a relatively small share of total volumes.

Table 2-2: Baltimore to Massachusetts 2007 Commodity Flows

Commodities	Tons (000)	Total $ (millions)	$/kg
Newsprint/paper	0	2	13.26
Paper articles	0	0	1.25
Precision instruments	0	4	11.32
Tobacco prods.	0	0	17
Misc. mfg. prods.	1	33	36.62
Pharmaceuticals	1	33	44.81
Electronics	2	110	63.74
Motorized vehicles	2	12	5.86
Plastics/rubber	2	7	3.74
Textiles/leather	2	9	4.46
Meat/seafood	4	34	8.49
Other ag prods.	4	7	1.75
Printed prods.	6	24	3.96
Furniture	8	29	3.41
Alcoholic beverages	9	11	1.22
Machinery	9	59	6.55
Milled grain prods.	12	19	1.58
Articles-base metal	13	61	4.69
Chemical prods.	50	202	4.04
Basic chemicals	56	23	0.41
Other foodstuffs	115	125	1.08
Wood prods.	117	73	0.63
Total	**413**	**875**	**2.12**

Source: Parsons Brinckerhoff Analysis of FAF3 Data

Balancing Cargo Flows

The next step in the process was to examine O/Ds where large flows were indicated to determine if flows in the opposite direction were balanced. In most cases these flows were found to be unbalanced and other O/Ds pairs or groups were identified that could serve to balance the overall flow of cargo. For example, cargo flows between the New York metropolitan region and Miami are heavily unbalanced southbound. However, these flows can possibly be balanced with northbound cargo from the Orlando/Tampa region to New York.

Potential Port Pairs

Five primary ECMHI ports/areas were identified for potential Marine Highway services under this study. Based on the commodity flow data, four additional ports along the Atlantic coast were selected to maximize potential balance between head-haul and back-haul cargo. Table 2-3 lists these nine identified primary and secondary ports and their corresponding FAF market regions.

Table 2-3: ECMHI Identified Ports and Corresponding FAF regions

East Coast Port	FAF Regions
New Bedford, Massachusetts	Massachusetts Remaining (MA Rem), Boston, Connecticut Remaining (CT Rem), Rhode Island (RI)
New York/New Jersey (NY/NJ)	New York-New York (NY-NY), New York-New Jersey (NY-NJ)
Delaware River	Philadelphia-New Jersey (Phil-NJ), Philadelphia (Phil)
Baltimore, Maryland	Baltimore, Maryland Remaining (MD Rem)
Port Canaveral, Florida	Orlando, Tampa
Portland, Maine	Maine (ME)
Wilmington, North Carolina	North Carolina Remaining (NC Rem)
Charleston, South Carolina	Charleston, South Carolina Remaining (SC Rem)
Miami, Florida	Miami

Source: Parsons Brinckerhoff

M-95 Origin/Destination Combinations

Based on the examination of domestic commodity flows along the Atlantic Coast that are composed of potential containerized goods, that are transported more than 400 miles between the identified ports, and where product flows are large and relatively balanced, three possible O/D combinations were identified (refer to Figure 2-6):

- **Mid Atlantic-New England:** New Bedford – Portland – Delaware River – Baltimore –New Bedford.
- **NY/NJ-Florida:** NY/NJ – Miami – Port Canaveral – NY/NJ
- **Delaware River-Florida :** Delaware River – Miami – Port Canaveral – Delaware River

The furthest O/D pairs for Mid Atlantic –New England are Portland, Maine and Baltimore, Maryland at a driving distance of approx. 510 miles. The driving distance between New York and Miami is about 1,240 miles for NY/NJ-Florida, and approximately 1,180 miles between Delaware River and Miami for Delaware River-Florida. Additional travel distances between East Coast origins and destinations by mode are provided in Section 3.9.3.

FIGURE 2-6: REGION-TO-REGION CONCEPTUAL O/D COMBINATIONS

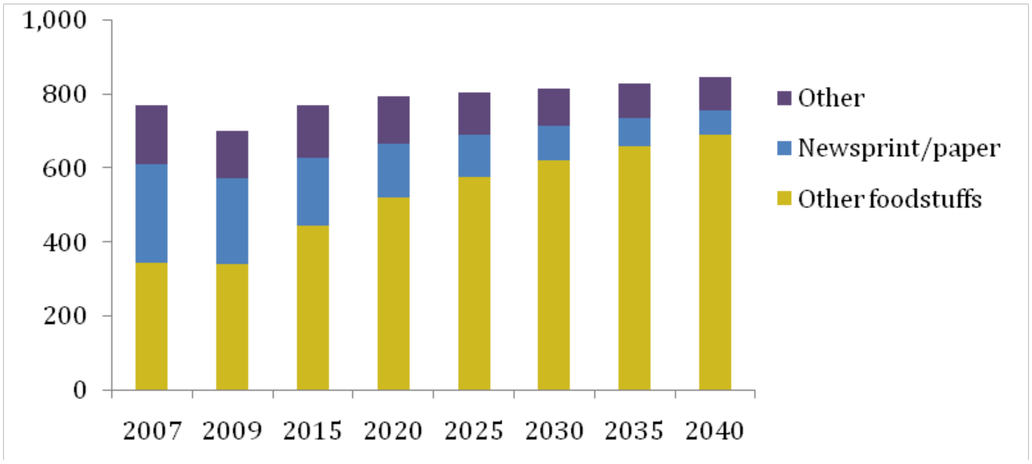
Source: Parsons Brinckerhoff

MID ATLANTIC-NEW ENGLAND

Mid Atlantic-New England combines southbound flows from New England (especially Maine) to Delaware River (Figure 2-7) with northbound flows from Baltimore to Massachusetts and Maine (Figure 2-8). Cargo from Maine to Delaware River regions totals 900,000 tons. The northbound cargo is a much smaller at 200,000 tons. However, Baltimore to New England (Boston and Maine FAF regions) cargo is 300,000 tons to each destination, which would balance the southbound cargo at 800,000 tons.

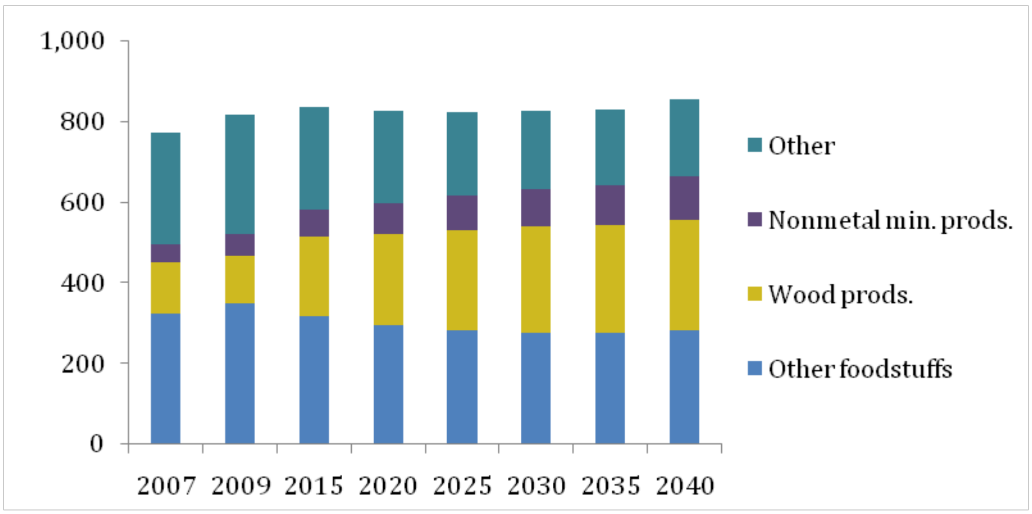
- Total southbound and northbound flows are balanced but projected growth in total cargo is low.
- Southbound cargo growth is projected in prepared foods, but is expected to decline in newsprint/paper.
- Northbound growth is expected in wood products, with decline projected in prepared foods and other products.

FIGURE 2-7: SOUTHBOUND CARGO FLOWS FROM MAINE TO PHILADELPHIA **(IN THOUSANDS OF TONS)**



Source: Parsons Brinckerhoff Analysis of FAF3 Data

FIGURE 2-8: NORTHBOUND CARGO FLOWS FROM BALTIMORE TO MASSACHUSETTS AND MAINE **(IN THOUSANDS OF TONS)**



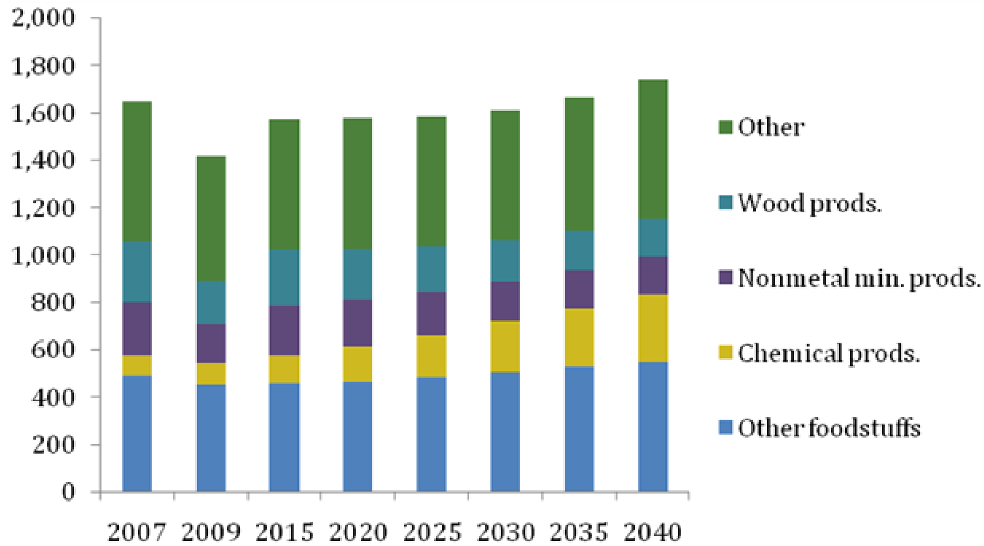
Source: Parsons Brinckerhoff Analysis of FAF3 Data

NEW YORK/NEW JERSEY-FLORIDA

Aggregate tonnage southbound from New York/New Jersey to Florida (mainly Miami) was 1.4 million tons in 2007 comprised most heavily of other foodstuffs and wood products (Figure 2-9). Goods moving northbound from Florida to New York/New Jersey total 550,000 tons (Figure 2-10) and included concentrations of other agricultural products (e.g. fresh fruit) and other foodstuffs (processed foods), which are more seasonal.

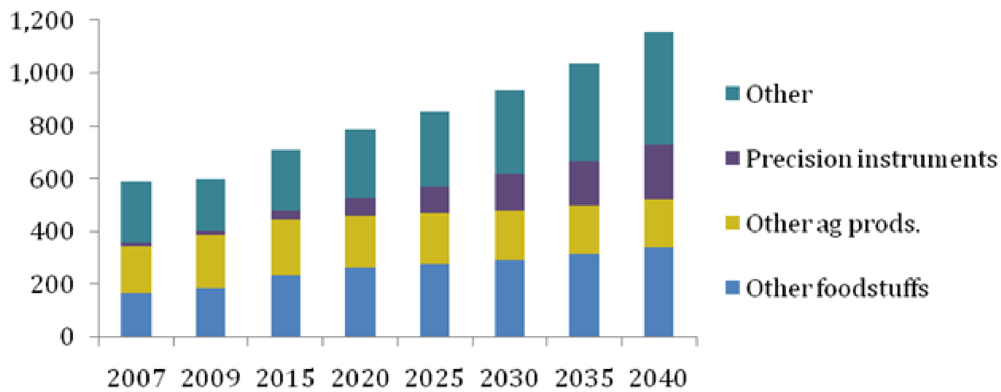
- Total southbound and northbound flows are unbalanced but projected growth in northbound cargo results in more balanced flows.
- Southbound flows are projected to have near zero growth.
- Northbound flows are projected to double by 2040 with growth in prepared foods, instruments and other commodities.

FIGURE 2-9: SOUTHBOUND CARGO FLOWS FROM NEW YORK TO FLORIDA **(IN THOUSANDS OF TONS)**



Source: Parsons Brinckerhoff Analysis of FAF3 Data

FIGURE 2-10: NORTHBOUND CARGO FLOWS FROM FLORIDA TO NEW YORK **(IN THOUSANDS OF TONS)**

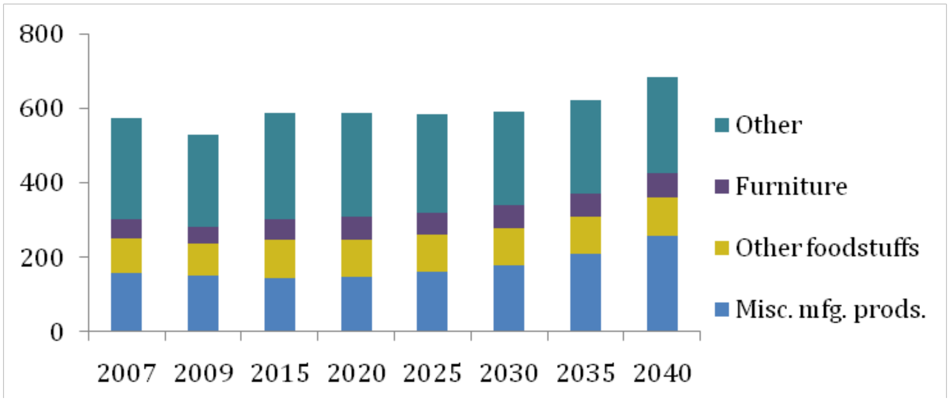


Source: Parsons Brinckerhoff Analysis of FAF3 Data

DELAWARE RIVER-FLORIDA

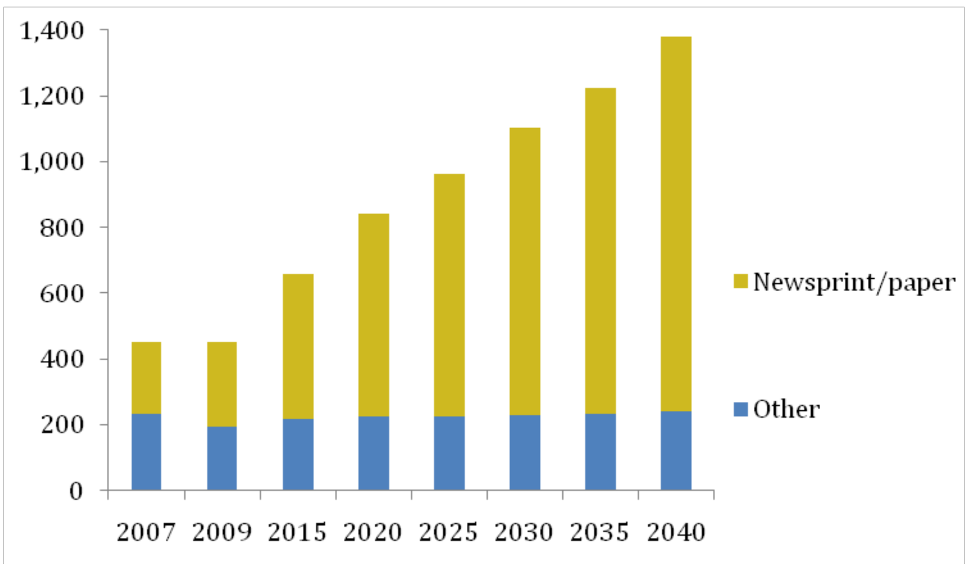
Cargo flows between Delaware River and Florida are unbalanced southbound in 2007, and southbound cargo is expected to show little growth (Figure 2-11). As a result of expected growth in northbound cargo due to high growth in newsprint/paper from Miami, cargo flows are projected to be balanced in 2015 and unbalanced northbound in 2020 and later years (Figure 2-12).

FIGURE 2-11: SOUTHBOUND CARGO FLOWS FROM DELAWARE RIVER TO FLORIDA **(IN THOUSANDS OF TONS)**



Source: Parsons Brinckerhoff Analysis of FAF3 Data

FIGURE 2-12: NORTHBOUND CARGO FLOWS FROM FLORIDA TO DELAWARE RIVER **(IN THOUSANDS OF TONS)**



Source: Parsons Brinckerhoff Analysis of FAF3 Data

EXTENDED COASTAL SERVICE

In addition to the three primary services outlined above, an additional service option was identified that extends the Mid Atlantic-New England service south to the South Atlantic. Based on aggregate volumes, it would appear that the coastal regions of North Carolina and South Carolina could offer potential for Marine Highway services, but these regions are both geographically large and many areas are a significant distance from coastal ports.

Southbound cargo from the New York metro region (NY-NJ) is 440, 000 tons to NC and SC Remainder regions and 1.2 million tons northbound. A potential additional vessel call at the Port of Wilmington, NC or Charleston assumes those ports would serve some share of the geographically large NC or SC Remainder regions respectively.

For Delaware River to Wilmington, there are 1.7 million tons of cargo moving southbound and one million tons transported northbound (opposite balance from New York above). However, the majority of the southbound tonnage is basic chemicals moved by rail to NC Remainder.

2.2. ESTIMATING POTENTIAL CARGO CONVERSION

The final step in assessing potential cargo flows for Marine Highway services was to develop a rough estimate of the potential cargo that could be shifted to such a service. Based on previous studies of coastal shipping options along the Atlantic Coast,[137] an estimate of 25 percent of total filtered tonnage was assumed, which represented about two percent of the total domestic cargo moving through the corridor.

Since only 15 percent of U.S. freight currently moves by U.S. coast-wise and inland waterway services, when compared to the 40 percent moved coast-wise in Europe, it appears that there is still the potential for U.S. water freight movements to increase. Further, U.S. rail intermodal service presently captures about 20 to 30 percent of the Mid-Atlantic – Florida traffic. With M-95 service levels comparable or lower than what is offered by intermodal rail, a Marine Highway service is not likely to capture cargo that rail has not already captured.

Nevertheless, the portion of the available cargo that can be "captured" by a particular service is theoretically close to 100 percent, subject to achieving competitive costs and service parameters that benefit shippers. The following practical considerations suggested that the expected capture rate would be much less than the theoretical limit:

- **Transit times**: Marine highway transit times are likely to be no faster than rail service, and at least one day slower than truck service.
- **Service frequency**: Rail departures are generally offered every day while trucks may depart any hour of any day, with schedules tailored to a particular shipper's requirements. Initial M-95 services would likely be initiated on a less frequent basis with more frequent service offered over time.
- **Seasonality**: Some of the cargo flows are seasonal with a substantial **peak demand** that is difficult to accommodate in a marine service with a fixed weekly capacity. This could especially be an issue for seasonal refrigerated cargo, where shipboard reefer capacity is limited.
- Inbound and outbound **flows are imbalanced** at every port, which will be difficult to manage in the context of the Marine Highway service.

These factors led to the assumed 25 percent conversion rate of the estimated, filtered tonnage volumes. In view of the fact that the potential Marine Highway services market included truck and intermodal rail tonnages that have already been filtered by cargo distance more than 400 miles and likely commodities to effectively use a seaborne mode, the potential percent of diverted cargo is considered optimistic but possibly attainable from a marine-highway development perspective.

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137 The "Four Corridor Case Studies of Short-Sea Shipping Services" study prepared by Global Insight in association with Reeves Associates for the Office of the Secretary/MARAD in the U.S. DOT in August 2006 assumed a market penetration of 23 percent northbound and 25 percent southbound along Atlantic corridor. Similarly, the "East Coast Marine Transportation System Development based on High Speed Trimaran for 140 53-Foot Trailers" study prepared by the Center for the Commercial Deployment of Transportation Technologies in association with CSC PM, Herbert Engineering Corp. and SPAR Associates for the Office of Naval Research assessed the cargo availability of domestic trailers using the I-95 corridor by evaluation of prior SSS/AMH trade studies and concluded that the market appeal of a less than two day transit between Florida and Massachusetts using a HST160-53' express water transportation service would create a 25 percent penetration of the highway and intermodal (rail) trailers.

2.3. Cargo Flows by Load

Cargo weights will fluctuate greatly depending on commodity and shipment. Given the variability, 20 tons was assumed per container/trailer based on an average payload weight of a trailer at 22 tons and an average payload weight of a container at 16 tons.

The total of estimated container/trailer cargo tons were divided by an assumed 20 tons per container/trailer to provide a rough estimate number of containers/truckloads for each of the long haul O/D pairs and groups identified in Figure 2-13. The result of this analysis is an estimate of total containers/trailer loads moving between the selected long haul origin/destination pairs.

Figure 2-13: Estimated Loads per week for Container/Trailer Commodity Flows

Est. Loads/Wk		DESTINATION FAF Region																
	Total	ME	Bost-on	MA Rem	RI	CT Rem	NY-NY	NY-NJ	Phil-NJ	Phil	MD Rem	Baltimore	NC Rem	SC Rem	Charleston	Orla-ndo	Tam-pa	Mia-mi
Port of Call		Port.	New Bedford				NYNJ		Del River		Baltimore		Wilm	Charleston		P. Canaveral		Miami
Total	13,116	636	1,058	376	103	20	948	809	622	1,470	329	404	2,253	724	42	586	836	1,902
ORIGIN FAF Region																		
ME	1,053								295	443	13	59	87	40	0	5	22	91
Boston	392		NORTHBOUND ==>			SOUTHBOUND ==>					67	85	51	19	5	23	56	87
MA Rem	81										5	19	16	12	2	10	4	14
RI	54										1	21	5	7	1	8	6	5
CT Rem	36										28	2	3	2	0	0	0	1
NY-NY	1,135												159	48	5	177	270	475
NY-NJ	668												143	72	13	90	83	267
Phil-NJ	475	73											118	21	3	21	26	214
Phil	1,873	122											1,374	91	8	70	27	179
MD Rem	363	8	76	75	9	2							150	10	1	10	10	12
Baltimore	1,272	302	334	62	38	9								284	1	11	150	82
NC Rem	2,531	61	336	86	13	2	354	452	197	287	117					160	182	287
SC Rem	1,591	50	117	102	6	6	206	166	113	432	68	144						183
Charleston	151	10	44	3	18	2	5	45	8	2	6	3						5
Orlando	213	4	26	13	1	0	70	36	2	9	9	4	39					
Tampa	477	3	70	31	15	0	179	51	2	45	12	17	52					
Miami	751	4	57	4	3	0	134	59	6	253	4	50	56	119	2			

SECTION 3: OPERATIONAL DEVELOPMENT

The operational analysis estimated quantitative vessel and service parameters through logistics modeling that was used to identify the modal time, cost differentials and critical service advantages/constraints for each targeted Marine Highway service.

Potential Marine Highway services along the Eastern seaboard were identified based on the market analysis. Prospective vessel itineraries were then developed to serve the target markets, and representative vessel types were evaluated for each potential service. The vessel speed, voyage time and service frequency, terminal location and other operational costs were taken into account as part of the operational plan. Once these features were identified for each service, order of magnitude relative costs per mode were developed for the principal services to determine the competitiveness of the proposed alternatives.

MODAL CHARACTERISTICS

Various shipping methods and equipment types are used in a Marine Highway service such as containers and trailers that are transferred by Lo/Lo or Ro/Ro operations (Table 3-1). The equipment and operation is integral in the movement of cargo at each transition point. Prior to reviewing service analysis details, a brief description of the methods and equipment used to transport cargo over the road, on rail or water will assist the reader to understand some basic modal characteristics as they relate to service operations.

TABLE 3-1: STANDARD MARINE HIGHWAY OPERATIONAL CHARACTERISTICS

Operation	Lo/Lo	Ro/Ro
Equipment Type	20’, 40’ or 45’ containers and chassis	48’ or 53’ trailers
Cargo Type	Mainly international cargo	International and domestic cargo
Vessel Loading	Quay cranes (rail-mounted, mobile or ships’ gear)	Yard tractors and ramps
Storage Area	Denser storage area	Flexible, but larger area required
Cargo Handling	Quay cranes operators, yard lift equipment operators, ITV drivers (gang per quay crane)	ITV drivers

Source: Parsons Brinckerhoff

CONTAINERS

The dimensions of a typical intermodal shipping container are governed by International Organization for Standardization (ISO) to provide compatible equipment globally. There are variations to a container’s dimensions but typical dimensions measure 8 feet wide by 8.5 or 9.5 feet tall and either 20, 40 or 45 feet long. Container measurement is normally expressed in “TEUs” or twenty-foot equivalent units equal to one container measuring 20 feet long. It can also be expressed in “FEUs” or forty-foot equivalent units equal to one container measuring 40 feet long. Two TEUs equal one FEU.

Containers can by dry or refrigerated. A dry container handles non-perishable goods, has steel walls and typically a wooden floor. A refrigerated container or “reefer” container has insulated walls and a detachable generator or “gen-set” to power the refrigerating unit and provide climate control for the container. When the gen-set is not connected, the container must be connected to shipboard or land-based power to maintain certain temperatures for a prolonged period of time.

Containers are transported on over-the-road chassis, which are specifically designed for an ISO container using twist locks to secure the container in place at each corner. Chassis can be 20, 40 or 45 feet long, and there are combination chassis that can adjust to each container size.

Cassettes

A cassette is a detachable steel platform upon which containers are placed for transport over short distances. The advantage to the use of cassettes is the capability of containers to be double stacked. Within a terminal, the cassettes act as a "floating buffer" between the container crane and vehicles transporting the container. Once a crane places a container on the cassette, the transport vehicle can pick up or drop off the cassette without having to wait for a crane.

Trailers

Cargo being transported by truck along the East Coast is typically hauled in a semitrailer attached to a 3-axle tractor (with the combination also known as an 18-wheeler i.e. tractor plus semitrailer). The semitrailer is industry standard, having no front axle but attaches to the tractor via the tractor's "fifth wheel" coupling plate where the trailer rests and pivots. These trailers also have landing gear for storage purposes when no tractor is attached.

There are two types of semitrailers used for transporting cargo over-the-road, dictated by the commodity type. A dry van or trailer is used to haul goods that are not perishable. Dry vans can be either 48 or 53 feet in length, but 53 feet is more prominent due to its greater carrying capacity. Trailers are 102 feet wide, as compared to the standard container width of 96 feet. Typically a dry van cubes out, resulting in filling the trailer to capacity without reaching the weight limit.

Perishable goods are hauled in refrigerated or reefer trailers. These trailers are normally 48' in length (or shorter), have generators attached for temperature control and insulated walls. Unlike the dry van, a reefer trailer typically weighs out before it cubes out. This means the trailer reaches its weight limit before the entire trailer is full.

Ro/Ro

A Ro/Ro vessel is designed and constructed to allow wheeled cargo to be driven on and off the vessel. Ro-Ro cargo includes semi-trailer trucks, trailers or containers double stacked on cassettes. Ro/Ro vessels typically have built-in ramps that can be lowered to the port's dock to allow the cargo to be driven on and off the vessel.

Lo/Lo

A Lo/Lo vessel carries containers that must be loaded and offloaded with the use of shore-based cranes or the vessel's cranes.

RoCon

A RoCon vessel is a hybrid vessel that can store Ro/Ro cargo below deck and stack containers on the top decks. The RoCon's ability to carry stacked containers allows significantly more cargo to be carried on the same size vessel as compared to a Ro/Ro vessel that carries only Ro/Ro cargo.

3.1. Assumptions

The following operational assumptions were used in the analysis when developing the prospective vessel services and itineraries and when modeling operational costs of the Marine Highway services:

- **Service frequency**: At least two sailings per week are required in order to achieve market acceptance. Competing rail modes offer daily service and trucks can depart anytime of any day.
- **Scheduling**: Services should provide regular schedules with fixed early morning arrivals and late day departures for maximum shipper convenience. This is, however, not always possible without increasing the cost of providing service. Service economy was given priority over optimizing arrival and departure schedules.
- **Vessel Types**: The vessels for this analysis are based on the conceptual vessel designs presented in the study *"American Marine Highway Design Project"* addressing dual use vessel concepts, published October 28, 2011 by the MARAD.[138] They are U.S. built and U.S. crewed dual-use vessels that can serve in peacetime in commercial trade and are capable of meeting a portion of the U.S. Department of Defense's (DOD) military sealift needs in time of national emergency.
- **Vessel Speed:** Vessel speeds range from 13 to 22 knots. Vessels speed must be reduced to ten knots in certain areas such as Cape Cod Bay during specified seasons to avoid striking Right Whales. It was assumed that time lost due to speed restrictions in those areas could be made up with minimal impact to overall schedule reliability and cost.
- **Fuel Type**: Services will all operate within the U.S. East Coast Emission Control Area (ECA) and be required to meet strict emissions standards, so costs reflect the use of low-sulfur diesel fuel.
- **Container Handling**: Containers moving on Ro/Ro vessels are handled in two-container cassettes; the additional terminal costs of preparing (pre-loading) cassettes are assumed to be offset by the ability to load two containers onto the vessel in one cassette unit.
- **Equipment**: Cargo is assumed to move in shipper-provided trailers and intermodal containers. These may be owned or leased by shippers, truckers, 3PLs or other parties. As with truck and rail shipments, the responsibility and cost for managing and returning empty equipment to origin points is for the account of the shipper or equipment owner.

3.2. Vessel Services

The most promising cargo O/D combinations determined in the market analysis provided the starting point for the service designs. Region-to-region service concepts were reflected in vessel itineraries.

Table 3-2 shows each option's roundtrip rotation along the East Coast. The Single Region-Pair Services link only two regions along the East Coast. A sensitivity analysis was performed on the Mid Atlantic–New England option to determine if different port pairs would alter the service operating requirements and associated costs. The six proposed Multi Region-Pair "Pendulum" Services cover multiple regions along the East Coast, linking the Mid Atlantic ports with ports in New England and Florida or the South Atlantic.

The identified port pairs and services are conceptual and should be evaluated in the context of this study's objective. Services were explored to be screened for viability but should not be considered as the sole basis for potential services or a final business plan. Additional potential combinations of ports and corridors could strengthen or weaken the case for the establishment of a future Marine Highway service.

138 http://www.marad.dot.gov/documents/AMH_Report_Final_Report_10282011_updated.pdf.

TABLE 3-2: REGION-TO-REGION CONCEPTUAL SERVICES

SINGLE REGION-PAIR SERVICES		
Option 1	New England – Mid Atlantic	New Bedford – Portland – Del. River – Balt. –New Bedford
Option 1a	New England – Mid Atlantic	Boston– Portland – Del. River – Baltimore –Boston
Option 1b	New England – Mid Atlantic	Boston– Portland – Del. River – Norfolk –Boston
Option 2	New York – Florida	NY/NJ – Miami – Port Canaveral – NY/NJ
Option 3	Delaware River – Florida	Del. River – Miami – Port Canaveral – Del. River
MULTI REGION-PAIR "PENDULUM" SERVICES		
Option 4	New England – Mid Atlantic – South Atlantic	Portland – New Bedford –Del. River – Baltimore – Wilmington – Baltimore – Del. River – New Bedford
Option 5	New England – Mid Atlantic – South Atlantic	New Bedford – Portland – Del. River – Baltimore – Charleston – Wilmington – Baltimore – New Bedford
Option 6	New England – Mid Atlantic – South Atlantic	New Bedford – Portland – Del. River – Norfolk – Charleston – Wilmington – Norfolk – Del. River – New Bedford
Option 7	New England – Mid Atlantic – South Atlantic	New Bedford – Portland – Del. River – Norfolk – Savannah – Norfolk – New Bedford
Option 8	New England – Mid Atlantic - Florida	New Bedford – Portland – Del. River – Baltimore – Miami – Port Canaveral – Baltimore – Del. River – New Bedford
Option 9	New England – Mid Atlantic - Florida	New Bedford – Portland – New York – Norfolk – Miami – Port Canaveral – Norfolk – New York – New Bedford

Source: Mercator International

3.3. SERVICE CARGO VOLUMES

Cargo volumes for each service option were tallied for every port pair included in the itineraries. Table 3-3 shows the total cargo volumes for Option 1 service only. Details for all service options can be found in Appendix H. In this scenario, the ship would capture about 259 loads per week for the southbound route and approximately 278 loads per week for the northbound route, totaling 537 loads per week.

TABLE 3-3: ESTIMATED CARGO PROSPECTS FOR SERVICE OPTION #1

Service Option #1								
Port Rotation:		**Portland - New Bedford - Del River - Baltimore - Portland**						
Southbound Volumes:				Tons p.a.				
Load Port	FAF Origin	FAF Dest	Disch Port	000s	Capt%	ton/Ld	Lds/Yr	Lds/Wk
Portland	Maine	Phil NJ	Del River	460	25%	20	5,750	111
Portland	Maine	Phil	Del River	306	25%	20	3,825	74
Portland	Maine	MD Rem	Baltimore	13	25%	20	163	3
Portland	Maine	Balt	Baltimore	62	25%	20	775	15
New Bedford	Boston	Phil NJ	Del River	-	25%	20	-	-
New Bedford	Boston	Phil	Del River	-	25%	20	-	-
New Bedford	Boston	MD Rem	Baltimore	69	25%	20	863	17
New Bedford	Boston	Balt	Baltimore	88	25%	20	1,100	21
New Bedford	MA Rem/RI/CTRem	Phil NJ	Del River	-	25%	20	-	-
New Bedford	MA Rem/RI/CTRem	Phil	Del River	-	25%	20	-	-
New Bedford	MA Rem/RI/CTRem	MD Rem	Baltimore	36	25%	20	450	9
New Bedford	MA Rem/RI/CTRem	Balt	Baltimore	43	25%	20	538	10
Southbound Total				1,077			13,463	259

Northbound Volumes:

Load Port	FAF Origin	FAF Dest	Disch Port	000s	Capt%	ton/Ld	Lds/Yr	Lds/Wk
Del River	Phil NJ	Maine	Portland	76	25%	20	950	18
Del River	Phil NJ	Boston	New Bedford	-	25%	20	-	-
Del River	Phil NJ	MA Rem/RI/CT	New Bedford	-	25%	20	-	-
Del River	Phil	Maine	Portland	127	25%	20	1,588	31
Del River	Phil	Boston	New Bedford	-	25%	20	-	-
Del River	Phil	MA Rem/RI/CT	New Bedford	-	25%	20	-	-
Baltimore	MD Rem	Maine	Portland	9	25%	20	113	2
Baltimore	MD Rem	Boston	New Bedford	79	25%	20	988	19
Baltimore	MD Rem	MA Rem/RI/CT	New Bedford	89	25%	20	1,113	21
Baltimore	Balt	Maine	Portland	314	25%	20	3,925	76
Baltimore	Balt	Boston	New Bedford	348	25%	20	4,350	84
Baltimore	Balt	MA Rem/RI/CT	New Bedford	113	25%	20	1,413	27
Northbound Total				1,155			14,438	278
Grand Total Loads							**27,900**	**537**

Source: FAF3, Parsons Brinckerhoff and Mercator International

The summary of the single region-pair services are listed in Table 3-4. The potential weekly volumes range from approximately 200 to 550 loads per week for the single region-pair services. While not exhaustive, the service combination list does cover the majority of service options with meaningful volume potential.

Table 3-4: Summary of Single Region-Pair Service Cargo Volumes

Service	Voyage Itinerary	Potential Loads/Week SB	NB	Total
Option 1	NwBdfrd – Prtlnd. – Del. River – Balt. – NwBdfrd.	259	278	**537**
Option 1a	Boston– Prtlnd.– Del. River – Balt. –Boston	246	264	**510**
Option 1b	Boston– Prtlnd. – Del. River – Norfolk –Boston	225	103	**328**
Option 2	NY/NJ – Miami – Canaveral – NY/NJ	340	133	**473**
Option 3	Del. River – Miami – Canaveral – Del. River	134	79	**214**

Source: Mercator International

The summary of the multi region-pair services are listed in Table 3-5. The table shows volumes by destination region (north, central, south). The pendulum services were developed to serve more port pairs than the single region-pair service, which give it more flexibility. The estimated weekly volumes range from approximately 500 to 1,200 loads per week.

The estimated cargo volumes, based on an assessment of a new transportation mode, provide quantitative parameters that can be used in calculating preliminary costs for each of the proposed services. These volumes could be higher using the same assumptions, since the FAF3 data/forecasts do not include M-95 as a mode.

TABLE 3-5: SUMMARY OF MULTI REGION-PAIR (PENDULUM) SERVICE CARGO VOLUMES

		Potential Loads/Week						
		SB Direction			NB Direction			
Service	**Voyage Itinerary**	**To Cen**	**To South**	**Total SB**	**To Cen**	**To North**	**Total NB**	**Grnd Total**
Option 4	NwBdfrd – Prtlnd. – Del. River – Balt. – Wilm. – Balt. – Del. River – NwBdfrd	259	451	*710*	150	402	*552*	**1263**
Option 5	NwBdfrd – Prtlnd. – Del. River – Balt. – Charl. - Wilm. – Balt. – NwBdfrd	259	469	*728*	86	491	*578*	**1306**
Option 6	NwBdfrd – Prtlnd. – Del. River – Norf. – Charl. - Wilm. – Norf. – Del. River – NwBdfrd	244	467	*711*	259	326	*585*	**911**
Option 7	NwBdfrd. – Prtlnd. – Del. River – Norf. – Savannah – Norf. – NwBdfrd	244	12	*256*	64	138	*202*	**458**
Option 8	NwBdfrd. – Prtlnd. – Del. River – Balt. – Miami – Canaveral – Balt. – Del. River – NwBdfrd.	259	286	*545*	104	336	*440*	**984**
Option 9	NwBdfrd. – Prtlnd. – NY – Norf. – Miami – Canaveral – Norf. – NY – NwBdfrd.	60	471	*531*	146	121	*267*	**798**

Source: Mercator International

3.4. M-95 VESSEL CHARACTERISTICS AND COSTS

The conceptual AMH vessel designs prepared for MARAD were used in this study. The vessels were intended to be ocean-going vessels suitable for coastwise trade, rather than for inland or river trade, that can also be useful to the military for sealift transport in times of national emergency (military dual-use). Since the vessels will operate in the U.S. coastwise trade, they will be constructed in accordance with Section 27 of the Merchant Marine Act of 1920 (as amended). Some of the vessel designs could also be suitable for joint service to coastwise and non-contiguous U.S. ports (e.g. Puerto Rico, Hawaii, or Alaska).[139]

The 11 vessel designs prepared for the MARAD AMH project were divided into the categories of Ro/Ro, RoCon and Other and were given numbers and names for easy identification. The design numbers are presented in three numeric series to differentiate between vessel categories, and for each category, the design number sequence counts up from the smallest to the largest TEU capacity.

- The six Ro/Ro type vessels are Designs 01 to 06,
- The three RoCon type vessels are Designs 11 to 13,
- The two other type vessels are a Lo/Lo container feeder ship, Design 21, and a Ro/Ro passenger ship (Ropax), Design 22.[140]

The majority of vessels are Ro/Ro, because they are well-suited for domestic service operation. Ro/Ro vessels can flexibly accommodate shipper's equipment, offer quick turn-around in port with immediate availability of cargo in Ro/Ro trailers and modest potential delay for containers in cassettes, and can be operated at less developed facilities (i.e. those without quay cranes or other significant cargo handling equipment) with lower handling costs.

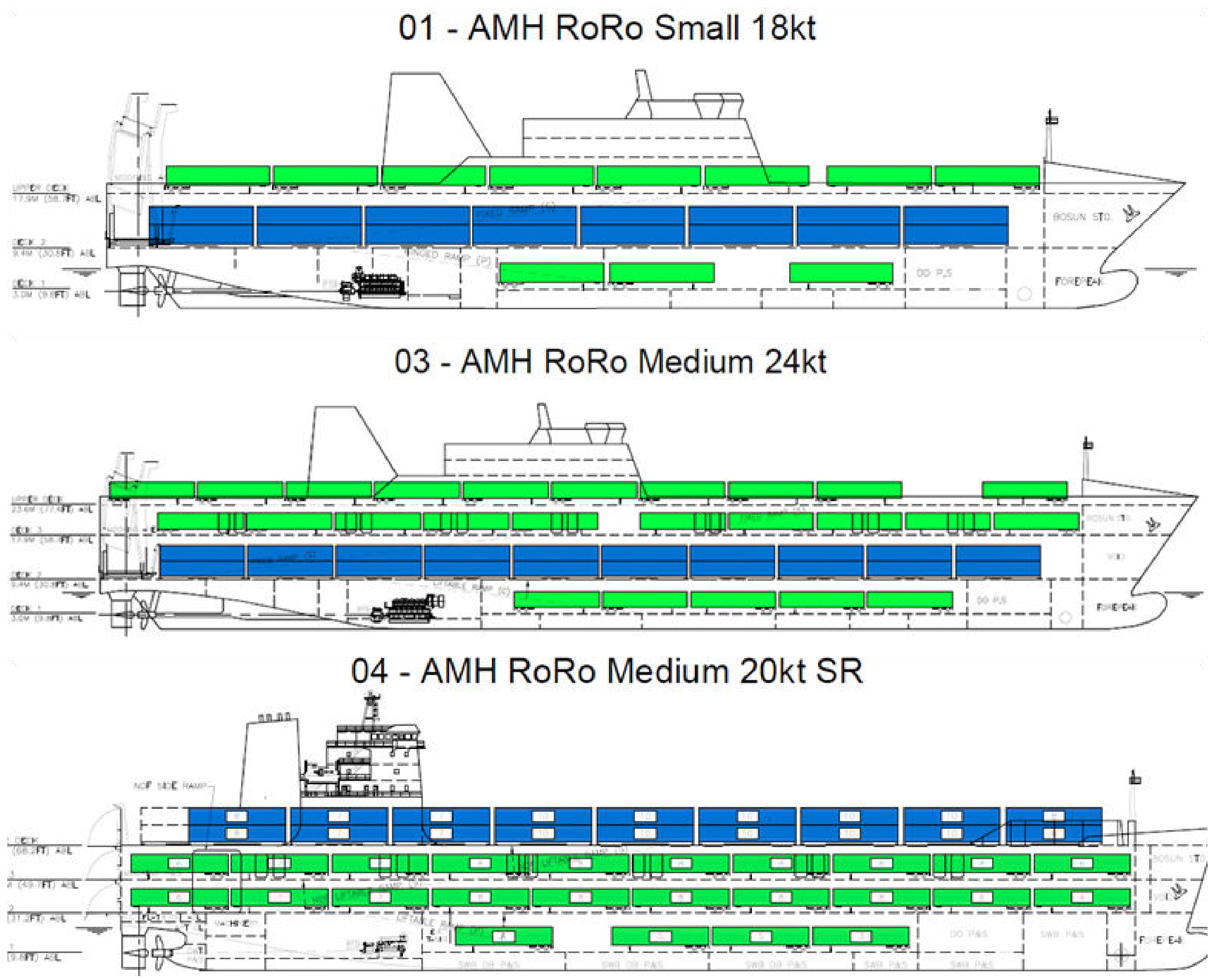
139 HEC 2011.

140 Ibid.

3.4.1 Marine Highway Vessel Characteristics for the M-95 Service

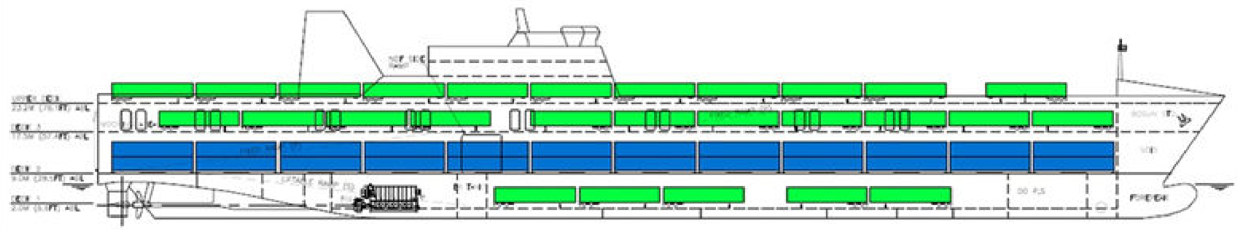
Eight out of the 11 MARAD AMH vessels were initially considered for the prospective M-95 services, including four Ro/Ro vessels, three RoCon vessels and one Lo/Lo vessel (shown in Figure 3-1). Standard size trailers (shown in green) and containers (blue) are displayed in a specific arrangement on the vessels; however, the vessels can accommodate a wide variety of trailer and container sizes, as well as special and oversize cargos.[141] The main dimensions, container and trailer capacities, speed and fuel consumption are summarized in Table 3-6. Further details of the design characteristics of the eight vessels and the design drawings are provided in Appendix I.

Figure 3-1: MARAD Marine Highway Vessel Designs



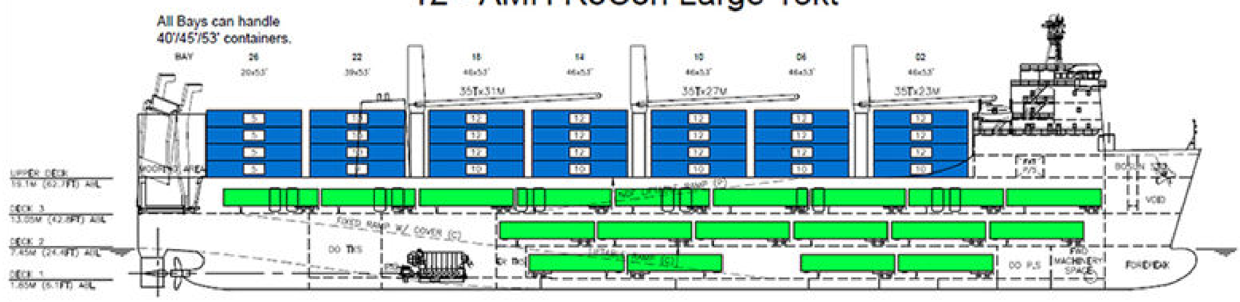
141 Ibid.

05 - AMH RoRo Large 21kt

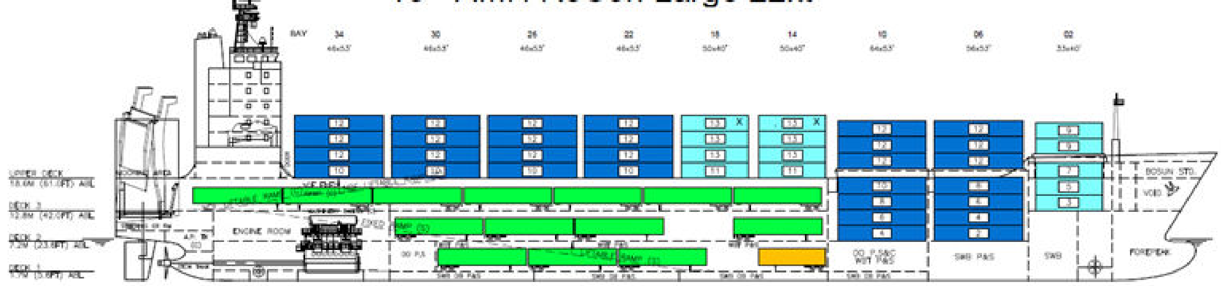


11 - ATB RoCon 14kt

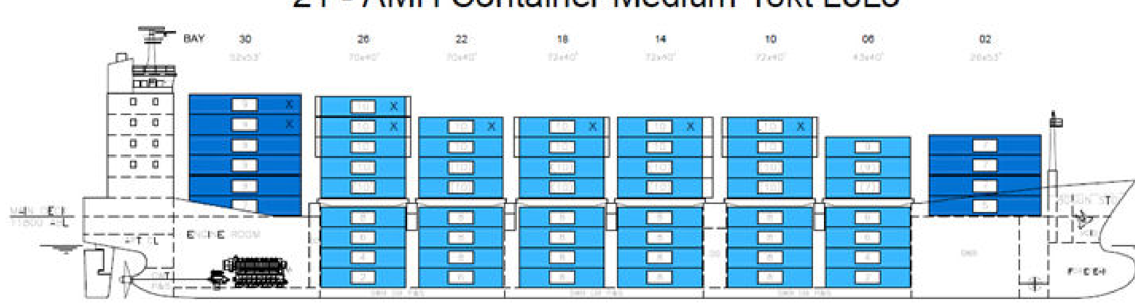
12 - AMH RoCon Large 18kt



13 - AMH RoCon Large 22kt



21 - AMH Container Medium 18kt LoLo



Source: MARAD AMH Vessel Designs

TABLE 3-6: VESSEL PARTICULARS & ROUTE COST MODELING INPUTS

Dimensions	01-RoRo Small 18kt	03-RoRo Med 24kt	04-RoRo Med 20kt	05-RoRo Large 21kt	12-Rocon Large 18kt	13-Rocon Large 22kt	21-Cont Feeder 18 kt	011 - ATB 14 kt Cont/RoRo
LBP (m)	150.2	190.4	175.0	208.6	172.0	187.0	142.4	199.6
LOA (m) - est.	167.7	207.9	183.5	225.7	181.7	201.3	151.7	215.7
Beam (m)	27.0	28.5	29.0	29.5	32.2	32.2	24.8	32.2
Depth (m) (Upper Dk for RoRo)	17.9	23.6	20.8	23.2	18.5	18.6	11.8	13.8
Capacity								
Trailers (53')	71	104	154	203	125	94		50
Trailers (40')						7		
Containers (48-53')	80	151	160	140	289	256	53	
Containers (40'-45')						107	339	376
Total Units	151	255	314	343	414	464	392	426
TEU Capacity (Loaded)	423	714	879	960	1,159	1,208	826	886
Max 53' Trailers	111	203	234	273	180	145	0	0
Speed, Power and Fuel Consumption								
Design Service Speed	18.5	23.7	20.0	21.0	18.3	22.0	18.0	14.0
Service Power (20% Sea Margin)	9,490	22,560	14,740	16,920	13,160	17,600	9,020	8,460
Tons/Day - M.E. @ Sea, 20% SM	45.5	107.6	70.8	80.7	62.8	74.6	41.2	40.6
Tons/Day - M.E. Pilot Transits	24.3	27.3	29.9	29.4	34.6	23.6	23.9	40.6
Tons/Day - M.E. Docking/Maneuv.	9.1	21.5	14.2	16.1	12.6	14.9	8.2	8.1
Tons/Day - Auxiliaries	3.5	4.0	3.5	4.1	3.7	4.6	2.0	2.0

Source: U.S. Maritime Administration, *American Marine Highway Design Project,* October 28, 2011. http://www.marad.dot.gov/documents/AMH_Report_Final_Report_10282011_updated.pdf

After comparing the attributes of each vessel with the service options and associated cargo volumes, the following six vessels were chosen for further analysis for this ECMHI study:

- **Vessel 01**: suitable for smallest markets
- **Vessel 03:** suitable when higher speeds were supported by the itinerary length
- **Vessel 04:** suitable when cargo volumes were large enough to employ economies of scale
- **Vessel 11:** an Articulated Tug Barge, which has low unit operating costs and works most effectively in a high volume, short haul market
- **Vessel 12:** suitable for future when service is more established and market cargo volumes increase
- **Vessel 21:** a pure Lo/Lo vessel has lower capital costs, but requires more developed port facilities, is not well suited for large-volume (45'-53') domestic freight containers, requires more time in port and has higher loading and discharging costs.

Vessels 05 and 13 were not considered since they were generally too large for the markets studied (none of the markets are space-constrained with vessel 04).

The performance capabilities of the selected six vessels were used as variable inputs to define the service pro-formas provided in Appendix J. The vessel performance requirements are based on conceptual services for this study, and therefore specific vessel requirements will need to be evaluated in more detail in conjunction with the establishment of a specific service.

3.4.2 VESSEL COSTS

The ownership and operating costs were analyzed for each of the selected AMH vessels. The results are summarized in Table 3-7, culminating with the total vessel cost per day. This analysis used the acquisition costs in the "*American Marine Highway Design Project*" study. The costs for each vessel include:

- **Ship ownership**: modest equity returns of 8 percent (on 12.5 percent of the acquisition cost) and repayment of debt on the 87.5 percent of acquisition cost that was financed for 25 years at an interested rate of six percent (maximum for Title XI).
- **Ship operations**: crew, consumable supplies, dry-docking and maintenance, insurance, and administration costs.
- **Fuel**: consumption of marine diesel oil (at $1,025/mt or $3.30/gal)
- **Accessorial costs:** costs incurred for making port calls (tugs, pilots, line handlers, dockage, security, agency, etc.).

The operating costs are based on "Comparison of U.S. and Foreign-Flag Operating Costs" published by MARAD in September 2011. The daily costs for capital and operating (without fuel) range from approximately $39,000 per day for the 18kt small Lo/Lo (Vessel 21) to approximately $63,000 per day for the 24kt medium Ro/Ro (Vessel 03).

TABLE 3-7: DAILY CAPITAL AND OPERATING COSTS FOR M-95 VESSELS

Ship Type		01-RoRo Small 18kt	03-RoRo Med 24kt	04-RoRo Med 20kt	11-ATB - 14 kt RoCon	12-Rocon Med 18kt	21-Container Feeder 18 kt
Ship Price (one of 2 ships)		**$128**	**$196**	**$169**	**$123**	**$172**	**$88**
Lower bound estimate		$115	$177	$152	$111	$154	$81
Upper bound estimate		$141	$216	$186	$135	$192	$95
Daily Capital Cost							
Acquis Cost, Millions, 1 of 2 ships		$128	$196	$169	$123	$172	$88
Life, years		25	25	25	25	25	25
Residual Value, %		10%	10%	10%	10%	10%	10%
Equity Investment, $million	**12.5%**	$16.0	$24.5	$21.1	$15.4	$21.5	$11.0
Owner's Cost of Equity	**8.0%**						
Equity Capital Recovery, mill p.a.		$1.7	$2.6	$2.2	$1.6	$2.2	$1.2
Daily Charge - Equity		$4,690	$7,180	$6,190	$4,510	$6,300	$3,230
Debt Portion, $million	**87.5%**	$112.0	$171.5	$147.9	$107.6	$150.5	$77.0
Borrowing Rate	**6.0%**						
Loan Period, Years	**25**						
Annual Payments - $millions		$8.8	$13.4	$11.6	$8.4	$11.8	$6.0
Cost Per Day - Debt	357	$24,540	$37,580	$32,400	$23,580	$32,980	$16,880
Capital Cost Per Vessel - $ Per Day		$29,230	$44,760	$38,590	$28,090	$39,280	$20,110
Estimated Operating Cost Per Day							
Crew		11,820	12,620	12,620	8,200	12,620	13,010
Stores & Lubes		1,250	1,250	1,250	1,090	1,250	920
Maintenance & Drydocking		3,040	3,040	3,040	2,660	3,040	2,510
Insurance		1,050	1,050	1,050	920	1,050	840
Vessel Admin / Management		1,250	1,250	1,250	1,090	1,250	1,260
Operating Per Vessel - $ Per Day		18,410	19,210	19,210	13,960	19,210	18,540
Total Vessel Cost per Day		**$ 47,600**	**$ 64,000**	**$ 57,800**	**$ 42,100**	**$ 58,500**	**$ 38,700**

Source: Mercator International

3.5. MARINE TERMINAL OPERATIONAL AND HANDLING COSTS

Operational costs for both International Longshoreman's Association (ILA) and non-ILA terminals have been estimated for handling Lo/Lo containers and Ro/Ro trailers in each respective U.S. East Coast port region. Costs are based on experience working in these ports, analysis and modeling of operations, and interviews with current and former managers. The results are summarized in Table 3-8.

TABLE 3-8: ESTIMATED TERMINAL HANDLING RATES – PER CONTAINER OR TRAILER, WITH TYPICAL OT INCLUDED

Locations	Region	LoLo Operations				RoRo Operations			
		ILA Terminal		Non-ILA		ILA Terminal		Non-ILA	
		Full	Mty	Full	Mty	Full	Mty	Full	Mty
Portland/N. Bedford	New England / Small	$255	$195			$205	$145		
Boston	New England / Large	$345	$265			$295	$215		
NYNJ	NYNJ (primarily local)	$400	$270			$300	$170		
PHL/Chest/Pauls/Wilm	DelRiver	$280	$200	$205	$205	$230	$150	$150	$150
Balt/NRF	Chesapeake	$345	$265			$295	$215		
Wilm/CHS/SAV/JAX	South Atlantic	$255	$195	$165	$165	$220	$160	$130	$130
Port Canaveral	Cen. Florida	$220	$170	$165	$165	$190	$140	$130	$130
Miami	S. Florida	$220	$170			$190	$140		

Source: Mercator International

"Mty"= empty container

3.6. OTHER COSTS

3.6.1 SERVICE MANAGEMENT COSTS

Service management costs are similar to administrative costs because the M-95 operator would need a senior management team and staff to handle sales and marketing, operations, finance and administration. For the single pair service operations, the minimum staff is estimated to be 27 full-time equivalents, with an annual cost of about $2.9 million (weekly cost of approximately $55,000). For the pendulum services with expanded port coverage, costs would be approximately $60,000 per week. These staffing requirements are estimates and assume that the general manager and the regional directors are performing sales and marketing functions in addition to their management duties. The service management costs are shown in Table 3-9.

TABLE 3-9: ESTIMATED SERVICE MANAGEMENT COSTS ($000S)

Service Management	Annual Cost
Senior Staff (GM & 4 Directors)	$830
Financial and Administration (4 ports, 10 staff)	$600
Sales and Marketing (2)	$160
Operations (4 ports, 10 staff)	$650
Subtotal Staff Costs (27)	$2240
Rent (200sf/per)	$135
Telecoms	$32
Travel	$50
Equipment and Systems	$50
Insurance/Other	$350
Grand Total Per Year	$2857
Cost per Week	**$55**

Source: Mercator International

3.6.2 HARBOR MAINTENANCE TAX

The HMT is a federal tax imposed on shippers based on the value of goods being shipped though ports. The tax is placed in a trust fund to be used for maintenance dredging of federal navigational channels[142]. The analysis assumes that M-95 cargos would be subject to the HMT. It is assumed the typical HMT levy is $50 per load, based on a cargo value of $40,000 per load (using the standard HMT tax rate of 0.125 percent). As the tax is assessed one time on each load, the New Bedford exemption from the HMT is not likely to result in any savings on a domestic shipment, because the other ports in services involving New Bedford do not have an HMT exemption.

3.7. Service Constraints

3.7.1 Transit Time Competitiveness

Transit time competitiveness is important to time-sensitive shippers. For example, a route from New York or Philadelphia to South Florida has a 2nd day morning delivery for trucks and a 3rd day morning delivery for rail.

M-95 services in these corridors will at best be a 3rd day morning delivery, matching the rail service but still a minimum one day slower than truck. Northbound M-95 service to a Mid-Atlantic port would be a 3rd day morning delivery from Canaveral, and a 4th day morning delivery from Miami.

Between the Mid-Atlantic and New England points, next day service is available by truck. M-95 service would offer a 2nd or possibly 3rd day availability, depending on whether intermediate stops are included. Marine highway service will thus be less frequent and less flexible in terms of departure times, with transit times that are suboptimal or no better than current options.

3.7.2 Irregularity of Service Schedules

Regularity of service schedules can be impacted by voyage distance, weather, maintenance or other factors which can affect arrival and departure times. For the short-haul New-England-Mid Atlantic service (Option 1), departure and arrival schedules will vary week by week due to the length of the voyage. In an effort to achieve lowest costs, the analysis assumes a voyage length of four or five days, which means the day-of-the-week for departures and arrivals will not be fixed. This could be avoided by having the ship sit idle, or by extending the voyage to seven days (so that the schedule is repeated consistently each week). These solutions, however, add to the costs. The team had sought to define a workable three-day schedule that could be consistently repeated twice per week and would capture adequate cargo volume, but market volumes were not adequate from any single port pair combination.

3.7.3 Empty Balancing

"Empty balancing" refers to the management of container flows to return empty containers to cargo origin points in the most efficient and least cost way, especially in trades or markets where the preponderance of freight is moving in only one direction. Trucks manage cargo flow imbalances by seeking return cargo even when it requires using "triangle routes" to limit the amount of miles driven without a load. For example, an empty truck in Miami may travel empty to Jacksonville to pick up a load for Atlanta, then go to Chicago to pick up a return load to New York, rather than returning empty to New York directly from Miami. This option would not be readily available for users of an M-95 service because they would not have their own tractors available at the headhaul destination point for use on the triangle return. In this study, it is assumed that shippers are responsible for returning their containers, and so may have understated shipper's costs for using the service.

142 http://www.aapa-ports.org/Issues/USGovRelDetail.cfm?itemnumber=891

3.7.4 SEASONALITY

Some of the cargo flows are seasonal, particularly between the Mid-Atlantic region and Florida. A substantial peak demand is difficult to accommodate in a marine service with a fixed weekly capacity. This could especially be an issue for seasonal reefer cargo, where shipboard reefer capacity is limited. With seasonal cargo flows, it is difficult to maintain a high utilization of service capacity on a regular year-round basis. Seasonality of demand may therefore limit the ability to achieve the high utilization levels assumed in certain analytical scenarios. An operator of an M-95 service would need to carefully evaluate the seasonality of the particular cargo flows being targeted to ensure that expected volumes can be accommodated across the seasons.

3.8. MARINE HIGHWAY SERVICE COSTS

The results of the operational plan including the vessel characteristics and costs and the marine terminal handling costs served as inputs in the modeling of the total service costs. The average cost per load was calculated for each of the nine service deployment options to assist in selecting options for further viability analysis. The cost model considered the cargo volumes (container/ trailer loads) estimated for the M-95 service options, the costs for cargo handling at the ports called by each proposed service, the service management costs, HMT costs and the costs to own and operate suitable vessels and provide regular service on the selected routes. The cost results for the single and multiple pair service options are summarized in Table 3-10 and Table 3-11.

TABLE 3-10: AVERAGE COST PER LOAD – SINGLE PAIR OPTIONS

Voy Option	Ship Type	Capacity Units/Voy	Avg. Speed	Vessel Cost $000/Voy	Voy/ Week'	Vessel Cost $000/wk	Loads / Week Adjusted For Capacity SB	NB	Total	Handling Cost $000/wk	Svce Mgmt $k/wk	HMT (Carrier $k/wk)	Total Cost $000/wk	Average Cost Per Load	Vessel Utilization Recap Loads/Voy SB	NB	Utilization % SB	NB
Single Region-Region Services												$ 50						
Option 1	New Bedford - Portland - Del River - Baltimore - New E						259	278	537	253		per load						
a) 4.0 day	03	255	21.7	519	1.75	908	259	278	537	253	55	27	1,243	$ 2,316	148	159	58%	62%
b) 5.0 day	04	314	15.2	492	2.80	1,377	259	278	537	253	55	27	1,712	$ 3,189	93	99	29%	32%
c) 5.0 day	01	151	15.2	408	2.80	1,142	259	278	537	253	55	27	1,477	$ 2,752	93	99	61%	66%
d) 5.0 day	11	426	13.2	399	2.80	1,116	259	278	537	253	55	27	1,451	$ 2,703	93	99	22%	23%
Option 1a	Boston - Portland- Del River - Baltimore - Boston						246	264	510	256								
a) 4.0 day, vsl 03	03	255	20.6	516	1.75	902	246	264	510	256	55	25	1,238	$ 2,430	141	151	55%	59%
b) 5.0 day, vsl 04	04	314	15.0	503	2.80	1,409	246	264	510	256	55	25	1,745	$ 3,425	88	94	28%	30%
c) 5.0 day, vsl 01	01	151	15.0	423	2.80	1,184	246	264	510	256	55	25	1,520	$ 2,984	88	94	58%	62%
Option 1b	Boston - Portland - Del River - Norfolk - Boston						225	103	328	156								
a) 5.0 day, vsl 04	04	314	18.0	542	2.80	1,517	225	103	328	156	55	16	1,744	$ 5,313	80	37	26%	12%
b) 5.0 day, vsl 01	01	151	17.0	449	2.80	1,256	225	103	328	156	55	16	1,483	$ 4,518	80	37	53%	24%
Option 2	NYNJ - Miami - Port Canaveral - NYNJ						340	133	473	232								
a) 7day, vsl 04	04	314	16.6	748	2	1,495	340	133	473	232	55	24	1,805	$ 3,817	170	66	54%	21%
b) 7day, vsl 01	01	151	16.6	620	2	1,240	272	133	404	198	55	20	1,513	$ 3,742	136	66	90%	44%
c) 7day, vsl 21	21	392	16.1	538	2	1,075	340	133	473	263	55	24	1,416	$ 2,994	170	66	43%	17%
d) 7day, vsl 12	12	414	16.1	694	2	1,388	340	133	473	232	55	24	1,698	$ 3,591	170	66	41%	16%
Option 3	Del River - Miami - Port Canaveral - Del River						134	79	214	90								
a) 7day, vsl 04	04	314	16.2	724	2	1,447	134	79	214	90	55	11	1,602	$ 7,505	67	40	21%	13%
b) 7day, vsl 01	01	151	16.2	594	2	1,188	134	79	214	90	55	11	1,343	$ 6,292	67	40	44%	26%
c) 7day, vsl 21	21	392	15.8	522	2	1,043	134	79	214	98	55	11	1,207	$ 5,653	67	40	17%	10%
d) 7day, vsl 12	12	414	15.8	683	2	1,366	134	79	214	90	55	11	1,521	$ 7,126	67	40	16%	10%

Yellow shaded figures reflect potential volume with 25% market capture.

Blue shaded figures were adjusted to be less than or equal to available capacity for each option.

Source: Parsons Brinckerhoff and Mercator International Analysis

Table 3-11: Average Cost per Load – Multiple Pair Options

Voy Option	Ship Type	Capacity Units/Voy	Avg. Speed	Vessel Cost $000/Voy	Voy/ Week'	Vessel Cost $000/wk	Loads / Week - Adjusted for Capacity By "Destination Region": To Central	To South	Total SB	To Central	To North	Total NB	Grand Total	Handling Cost $000/wk	Svce Mgmt $k/wk	HMT (Carrier $k/wk)	Total Cost $000/wk	Average Cost Per Load	Vessel Utilization Recap: Loads/Voy SB	Loads/Voy NB	Utilization % SB	Utilization % NB
Multiple Region-Region Services																$50/load			Loads on Board - Heavy L			
Option 4	NB - Prtlnd - Del Rvr - Balt - Wilm - Balt - Del Rvr - NB						259	451	710	150	402	552	1263	580								
a) 7day	03	255	21.3	862	2	1,725			710			552	1263	580	60	63	2,428	$ 1,923	226	201	88%	79%
Option 5	NB - Prtlnd - Del Riv - Balt - Charl - Wilm - Balt - NB						259	469	728	86	491	578	1306	598								
a) 7day	03	255	22.0	902	2	1,804			718			545	1263	579	60	63	2,506	$ 1,983	230	230	90%	90%
Option 6	NB - Prtlnd - Del Riv - Nrflk - Charl - Wilm - Nrflk - Del Riv - NB						244	467	711	259	326	585	1296	579	***Not feasible in 7 days with 24 kt speeds; Need to reduce port coverage as in options below.***							
a) 7.9 day	03	255	24.0	1,080	2	2,159			703			571	1274	569								
Option 7	NB - Prtlnd - Del Rvr - Nrflk - Sav - Nrflk - NB						244	12	256	64	138	202	458	210								
a) 7 day	03	255	19.9	896	2	1,792			256			202	458	210	60	23	2,084	$ 4,552	124	69	48%	27%
Option 8	NB - Prtlnd - Del Rvr - Balt - Mia - Pt. Can - Balt - Del Rvr - NB						259	286	545	104	336	440	984	444								
a) 10.5day	04	314	17.1	1,124	2	2,249			545			440	984	444	60	49	2,802	$ 2,846	171	168	54%	53%
b) 10.5day	01	151	17.1	978	2	1,956			475			376	851	383	60	43	2,442	$ 2,871	136	136	90%	90%
Option 9	NB- Prtlnd - NYNJ - Nrflk - Mia - Pt.Can - Nrflk - NYNJ - NB						59.8	471	531	146	121	267	798	379								
a) 10.5day	04	314	16.5	1,111	2	2,221			531			267	798	379	60	40	2,700	$ 3,382	236	102	75%	32%
b) 10.5day	01	151	16.5	1,005	2	2,011			332			267	599	284	60	30	2,385	$ 3,984	136	102	90%	67%

* 3 ships operating on 10.5 day schedules provide 2 sailings per week

Yellow shaded figures reflect potential volume with 25% market capture.

Blue shaded figures were adjusted to be less than or equal to available capacity for each option.

Source: Parsons Brinckerhoff and Mercator International Analysis

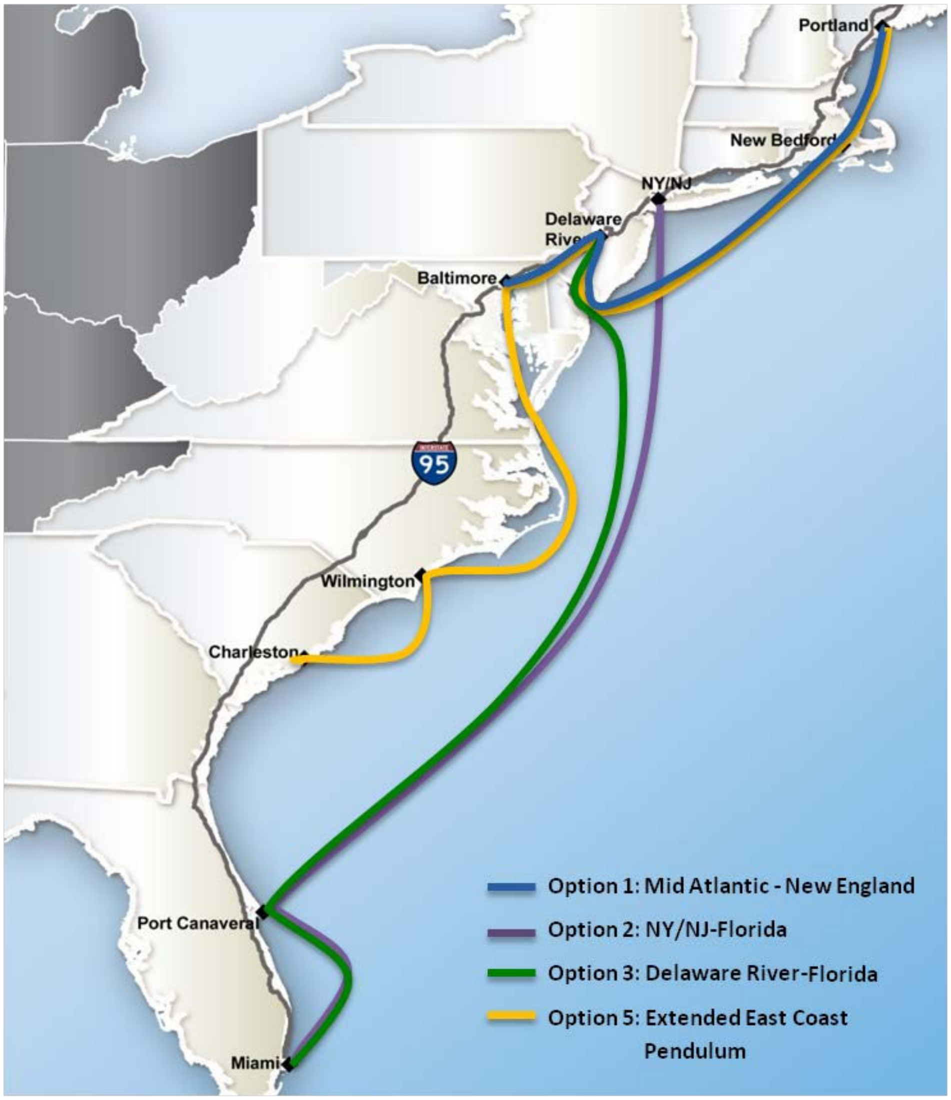
Of the three single pair service options, the Mid Atlantic–New England Option 1 has the most favorable average cost per load at $2,316 using vessel 03, primarily due to the shorter length of haul. Due to the low cargo volumes linked to the Mid-Atlantic to Florida service options 2 and 3 and the longer haul, the average costs per load are significantly higher.

For the pendulum services, the lowest average cost per load is seen in Options 4 and 5 at $1,923 and $1,982 respectively using vessel 03. As would be expected, the vessel utilization for these services is very high, resulting in lower average costs per load. The findings illustrate the importance of ensuring that the cargo sufficiently fills the capacity of the vessel in both directions. In other words, the higher the utilization of the vessel space, the lower the average cost per load, which results in a greater profit potential for the service.

Based on the findings of this initial cost analysis, four service options (Figure 3-2) were selected for further evaluation of viability:

- Option 1, the short-haul loop linking New England and Mid-Atlantic ports, with a focus on New Bedford and Baltimore.
- Options 2 and 3, the two long-haul East Coast routes linking New York (or Delaware River) markets with Florida.
- Option 5, a "pendulum" serving both short and long-haul markets, linking New England, Delaware River/Chesapeake Bay, and South East ports.

FIGURE 3-2: SELECTED M-95 SERVICE OPTIONS



Source: Parsons Brinckerhoff

The estimated cargo loads for each selected service option reflect current market volumes and do not take into account future growth, other cargo markets outside the scope of this study, and increased diversion as the Marine Highway services become more established – all of which could lead to additional cargo loads and increased utilization of the vessels.

It is therefore useful to consider the effects of higher cargo volume levels on the service costs for these four ECMHI services. In order to equitably compare the service costs of each service, a sensitivity analysis on vessel utilization was applied uniformly to each vessel assigned to a service option. A vessel utilization of 90 percent in both directions was tested as the most optimistic scenario, although natural imbalances in cargo flows make it unlikely to ever carry the same high volumes in both directions. A lower and perhaps more realistic vessel utilization of 65 percent in both directions was also evaluated for each option. These sensitivity analyses should be considered as 'optimal' scenarios that may be difficult to replicate in an actual service.

TABLE 3-12: AVERAGE COST PER LOAD RESULTING FROM SENSITIVITY ANALYSIS OF VESSEL UTILIZATION

Service Opt / Voy Duration	Vessel Type	Sailings / Week	Base 25% Mkt Capture / Max 90% Util	Force Utilization to 65% (Both Directions)	Force Utilization to 90% (Both Directions)
Option 1	**Portland - New Bedford - Del River - Baltimore - Portland**				
a) 4.0 day	vsl 03	1.7	2,298	2,182	1,721
b) 5.0 day	vsl 04	2.8	3,210	1,773	1,425
c) 5.0 day	vsl 01	2.8	2,770	2,698	2,093
d) 5.0 day	vsl 11	2.8	2,687	1,277	1,067
Option 2	**NYNJ - Miami - Port Canaveral - NYNJ**				
a) 7day	vsl 04	2.0	3,818	2,878	2,229
b) 7day	vsl 01	2.0	3,741	3,838	2,922
c) 7day	vsl 21	2.0	3,009	1,729	1,421
d) 7day	vsl 12	2.0	3,672	1,961	1,588
Option 3	**Del River - Miami - Port Canaveral - Del River**				
a) 7day	vsl 04	2.0	7,507	2,310	1,799
b) 7day	vsl 01	2.0	6,293	3,636	2,757
c) 7day	vsl 21	2.0	5,695	1,628	1,328
d) 7day	vsl 12	2.0	7,206	1,870	1,503
Option 5	**Nw Bed - Prtlnd - Del Riv - Balt - Charl - Wilm - Balt - Nw Bed**				
a) 7day	vsl 03	2.0	1,981	2,347	1,970

Source: Mercator International

Greater vessel utilization rates result in lower average costs per load for those options that did not already have 90 percent vessel utilization, as can be seen in Table 3-12. This is based on capturing 25 percent of the FAF market. In the 65 and 90 percent sensitivity analysis, Option 1 maintains the lowest average cost per load. At 90 percent utilization, the average cost per load for Option 1 using vessel 11 is $1,067, or $1,620 less per load than the base cost analysis.

The average costs per load for Option 2 is reduced by approximately $1,500 to $2,000 when achieving 90 percent vessel utilization. The lowest average cost per load for Option 2 is $1,421 using vessel 21.

Even more remarkable is the $3,000 to $5,700 decline on the cost per load for Option 3 when increasing the utilization of the vessel to 90 percent. The lowest average cost per load for Option 3 is $1,328 using vessel 21. The considerable differences in these costs indicate to what extent the viability of a service is influenced by variations in cargo volumes and vessel capacity utilization.

The cost analysis for Option 5, vessel 03 increases by approximately $300 per load when the vessel is 65 percent utilized since the vessel was already 90 percent utilized in the base analysis.

It is important to note that by equalizing the utilization for each vessel and assuming that cargo volumes would fill the vessel to 65 or 90 percent capacity in both directions, the service costs become independent of the estimated cargo volumes (which were notably based on an uncertain market demand for the services). In addition, any assumptions related to cargo volumes (e.g. capture rate, weight conversion, etc.) do not impact the findings of the financial analysis for these sensitivity scenarios.

3.9. Modal Comparison

The propensity of a shipper to choose Marine Highway services as their preferred transportation mode is impacted by cost and a range of service factors such as reliability and transit time. Of these factors, reliability is the most subjective. Reliability can be influenced by variation in transit time, frequency of transportation service, flexibility of distribution networks, or many other factors. Ultimately, however, it reflects the shipper's confidence that cargo will consistently arrive at its specified destination on schedule, in good condition, and at predictable rates.

Transit time is important in determining how goods move because "time is money." Higher-value products tend to be shipped on faster routes and services, with the most valuable goods shipped by air, if possible.

Transportation cost is often the most important criteria that influence shippers' decisions when choosing a shipment mode. All-water routing can be particularly attractive for transporting lower-value products, for which longer transit times are less important than the net transportation costs. Even in the case of low and moderate value products, however, reliability is still important, particularly when the all-water leg serves as part of an "inventory in transit" management system.

The role of each of these factors is significant in determining the viability of any service. The travel distances, transit times and costs were compared between the three modes of transportation (truck, rail and water) for the port pairs served by the four different service options. In order to contrast the three different modes, the M-95 service options were divided into four northern East Coast origins and five southern East Coast destinations.

3.9.1 Variations in Location by Mode

In some instances, the truck and rail origins or destinations were different than those for the Marine Highway service. For example, the intermodal yard location for New Bedford is designated as Worcester, MA for moving cargo to/from Baltimore and Wilmington, and in Allston, MA for moving cargo to/from Charleston. Table 3-13 lists the intermodal rail yards presented in the cost model with respect to the port location:

Table 3-13: Port Nodes and Respective Location of Rail Intermodal Ramps

Port Location	Intermodal Rail Ramp Location
New Bedford	Worcester, MA or Boston (Allston)
Wilmington, NC	Charlotte, NC
Delaware River	Philadelphia or Philadelphia/Greenwich
Canaveral	Orlando
NY/NJ	Kearny, NJ or North Bergen, NJ

The identified rail intermodal ramps are centrally located in the market regions being examined and not necessarily the closest terminals to ports. For example, the Orlando intermodal rail ramp is centrally located to the largest market served by Port Canaveral, although it is not the closest intermodal ramp to the port.[143]

[143] NS offers an intermodal ramp in Titusville, FL that is approximately 18 miles from Port Canaveral. FEC has also re-opened its intermodal ramp in Cocoa, which is approximately 12 miles from Port Canaveral.

For two locations in the trucking segment, Delaware River and Northern New Jersey/New York, a nearby major distribution area was used rather than port locations. Table 3-14 lists the locations used with respect to the corresponding port nodes:

Table 3-14: Port Nodes and Respective Trucking Location

Port Location	Trucking Points
Delaware River	Pureland Industrial Complex, Exit 10, I-295
NY/NJ	New Jersey Turnpike, Exit 8A (Cranbury, NJ)

For this analysis, rail intermodal costs were calculated using U.S. Rail Desktop's cost model. U.S. Rail Desktop derives the railroad cost information from many financial sources using algorithms similar to those used by the major railroads. Rail cost information was available for all port regions except for the area between Boston, Massachusetts and Portland, Maine, which has limited rail service. In order to provide comparable estimates for each mode, the data for any rail routes to/from Portland, Maine were estimated based on Amtrak mileage between Boston and Portland (115 miles)[144] at an estimated operating rate of $0.70 per mile, with a travel time of approximately two hours as shown in Table 3-15.

Table 3-15: Estimated Rail Characteristics for Boston – Portland, Maine Route

Boston – Portland	
Miles	115
Cost per Mile	$0.70
Trip Cost	$80.50
Trip Time	2 hrs

3.9.2 Assumptions

The following assumptions were used to calculate the distances, transit times and/or costs for the three transportation modes:

Drayage: For movement of cargo by water and rail, it was assumed that freight would be transported by truck (drayed) twice during the voyage. A 50-mile dray was assumed from the cargo origin to the selected East Coast port location or intermodal rail ramp, and a second 50-mile dray was assumed from the destination port or intermodal terminal to the ultimate cargo destination. The drayage cost was estimated at $3 per mile, or $150 per dray, and a transit time of 1.5 hours per dray. In brief, the drayage component added 100 miles, $300, and approximately three hours to the Marine Highway and intermodal rail service.

Truck service: Truck routing maximized interstates and highways with preference given to interstates if the route was longer but the route time was shorter. The truck door-to-door service time assumed that the truck averages 50 miles per hour and operates for 11 hours per day. This is the maximum allowable on-duty driving hours in a given day (550 miles/day). The long haul truck cost of operations was estimated to be $1.491/mile.[145]

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144 http://www.railpassengerusa.com/routes/downeaster.php, accessed 20 January 2012

145 American Transportation Research Institute, "An Analysis of the Operational Costs of Trucking: A 2011 Update," p. 11

Marine service: The Marine Highway service distance, time and cost data was calculated based on notional port-to-port pairings along the service routes, rather than on the entire loop or pendulum service. This approach, while operationally unrealistic, provided for a more equitable comparison between Marine Highway service and truck and rail, which operate on a point-to-point service model.

TRAVEL DISTANCES

Table 3-19 provide the travel distances between East Coast origins and destinations for a movement by each mode in a given service route.

TABLE 3-16: MODAL COMPARISON OF TRAVEL DISTANCE (MILES) – SERVICE 1

Service 1 By Distance (miles)		Delaware River			Baltimore		
		Truck	Rail	Marine	Truck	Rail	Marine
Portland	Truck	365			510		
	Rail		600			684	
	Marine			493			648
New Bedford	Truck	317			396		
	Rail		485			569	
	Marine			355			465

Source: Parsons Brinckerhoff Analysis

TABLE 3-17: MODAL COMPARISON OF TRAVEL DISTANCE (MILES) – SERVICE 2

Service 2 By Distance (miles)		Canaveral/Orlando			Miami		
		Truck	Rail	Marine	Truck	Rail	Marine
NY/NJ	Truck	1,054			1,240		
	Rail		1,221			1,478	
	Marine			1,028			1,159

Source: Parsons Brinckerhoff Analysis

TABLE 3-18: MODAL COMPARISON OF TRAVEL DISTANCE (MILES) – SERVICE 3

Service 3 By Distance (miles)		Canaveral/Orlando			Miami		
		Truck	Rail	Marine	Truck	Rail	Marine
Delaware River	Truck	991			1,176		
	Rail		1,136			1,393	
	Marine			918			1,049

Source: Parsons Brinckerhoff Analysis

TABLE 3-19: MODAL COMPARISON OF TRAVEL DISTANCE (MILES) – SERVICE 5

Service 5 By Distance (miles)		Baltimore			Wilmington			Charleston		
		Truck	Rail	Marine	Truck	Rail	Marine	Truck	Rail	Marine
Portland	Truck	510			922			1,086		
	Rail		681			1,231			1,269	
	Marine			684			922			1013
New Bedford	Truck	396			808			972		
	Rail		566			1,116			1,154	
	Marine			465			729			840
Delaware River	Truck	N/A - Distance is significantly less than 400 miles			493			657		
	Rail					709			747	
	Marine						529			610

Source: Parsons Brinckerhoff Analysis

On average, the marine route is shorter than the rail travel distances and longer than the truck travel distances. In nearly all the cases, the rail distance is greater than the truck and Marine Highway service distances. While the distance that a Marine Highway vessel must travel is sometimes longer than the distance that a truck or railcar must travel, its ability to take advantage of economies of scale with larger payloads of cargo can result in a cost-competitive option for shippers.

3.9.3 TRANSIT TIMES

Roadway transit times are general and provided by open source mapping software. These times assume normal traffic and roadway conditions. Approximate rail transit times were provided by U.S. Rail Desktop's cost model and Parsons Brinckerhoff analysis.

The marine transit times are dependent upon the assumed design speed for each vessel type. There are some circumstances whereby slower speeds are required, northbound (NB) speeds maybe slower than southbound (SB) speeds. The assumed vessel speeds are provided in Table 3-20. These speeds are used to provide a baseline. Actual speeds are dependent upon the direction of travel, sea conditions, traffic density, etc.

Table 3-20: Average Vessel Speed by Vessel Type and MH Service Option

Service	Vessel	Knots
Option 1	11	14
Options 2 and 3 (SB)	21	18
Options 2 and 3 (NB)	21	16
Option 5	03	22

Table 3-21 to Table 3-24 provide the travel times between East Coast origins and destinations for a movement by each mode in a given service route.

Table 3-21: Modal Comparison of Transit Times (in days) – Service 1, Vessel 11

Service 1 By Time (days)		Delaware River			Baltimore		
		Truck	Rail	Marine	Truck	Rail	Marine
Portland	Truck	0.66			0.93		
	Rail		2.48			2.68	
	Marine			1.48			1.98
New Bedford	Truck	0.58			0.72		
	Rail		2.40			2.60	
	Marine			1.07			1.32

Source: Parsons Brinckerhoff Analysis

Table 3-22: Modal Comparison of Transit Times (in days) – Service 2, Vessel 21

Service 2 By Time (days)		Canaveral/Orlando			Miami		
		Truck	Rail	Marine	Truck	Rail	Marine
NY/NJ	Truck	1.92			2.25		
	Rail		3.80			4.30	
	Marine			3.01			3.02

Source: Parsons Brinckerhoff Analysis

Table 3-23: Modal Comparison of Transit Times (in days) – Service 3, Vessel 21

Service 3 By Time (days)		Canaveral/Orlando			Miami		
		Truck	Rail	Marine	Truck	Rail	Marine
Delaware River	Truck	1.80			2.14		
	Rail		3.60			4.10	
	Marine			2.97			3.25

Source: Parsons Brinckerhoff Analysis

TABLE 3-24: MODAL COMPARISON OF TRANSIT TIMES (IN DAYS) – SERVICE 5, VESSEL 3

Service 5 By Time (days)		Baltimore Truck	Baltimore Rail	Baltimore Marine	Wilmington Truck	Wilmington Rail	Wilmington Marine	Charleston Truck	Charleston Rail	Charleston Marine
Portland	Truck	0.93			1.68			1.97		
	Rail		2.68			3.68			3.68	
	Marine			2.19			3.49			3.96
New Bedford	Truck	0.72			1.47			1.77		
	Rail		2.60			3.60			3.60	
	Marine			1.32			2.55			2.77
Delaware River	Truck	N/A This journey is less than 400 miles			0.90			1.19		
	Rail					2.80			2.90	
	Marine						2.29			2.76

Source: Parsons Brinckerhoff Analysis

3.9.4 OPERATIONAL COSTS

Transportation costs are the fundamental component of rates charged to shipping customers and can be built up from individual costs components such as handling costs, fuel usage, and capital expenses. In general, costs provide a long-range floor on which the actual rates charged to customers are based. Rates fluctuate widely based on short-term economic and demand conditions, while costs can be somewhat more stable. Given the large role that fuel plays in transportation costs, oil prices can also cause significant changes in costs and thus in rates.

For each mode, certain fixed and variable costs (such as rate of fuel consumption, cost of machinery, federal and state licensing costs, and permitting requirements) were generalized to provide a benchmark that compares each mode's relative cost.

The marine service costs are dependent upon the assumed vessel type and service route. Table 3-25 presents a few of most economical vessels for the respective Marine Highway service option and the total associated service cost based on a 90 percent vessel utilization, which were used to calculate the costs for individual legs of the journey under optimal conditions.

TABLE 3-25: MH COST PER LOAD BY SERVICE OPTION AND VESSEL TYPE

Service	Voyage Itinerary	Vessel	Cost/Load*
Option 1	NwBdfrd. – Prtlnd. – Del. River – Balt. – NwBdfrd.	11	$1,367
Option 2	NY/NJ – Miami – Canaveral – NY/NJ	12	$1,888
Option 3	Del. River – Miami – Canaveral – Del. River	21	$1,628
Option 5	NwBdfrd. – Prtlnd. – Del. River – Balt. – Charl. - Wilm. – Balt. – NwBdfrd.	03	$2,268

Source: Mercator International and Parsons Brinckerhoff Analysis
*Includes $300 drayage cost.

The data contained Table 3-26 to Table 3-29 was based on general operating costs for each mode. The daily operating costs were then used as the basis for determining the relative cost per load to transport a given cargo bound for a specific destination by each means of conveyance. The rail operating costs were dependent upon a number of variables and are calculated individually for each journey. Since the marine costs were broken down into one-way port to port routes, these operating costs were estimated on a cost per mile basis of a full service but do not reflect the actual cost to operate a loop or pendulum service.

TABLE 3-26: MODAL COMPARISON OF COST FOR SERVICE 1 PORT PAIRS

Service 1 O/D Pairs By Cost per Load		Delaware River			Baltimore		
		Truck	Rail	Marine	Truck	Rail	Marine
Portland	Truck	$546			$763		
	Rail		$810			$853	
	Marine			$864			$1,087
New Bedford	Truck	$475			$593		
	Rail		$729			$772	
	Marine			$666			$824

Source: Mercator International and Parsons Brinckerhoff Analysis

TABLE 3-27: MODAL COMPARISON OF COST FOR SERVICE 2 PORT PAIRS

Service 2 O/D Pairs By Cost per Load		Canaveral/Orlando			Miami		
		Truck	Rail	Marine	Truck	Rail	Marine
NY/NJ	Truck	$1,578			$1,856		
	Rail		$1,117			$1,263	
	Marine			$1,182			$1,306

Source: Mercator International and Parsons Brinckerhoff Analysis

TABLE 3-28: MODAL COMPARISON OF COST FOR SERVICE 3 PORT PAIRS

Service 3 O/D Pairs By Cost per Load		Canaveral/Orlando			Miami		
		Truck	Rail	Marine	Truck	Rail	Marine
Delaware River	Truck	$1,482			$1,760		
	Rail		$1,077			$1,215	
	Marine			$1,054			$1,174

Source: Mercator International and Parsons Brinckerhoff Analysis

TABLE 3-29: MODAL COMPARISON OF COST FOR SERVICE 5 PORT PAIRS

Service 5 O/D Pairs By Cost per Load		Baltimore			Wilmington			Charleston		
		Truck	Rail	Marine	Truck	Rail	Marine	Truck	Rail	Marine
Portland	Truck	$763			$1,380			$1,626		
Portland	Rail		$853			$1,195			$1,209	
Portland	Marine			$1033			$1,335			$1,446
New Bedford	Truck	$593			$1,210			$1,455		
New Bedford	Rail		$772			$1,114			$1,128	
New Bedford	Marine			$758			$1,089			$1,229
Delaware River	Truck	N/A This journey is less than 400			$738			$984		
Delaware River	Rail	N/A This journey is less than 400				$838			$857	
Delaware River	Marine	N/A This journey is less than 400					$838			$940

Source: Mercator International and Parsons Brinckerhoff Analysis

The results presented above summarize the relative costs of shipping cargos via Marine Highway service (under what can be considered optimal conditions of 90 percent vessel utilization in both directions) as compared to the trucking and rail modes that currently dominate the shipment of domestic cargo along the East Coast.

The tables demonstrate that the cost competitiveness of each mode varies depending upon distance traveled and specific port pairs involved in the service. While there are some exceptions to this trend, for longer hauls (such as NY-NJ to Miami), marine transit tends to be more cost effective than trucking, with the opposite being the case for shorter hauls. Where rail transportation was available for the service origin and destination pairs evaluated in this study, it typically costs less than that of the marine mode. However, the rail and marine modal costs for routes greater than 1,000 miles were comparable.

In determining the potential viability of a service, conclusions cannot be drawn from costs alone. In the following section, the analyses turn to matters of shipping rates, which when compared with the costs developed in this section, allow for some conclusions to be drawn as to the potential profitability of the service options being considered.

SECTION 4: BUSINESS PLAN AND VIABILITY

The business plan and viability analysis evaluated the prospective financial performance of the specific vessel operations described in Section 3. A revenue forecast was prepared for the selected service options by examining and quantifying:

- Competitive rates currently offered for truck and/or intermodal rail service,
- Minimum discount from those rates that would likely be required by M-95 shippers to justify switching their cargo to a new transportation mode,
- Corresponding rates an M-95 service could charge, and
- Weekly revenue an M-95 service could achieve predicated on volume and vessel utilization assumptions of 65 and 90 percent.

Once the information was compiled and analyzed, a high-level "base case" profit and loss summary was created for each service under specified assumptions. Once the "base case" was established, profitability was examined under alternative sets of assumptions that were both favorable and unfavorable to the profitability of the service.

4.1. ESTIMATED M-95 RATES

The study team interviewed shippers and 3PLs to determine current market rates for truck and intermodal rail service in each service lane. The estimated rates for the M-95 service required to competitively capture cargo volume were then calculated based on competitive rail and truck rates, assuming:

- A ten percent discount versus the current competitive mode.
- If the competitive mode is truck (which provides door to door service), the cost of the local drays between the ports' marine terminals and the ultimate cargo origin or destination is deducted from the rate for the M-95 service, in recognition that the M-95 services as evaluated do not include this door-to-door delivery service.
- All rates include a fuel surcharge.

The estimated M-95 rates are summarized in Table 4-1, which includes the following columns:

- **Load Port:** port where the container is loaded
- **Load Reg:** region where the container is loaded
- **Disch Port:** port where the container is discharged
- **Disch Reg:** region where the container is discharged
- **Direction:** southbound ("SB") or northbound ("NB")
- **Comp Mode:** lists the most competitive mode of transportation ("rail" or "truck") versus water for the specified route
- **Comp Rate:** lists the rate for the selected competitive mode
- **ECMH Disc.:** lists the calculated ten percent discount from the competitive rate
- **Local Dray:** deducts $300 from the competitive rate if the competitive mode selected is truck
- **ECMH Rate:** sum of the competitive rate, ECMH discount and local dray columns

TABLE 4-1: ECMH RATES BY PORT PAIR

ECMH Rates By Port Pair Load Port	Load Reg	Disch Port	Disch Reg	Dir-ection	Comp Mode	Comp Rate	ECMH Disc.	Local Dray	ECMH Ocean Rate
							-10%	-300	
Baltimore	MidAtl	Charleston	SEast	SB	Rail	850	-85	0	**765**
Baltimore	MidAtl	New Bedford	NewEngl	NB	Truck	617	-62	-300	**255**
Baltimore	MidAtl	Portland	NewEngl	NB	Truck	789	-79	-300	**410**
Baltimore	MidAtl	Wilmington	SEast	SB	Truck	800	-80	-300	**420**
Canaveral	Florida	Del River	MidAtl	NB	Rail	1050	-105	0	**945**
Canaveral	Florida	NYNJ	MidAtl	NB	Rail	1050	-105	0	**945**
Charleston	SEast	Baltimore	MidAtl	NB	Rail	700	-70	0	**630**
Charleston	SEast	Del River	MidAtl	NB	Rail	778	-78	0	**700**
Charleston	SEast	New Bedford	NewEngl	NB	Rail	983	-98	0	**885**
Charleston	SEast	Portland	NewEngl	NB	Rail	1200	-120	0	**1080**
Del River	MidAtl	Canaveral	Florida	SB	Rail	1300	-130	0	**1170**
Del River	MidAtl	Charleston	SEast	SB	Rail	889	-89	0	**800**
Del River	MidAtl	Miami	Florida	SB	Rail	1300	-130	0	**1170**
Del River	MidAtl	Portland	NewEngl	NB	Truck	650	-65	-300	**285**
Del River	MidAtl	Wilmington	SEast	SB	Rail	722	-72	0	**650**
Miami	Florida	Del River	MidAtl	NB	Rail	1050	-105	0	**945**
Miami	Florida	NYNJ	MidAtl	NB	Rail	1050	-105	0	**945**
New Bedford	NewEngl	Baltimore	MidAtl	SB	Truck	800	-80	-300	**420**
New Bedford	NewEngl	Charleston	SEast	SB	Rail	1100	-110	0	**990**
New Bedford	NewEngl	Wilmington	SEast	SB	Rail	950	-95	0	**855**
NYNJ	MidAtl	Canaveral	Florida	SB	Rail	1380	-138	0	**1242**
NYNJ	MidAtl	Miami	Florida	SB	Rail	1380	-138	0	**1242**
Portland	NewEngl	Baltimore	MidAtl	SB	Truck	950	-95	-300	**555**
Portland	NewEngl	Charleston	SEast	SB	Rail	1460	-146	0	**1314**
Portland	NewEngl	Del River	MidAtl	SB	Truck	800	-80	-300	**420**
Portland	NewEngl	Wilmington	SEast	SB	Rail	1250	-125	0	**1125**
Wilmington	SEast	Baltimore	MidAtl	NB	Truck	583	-58	-300	**225**
Wilmington	SEast	Del River	MidAtl	NB	Rail	694	-69	0	**625**
Wilmington	SEast	New Bedford	NewEngl	NB	Rail	850	-85	0	**765**
Wilmington	SEast	Portland	NewEngl	NB	Rail	1020	-102	0	**918**

Source: Mercator International and Parsons Brinckerhoff Analysis

4.2. SENSITIVITY ANALYSIS

The analysis performed in Section 3 provided the assumptions and parameters that form the base case scenario. In addition to the Base Case, alternative assumptions which are "Favorable" and "Unfavorable" to the profitability of the service were tested. Base Case assumptions are reiterated in Table 4-2, along with input assumptions that varied for the favorable and unfavorable cases (with changes highlighted). Each variable input was increased or decreased to ascertain the impact on voyage profitability.

Table 4-2: Overview of Sensitivity Assumptions

Overview of Sensitivity Assumptions	Base Case	Alternate Case: Unfavorable	Alternate Case: Favorable
Fuel Cost (MDO/MGO), $/mt	$1,025	$1,230	$1,025
Vessel Mortgage Interest Rate	6%	8%	6%
Assumed Return on Vessel Equity	8%	18%	8%
Handling Cost	ILA Costs	ILA Costs	Reduced Costs
Cargo Density, Ton/Ld	20	20	16
Local Port Drayage Total $/Ld	$300	$300	$200

Source: Mercator International

4.2.1 Sensitivity Analysis Factors

The following factors were key variable inputs used in the sensitivity analysis.

Utilization

As discussed in Section 3, three levels of vessel capacity utilization were considered for each set of inputs used in the base case and favorable / unfavorable alternatives, which are listed below:

1. Capturing 25 percent of the market (based on FAF volumes), up to the limit of 90 percent vessel utilization
2. Achieving 90 percent vessel utilization in both directions (the 90 percent case was included to test whether an option could possibly be viable under the best/most optimistic assumptions)
3. Achieving 65 percent vessel utilization in both directions

Cargo Volumes

As an approximation, the available base case cargo volume was estimated by converting the FAF tonnage at the rate of 20 tons per container or trailer. This assumes higher weight cargos will be the likely cargos for M-95 service. To test the sensitivity of a lower average weight per container or trailer, container/trailer counts in the "favorable" sensitivity were estimated using 16 tons per load, which increases the number of loads on a given service.

Handling Costs

A set of alternative port handling costs, between $60 to $75 per load lower than prevailing costs, were assumed while testing the impact on service viability of calling at smaller terminals or ports with reduced handling costs. These lower costs are rough estimates, because achieving such lower costs will depend on the results of service negotiations.

Local Port Drayage

A total local port dray cost of $300 per load is assumed based on an average 50 mile origin and 50 mile destination transport at $3 per mile. Given the variability of ECMHI port locations, the origin and/or destination of the cargo may be closer to the port or the trucking rate could be less than $3 per mile. To test the effect of a lower cost local truck dray, a total dray cost of $200 was calculated in the "favorable" sensitivity.

4.3. Service Viability Overview And Results

The scenario overview and results from the sensitivity analysis using the four best performing options are shown in Table 4-3. The weekly financial performance results are based on charging the estimated M-95 rates listed in Table 4-1 and an assumed 'steady-state' operation (after ramping-up to specified volume levels). The table includes weekly profit or loss figures for the base case, favorable and unfavorable sensitivities with different utilization levels. The detailed service profit and loss summaries are provided in Appendix K.

As indicated by the bracketed numbers, none of the potential service options generate a positive profit. The option with the return closest to breaking even is Option 3 at an operating loss of $213,000 per week (which translates to a loss of $151 per load). This option uses the Lo/Lo container vessel 21 from Delaware River – Miami – Port Canaveral – Delaware River, sails twice a week and reflects the favorable sensitivity assumptions with a forced vessel utilization of 90 percent in both directions.

Table 4-3: Summary Results of Service Viability Analysis

Profit (Loss) - $000s per Week											
Service/ Duration	Vessel Type	Sailings/ Week	Base Case	Unfavorable Sensitivity	Favorable Sensitivity	Base Case	Unfavorable Sensitivity	Favorable Sensitivity	Base Case	Unfavorable Sensitivity	Favorable Sensitivity
	Volume Case		25% Mkt Capture / to Max 90% Util			Force Utilization to 65% (Both Directions)			Force Utilization to 90% (Both Directions)		
Option 1	**Portland - New Bedford - Delaware River - Baltimore - Portland**										
a) 4 day	vsl 03	1.7	(1,038)	(1,197)	(906)	(1,042)	(1,201)	(911)	(1,076)	(1,235)	(895)
b) 5 day	vsl 04	2.8	(1,528)	(1,763)	(1,396)	(1,621)	(1,857)	(1,358)	(1,690)	(1,925)	(1,326)
c) 5 day	vsl 01	2.8	(1,291)	(1,473)	(1,159)	(1,292)	(1,474)	(1,166)	(1,325)	(1,507)	(1,150)
d) 5 day	vsl 11	2.8	(1,247)	(1,537)	(1,207)	(1,400)	(1,690)	(1,142)	(1,491)	(1,782)	(1,098)
Option 2	**NYNJ - Miami - Port Canaveral - NYNJ**										
a) 7day	vsl 04	2.0	(1,258)	(1,523)	(1,105)	(1,183)	(1,449)	(1,094)	(1,042)	(1,308)	(918)
b) 7day	vsl 01	2.0	(1,050)	(1,255)	(978)	(1,077)	(1,282)	(1,024)	(994)	(1,199)	(920)
c) 7day	vsl 21	2.0	(875)	(1,036)	(732)	(647)	(808)	(510)	(462)	(622)	(271)
d) 7day	vsl 12	2.0	(1,189)	(1,434)	(1,045)	(934)	(1,179)	(788)	(738)	(983)	(537)
Option 3	**Delaware River - Miami - Port Canaveral - Delaware River**										
a) 7day	vsl 04	2.0	(1,371)	(1,628)	(1,306)	(1,023)	(1,280)	(925)	(838)	(1,095)	(703)
b) 7day	vsl 01	2.0	(1,112)	(1,310)	(1,047)	(1,013)	(1,211)	(965)	(924)	(1,122)	(859)
c) 7day	vsl 21	2.0	(984)	(1,125)	(923)	(581)	(674)	(459)	(382)	(451)	(213)
d) 7day	vsl 12	2.0	(1,306)	(1,547)	(1,246)	(875)	(1,115)	(746)	(665)	(905)	(486)
Option 5	**New Bedford - Portlnd - Delaware River - Baltimore - Charleston - Wilmington - Baltimore - New Bedford**										
a) 7day	vsl 03	2.0	(1,609)	(1,919)	(1,393)	(1,625)	(1,935)	(1,409)	(1,506)	(1,816)	(1,290)

Source: Mercator International

To assess the economic feasibility of the services relative to weekly costs and revenues, the "best" case conditions under the base case and 25 percent market capture rate (up to 90 percent utilization) and under the favorable case with a forced 90 percent utilization for each of the four service options were summed and compared and are provided in Table 4-4.

Table 4-4: Best Case Ongoing Revenues

Sensitivity/ Volume Case	Best Case Options	1- New England <-> Mid-Atlantic	2- NY/NJ <-> Florida	3 - Del. River <-> Florida	5- East Coast Pendulum
Base Case with 25% Mkt Capture	Vessel	03 -Ro/Ro Med 24 kt	21 – Lo/Lo Feeder 18 kt	21 – Lo/Lo Feeder 18 kt	03 -Ro/Ro Med 24 kt
	Cost/Week ($000s)	$(1,234)	$(1,423)	$(1,216)	$(2,506)
	Revenue/ Week ($000s)	$196	$548	$232	$897
	Net/ Week ($000s)	$(1,038)	$(875)	$(984)	$(1,609)
	Rev/Cost Week ($000s)	**16%**	**39%**	**19%**	**36%**
Favorable Case with 90% Utilization in both Directions	Vessel	03 -Ro/Ro Med 24 kt	21 – Lo/Lo Feeder 18 kt	21 – Lo/Lo Feeder 18 kt	03 -Ro/Ro Med 24 kt
	Cost/Week ($000s)	$(1,266)	$(1,814)	$(1,705)	$(2,507)
	Revenue/ Week ($000s)	$371	$1543	$1,492	$1,217
	Net/ Week ($000s)	$(895)	$(271)	$(213)	$(1,290)
	Rev/Cost Week ($000s)	**29%**	**85%**	**88%**	**49%**

Source: Mercator International and Parsons Brinckerhoff Analysis

For the relatively short-haul New England – Mid Atlantic service using vessel 03, the weekly revenue is projected to be 16 to 29 percent of the service costs. The extended East Coast pendulum service has a somewhat higher revenue to cost ratio of 36 to 49 percent with the same vessel. The longer-haul services between New York/New Jersey or Delaware River to Florida, both using vessel 21, have projected revenues that represent between 19 percent to 88 percent of costs depending on service, volume (utilization) and sensitivity case.

It is no surprise that the "most economical" vessel alternative for these services is the Lo/Lo container vessel 21. When fully utilized, the vessel cost/load is well below the cost for the Ro/Ro alternatives. However, there are a number of commercial factors with this vessel (or other Lo/Lo vessels that may be considered) including:

- Capacity is based primarily on 40/45 foot containers, which are less attractive than the 53' x 102' domestic trailers because of the large reduction in volume capacity. Rates for these smaller containers will be lower than rates for the 53' trailers.
- Heavy use of containers requires a solution for chassis supply, which will add to the cost and complexity faced by shippers.
- Use of Lo/Lo vessels requires more developed terminals that are typically handling international cargo.

For these reasons, the team identified the second most economical vessel (Ro/Ro vessel 01 or RoCon vessel 12) servicing Options 2 and 3 in Table 4-5, to provide a more comprehensive view of the prospective vessels that can serve the long-haul markets, and in recognition of the market and operational limitations characteristic of a Lo/Lo vessel. This information also allows a potential service provider to evaluate the service viability under the operation of a more representative M-95 vessel.

TABLE 4-5: OPTIONS 2 AND 3 BEST CASE ONGOING REVENUES – COMPARISON OF VESSELS

Sensitivity/ Volume Case	Best Case Options	2- NY/NJ <-> Florida	2- NY/NJ <-> Florida	3 - Del. River <-> Florida	3 - Del. River <-> Florida
Base Case with 25% Mkt Capture	Vessel	21 – Lo/Lo Feeder 18 kt	01 – Ro/Ro Small 18 kt	21 – Lo/Lo Feeder 18 kt	01 – Ro/Ro Small 18 kt
	Cost/Week ($000s)	$(1423)	$(1,513)	$(1,216)	$(1,344)
	Revenue/ Week ($000s)	$548	$463	$232	$232
	Net/ Week ($000s)	$(875)	$(1,050)	$(984)	$(1,112)
	Rev/Cost Week ($000s)	**39%**	**31%**	**19%**	**17%**
Favorable Case with 90% Utilization in both Directions	Vessel	21 – Lo/Lo Feeder 18 kt	12 –RoCon Large 18kt	21 – Lo/Lo Feeder 18 kt	12 –RoCon Large 18kt
	Cost/Week ($000s)	$(1,814)	$(2,166)	$(1,705)	$(2,062)
	Revenue/ Week ($000s)	$1,543	$1,630	$1,492	$1,576
	Net/ Week ($000s)	$(271)	$(537)	$(213)	$(486)
	Rev/Cost Week ($000s)	**85%**	**75%**	**88%**	**76%**

Source: Mercator International and Parsons Brinckerhoff Analysis

The second best case (vessel) for Options 2 and 3 include Ro/Ro vessel 01 or RoCon vessel 12 depending on sensitivity case and volume scenario. The difference in revenue to cost ratios between the vessels is relatively low, ranging from only two percent to 12 percent.

Table 4-6 presents the revenue to cost ratio per load for the selected "best" case services. The results of the comparison of the revenue to cost ratio by load are equivalent to the ratios by week, with one notable exception. For the New England – Mid Atlantic service, the revenue to cost ratio increases to 48 percent of the per load cost when using vessel 11 at 90 percent capacity under a favorable sensitivity. This is due to the higher cargo carrying capacity of vessel 11 (nearly three times larger than vessel 03), which results in greater economies of scale.

TABLE 4-6: BEST CASE PER LOAD

Sensitivity/ Volume Case	Best Case Options	1- New England <-> Mid-Atlantic	2- NY/NJ <-> Florida	2- NY/NJ <-> Florida*	3 - Del. River <-> Florida	3 - Del. River <-> Florida*	5- East Coast Pendulum
Base Case with 25% Mkt Capture	Vessel	03 -Ro/Ro Med 24 kt	21 – Lo/Lo Feeder 18 kt	01 – Ro/Ro Small 18 kt	21 – Lo/Lo Feeder 18 kt	01 – Ro/Ro Small 18 kt	03 -Ro/Ro Med 24 kt
	Cost/Load	$(2,298)	$(3,009)	$(3,741)	$(5,695)	$(6,293)	$(1,981)
	Revenue/ Load	$364	$1,159	$1,145	$1,086	$1,086	$709
	Net/Load	$(1,934)	$(1,850)	$(2,597)	$(4,609)	$(5,206)	$(1,272)
	Rev/Cost per Load	**16%**	**39%**	**31%**	**19%**	**17%**	**36%**
Favorable Case with 90% Utilization in both Directions	Vessel	11 – RoCon ATB 14 kt	21 – Lo/Lo Feeder 18 kt	12 –RoCon Large 18kt	21 – Lo/Lo Feeder 18 kt	12 –RoCon Large 18kt	03 -Ro/Ro Med 24 kt
	Cost/Load	$(982)	$(1,286)	$(1,453)	$(1,208)	$(1,383)	$(1,575)
	Revenue/ Load	$467	$1,094	$1,094	$1,058	$1,058	$765
	Net/Load	$(515)	$(192)	$(360)	$(151)	$(326)	$(810)
	Rev/Cost per Load	**48%**	**85%**	**75%**	**88%**	**76%**	**49%**

*2nd Best Case Vessel

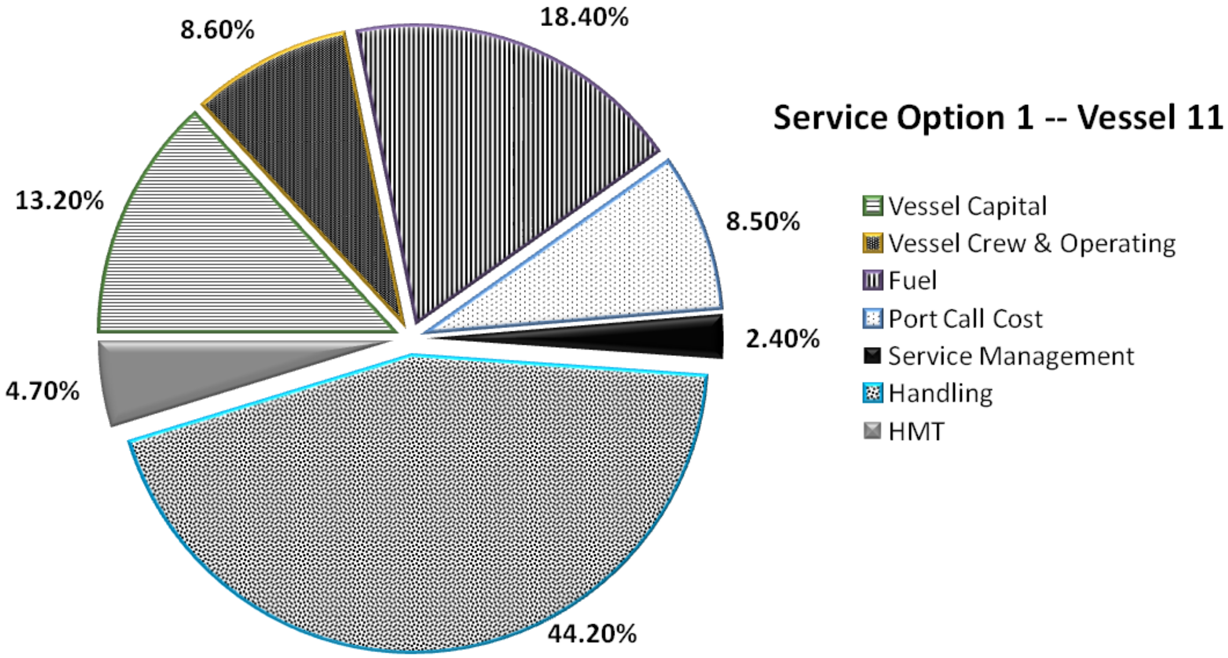
Source: Mercator International and Parsons Brinckerhoff Analysis

Based on the aggressive operating assumptions of high potential volumes, favorable operating costs and weight values, and balanced movements, each of the potential services identified in the study would currently operate at a loss per week and loss per load on an ongoing basis without changes in market conditions, short and/or long-term financial support from external sources, or a combination of the two.

Changes in market conditions and other external factors could improve the viability of the service to the point at which a self-sustaining service (defined as break-even or better) is possible. In looking at means to reduce service costs so as to have a more viable service, consideration must be given to the impact of each cost component on the total cost per load.

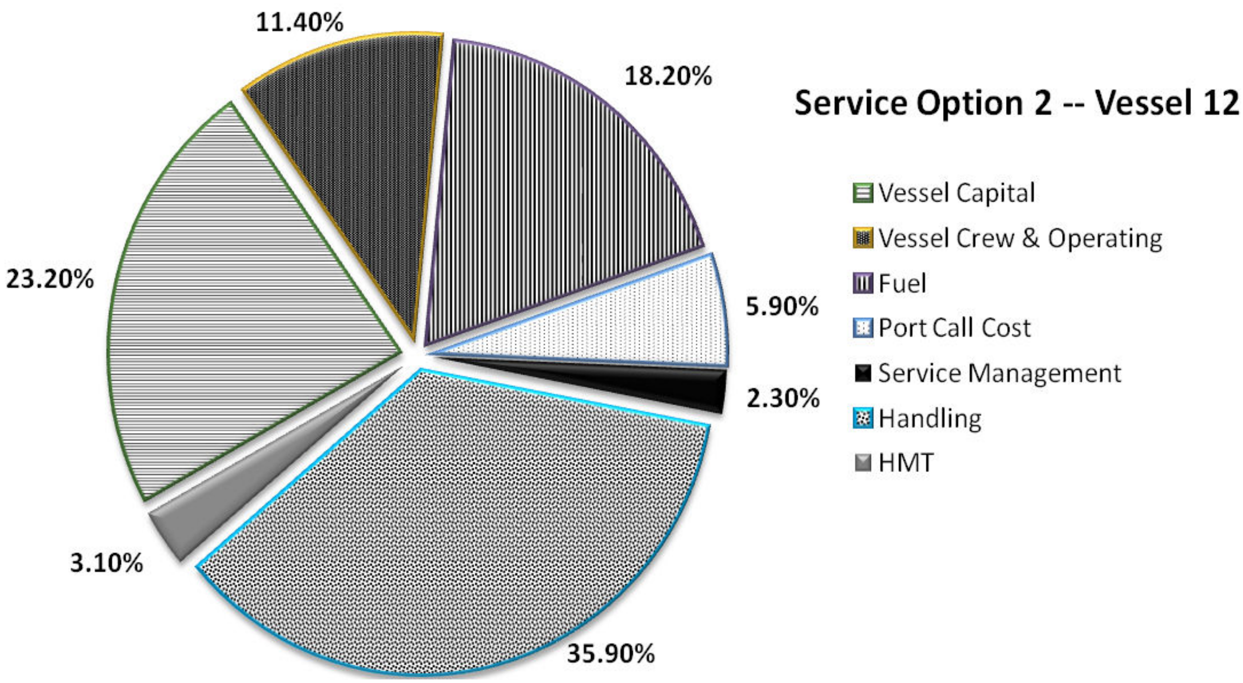
Figures 4-1 through Figure 4-4 present the percentage allocation of costs per load for each “best” base case service option with 90 percent vessel capacity utilization.

FIGURE 4-1: BREAKDOWN OF SERVICE COSTS BY PERCENTAGE – OPTION 1, VESSEL 11



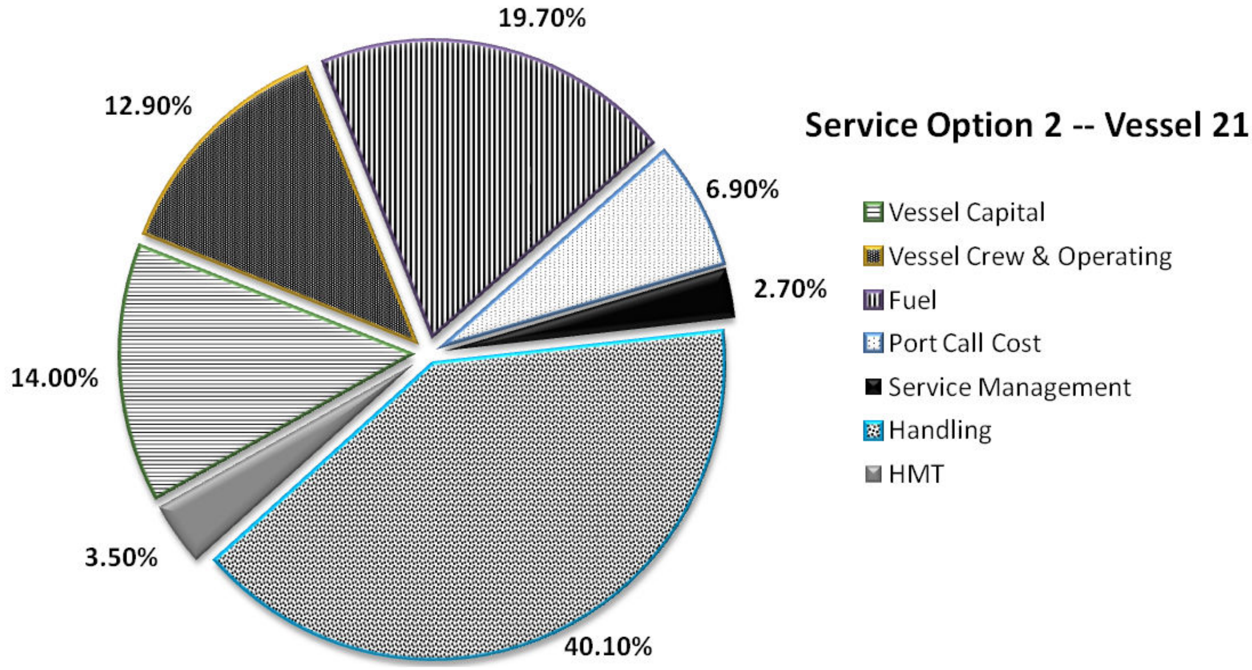
Source: Mercator International and Parsons Brinckerhoff Analysis

FIGURE 4-2: BREAKDOWN OF SERVICE COSTS BY PERCENTAGE – OPTION 2, VESSELS 12



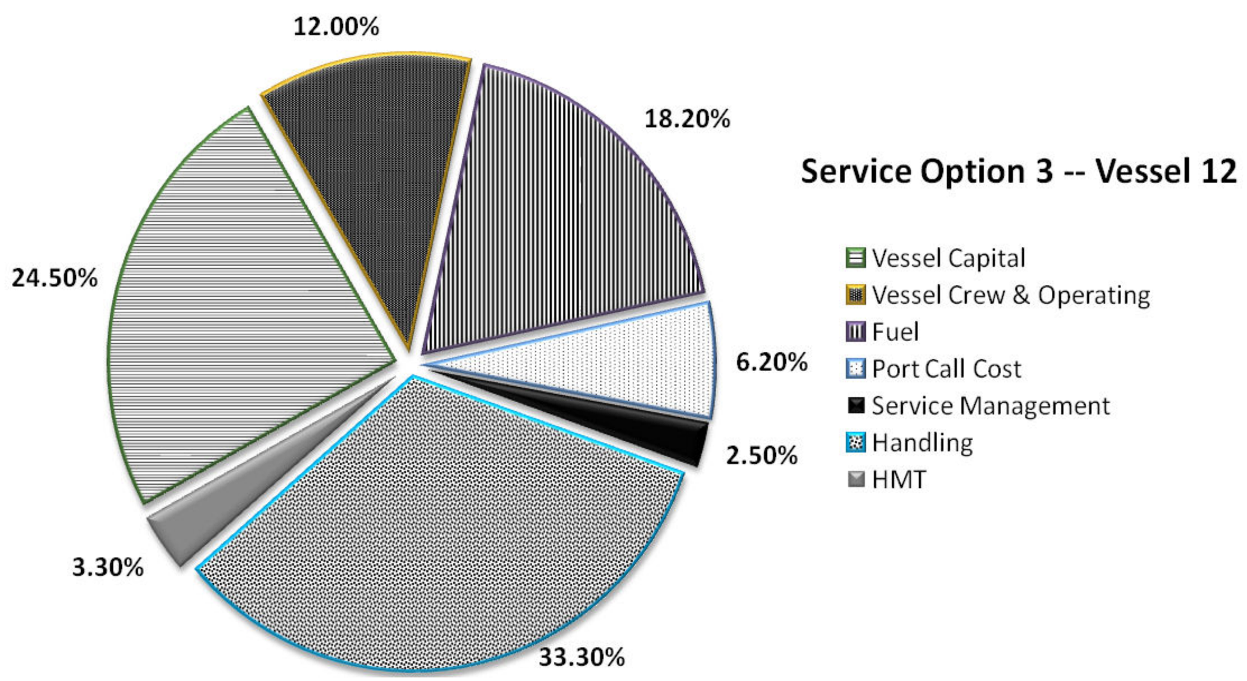
Source: Mercator International and Parsons Brinckerhoff Analysis

FIGURE 4-3: BREAKDOWN OF SERVICE COSTS BY PERCENTAGE – OPTION 2, VESSEL 21



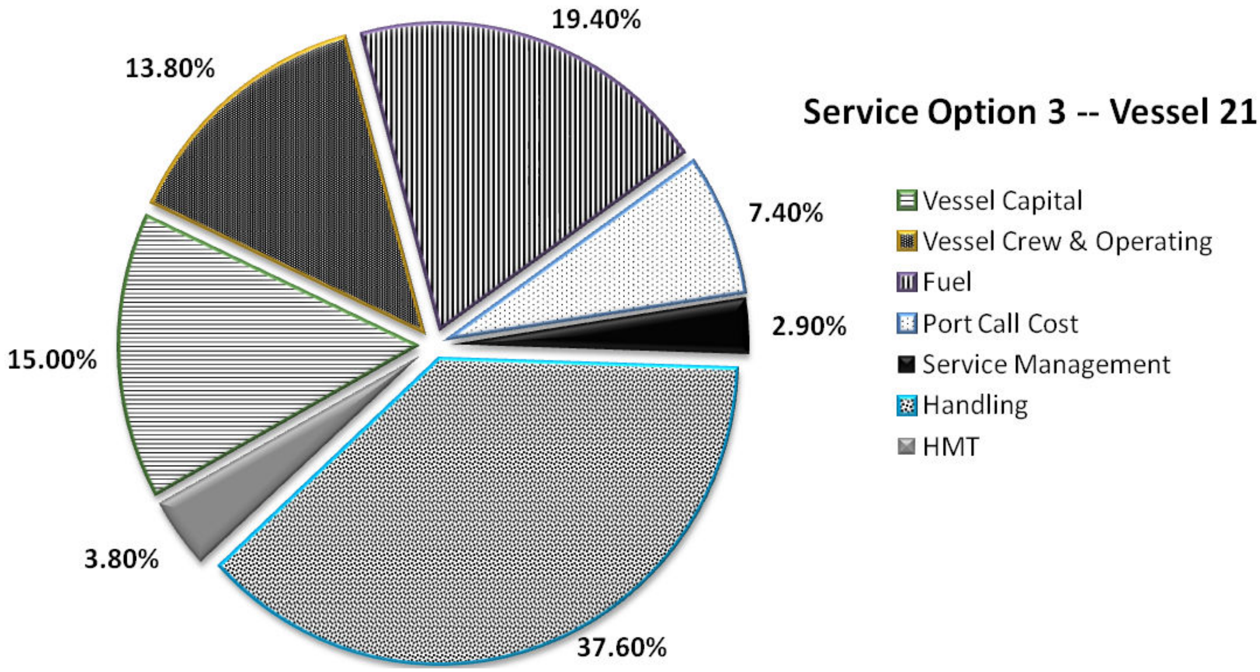
Source: Mercator International and Parsons Brinckerhoff Analysis

FIGURE 4-4: BREAKDOWN OF SERVICE COSTS BY PERCENTAGE – OPTION 3, VESSEL 12



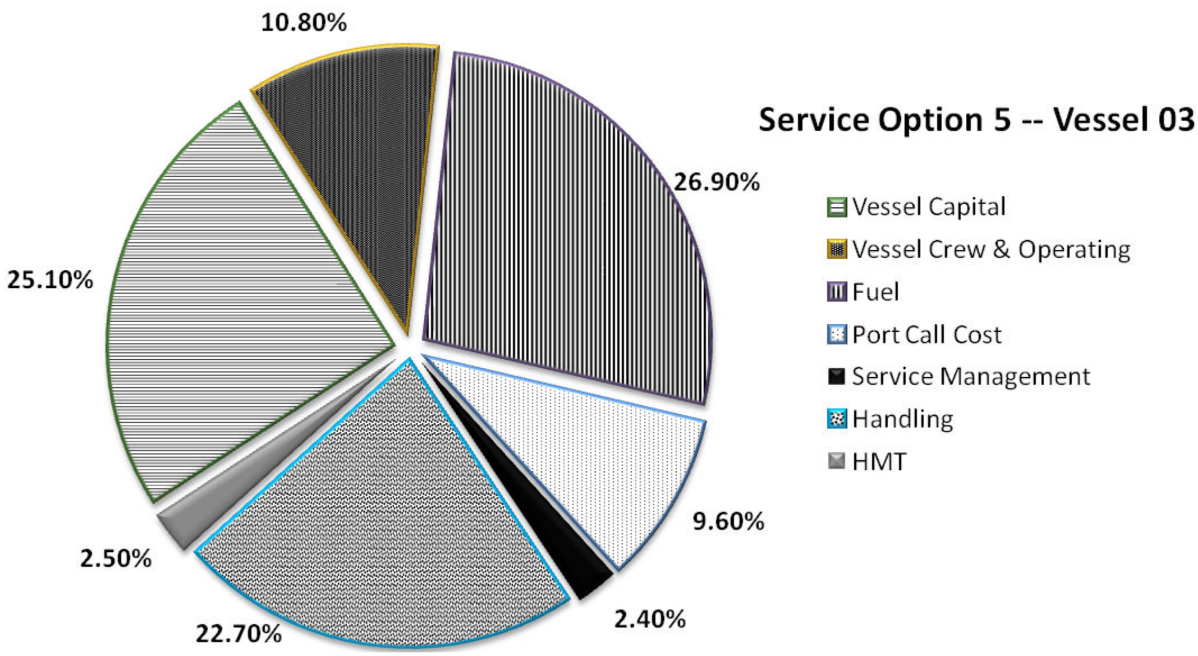
Source: Mercator International and Parsons Brinckerhoff Analysis

FIGURE 4-5: BREAKDOWN OF SERVICE COSTS BY PERCENTAGE – OPTION 3, VESSEL 21



Source: Mercator International and Parsons Brinckerhoff Analysis

FIGURE 4-6: BREAKDOWN OF SERVICE COSTS BY PERCENTAGE – OPTION 5, VESSEL 03



Source: Mercator International and Parsons Brinckerhoff Analysis

Overall port call and handling costs represent the highest percentage of the service cost, with vessel and fuel costs also having a significant impact. Although not included in the figures, it is recognized that drayage is also a significant cost component of the total service cost. Since drayage costs are not a cost to be paid by the ship operator, local drayage costs were not included in the ship operator's P&L and not reflected in the cost allocation breakdown. Cargo interests pay the cost to deliver cargo to the marine terminal, and having done so, will be willing to pay less to the ship operator. In other words, the local dray reduces the amount a customer would be willing to pay for the port-to-port service.

For this analysis, the drayage cost has been estimated at $300 per load. Total service costs for the four "best" favorable case, 90 percent utilization services range from roughly $1,000 to $1,500 per load. Based on these figures, drayage costs represent approximately 20 to 30 percent of the total door-to-door cost depending on the service option.

Surprisingly there is little deviation in the percentage breakdown of the total costs for the shorter New England – Mid Atlantic service and the longer Mid Atlantic to Florida services. The reduction in the handling costs in Option 5 is largely offset by the increase in the fuel cost, as a result of making additional port calls along the route.

Based on the results, it appears that for one or more of the potential services to be economically viable, changes must occur in the underlying Marine Highway service cost and/or revenue structures—or for the truck and rail alternatives—that reduce the gap between the Marine Highway service and the truck or rail alternative by at least $200 per load.

Nevertheless, Marine Highway services that are sustainable and commercially-viable (defined as having revenue to cost ratio of 100 percent or better) may present themselves upon further analysis of the following characteristics:

- Encompasses a wider geographic scope (e.g. East and Gulf Coast),
- Transports heavier weight and/or hazardous cargos that garner higher rates for existing transport modes,
- Provides service between a maximum of three ports, and
- Employs dual-use vessels partially funded by the U.S. government.

In Section 5, factors that could reduce the gap between cost and revenue for the M-95 services are addressed, along with findings and conclusions for the ECMHI study.

SECTION 5: FINDINGS AND CONCLUSION

The opportunity to shift containerized or trailer load freight traffic from congested highways and augment capacity in the Nation's supply chains has stimulated significant interest in Marine Highway service development.

Numerous past studies have explored the feasibility of establishing coastal and inland services in the U.S., with particular focus on the anticipated economic and sustainability benefits and market potential. However, the existence of cargo volumes of freight and commodities is only the starting point in determining whether a market for such services exist, which ports it may involve, and whether the services can be competitive. Often ignored is that demand for coastal domestic shipping services is driven by economic sustainability.

Thus, the intent underlying this study was not primarily to derive a service from demand, but rather to examine the financial and operational environment under which Marine Highway services can thrive. The analysis presented in this report shows that with current economic conditions and cost and revenue structures, the ECMHI services that were identified as most promising are uneconomical to operate at this time. Service operating costs exceeded expected revenues by a minimum of $150-200 per load on average along the highest performing routes, under the favorable sensitivity and highest utilization level.

These findings may affirm why the private sector may not have developed ongoing Marine Highway services to date or why other similar services have not achieved self-sustainability in the past. The findings also provide a roadmap of what is needed to stimulate and nurture domestic Marine Highway service development.

The development of these self-sustaining services along the U.S. Atlantic Coast is very much dependent on altering the financial conditions and interconnected operating and political environment under which they operate. Historically, each emerging freight mode in the U.S. has been conceived from necessity and vision, and then established with some degree of financial investment of public agencies.. Initial investments in existing freight modes (rail freight, trucking and air cargo) and favorable governmental policies eventually led to robust private sector supported operations. Based on the findings, Marine Highway services would similarly benefit through initial nurturing.

5.1. FINANCIAL STRATEGIES

The following are cost reducing and/or revenue generating measures that, if implemented, could influence the potential profitability of an M-95 service:

5.1.1 VESSEL CAPITAL COSTS

Reduce vessel capital costs – On average, vessel construction costs are the third largest cost contributor to an M-95 service. To the extent that a portion of these capital costs are paid by the federal government as part of defense-related benefits, capital costs for use of these dual-use ships in Marine Highway service utilization could be somewhat reduced.

Based on the vessel capital costs developed in the *"American Marine Highway Design Project"* study[146] and service cost analyses performed as part of this study by the Parsons Brinckerhoff team, vessel costs range from 13 to 25 percent of total service costs (depending on the service pattern and vessel utilized). A governmental cost share of one form or another equating to a 50 percent reduction in vessel capital costs attributable to an M-95 service would result in a reduction in overall service costs of seven to 13 percent.

5.1.2 PORT HANDLING COSTS

***Reduce port handling costs as a share of total operating costs**.* Overall cargo handling at ports accounted for the largest share (23 to 44 percent) of total operating costs for the potential M-95 services evaluated. The cost of handling Ro/Ro cargo at East Coast ports ranges from $140 to $300 per unit. If these costs were lowered to the level evaluated as part of the favorable sensitivity case used in this study (approximately 25 percent less), total service costs could be reduced by six to 11 percent.

5.1.3 FUEL

Increase rates as fuel costs rise over time. As marine vessels are more fuel efficient than rail and truck transportation, service rates and revenues could be increased more than direct fuel costs, while still remaining competitive with truck and rail, thereby closing the revenue/cost gap for an M-95 service. Fuel consumption costs were generally the second highest portion (18 to 27 percent) of service costs. The fuel efficiency of a loaded truck is estimated to be approximately 155 ton-miles of freight per gallon, rail is approximately 413 ton-miles of freight per gallon, and marine (tug and barge) is approximately 576 ton-miles per gallon of fuel.[147]

In addition, the proposed AMH vessels designs are fuel efficient, using low sulfur fuel, which will further increase energy efficiencies compared to land-based modes. On average, trucks are about 70 percent less fuel efficient than domestic waterway vessels and trains are about 25 percent less fuel efficient based on revenue ton-miles per gallon. If fuel prices increase by 30 percent (e.g. $3.90 to $4.68 for diesel), the cost impact to marine transportation will be over eight percent lower than to rail transportation and about 22 percent lower than to the trucking industry.

Reduce operating costs through use of liquefied natural gas (LNG) fuel - The use of LNG fuel might be an option for reducing fuel–related vessel-operating costs by about 30 percent, as well as benefit the environment. In the past ten years, LNG has successfully been introduced as fuel for coastal ships in Northern Europe, particularly in the short sea shipping market. There are more than 20 LNG-powered vessels currently in service globally and more being developed, including tugboats, offshore vessels, high-speed ferries, LNG carriers, and Ro/Ro and container ships.[148,149] An operating cost benefit of LNG power is its typically longer service life and longer maintenance cycles than those required by marine diesel oil and diesel engines. Det Norske Veritas (DNV)[150]

146 MARAD, 2011, p. 35. http://www.marad.dot.gov/documents/AMH_Report_Final_Report_10282011_updated.pdf

147 Texas Transportation Institute, Center for Ports and Waterways, A Modal Comparison of Domestic Freight Transportation Effects on the General Public, prepared for the U.S. DOT, MARAD, and National Waterways Foundation, December 2007, p. 42.

148 "Short sea shipping is the ideal case for LNG fuel," Det Norske Veritas, http://www.dnv.com/press_area/press_releases/2010/shortseashippingistheidealcaseforlngfuel.asp, accessed January 23, 2012

149 "Use of LNG as marine fuel gathers pace", 2012. *LNG World Shipping*, January/February, 34-40.

150 DNV (Det Norske Veritas) is an independent foundation headquartered in Oslo, Norway with the objective of safeguarding life, property and the environment.

estimates that over the operating life of the vessel, at today's gas rates, LNG fuel would save more than $4 million over CO_2 scrubbers and $12 million for low sulfur fuel.[151]

5.1.4 Competitive M-95 Rates

Increase M-95 rates in relation to higher transportation rates for competing truck and rail modes –Whether influenced by rising fuel costs, shortages in the supply of truck drivers resulting from work hour rules, rail congestion, or other factors, an increase in the rates for competing modes would offer the potential for Marine Highway service rates to increase proportionately while still remaining at the assumed ten percent discount to prevailing modes. The financial analysis presented in Section 4 is based on prevailing rate figures and additional supporting data available at the time of writing. Market rates are influenced by numerous factors, and future rates may differ considerably from the current values.

As an example, The Journal of Commerce recently reported that truckload rates are expected to rise ten percent in 2012 according to a transportation economist at FTR Associates.[152] The projected increase is due to rising operational costs, higher "domestic freight and exports combined with tight truckload capacity." Such an increase would allow service operators to increase rates by the same percent for those routes served by trucks.

The potential exists for Marine Highway service rates to move up with those of competing modes without an associated increase in service costs.

5.1.5 Taxes

Eliminate HMT on certain domestic cargos -Domestic shippers using a Marine Highway service would be assessed HMT along a service route. The tax makes it difficult for an M-95 service to compete with trucking and rail, which are not subject to HMT. The elimination of the applicability of HMT to domestic intermodal cargos has been discussed in a number of studies, as well as in the U.S. DOT report to Congress.[153]

Some cargos on vessels are already exempt from the tax such as fresh caught fish and goods for consumption in Hawaii, Alaska and territories. The HMT is not charged on cargo in ports where channels have not required construction, operation or maintenance by the Corps of Engineers since 1977. Also, Massachusetts law allows a tax credit against the amount paid for HMT on specific cargo in Boston and a few other ports of the Commonwealth. On the other hand, the HMT is applied in most M-95 ports on imports entering the country, as well as cargo moved between American ports. This tax is estimated to represent about three to five percent of the cost of a service in this study, therefore the successful elimination of HMT applicability to cargos transported on a Marine Highway service would result in an equivalent reduction in costs to the shipper. The impact of eliminating the HMT is already represented under the favorable sensitivity case used in this study.

Modify the tonnage tax law – When Congress enacted the Tonnage Tax provision in 2004[154], the purpose was to help U.S. flag operators become more competitive in the foreign trades by lessening the income tax burden to be more on a par with that incurred by their foreign competition.

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151 "Greener shipping in North America," Det Norske Veritas, http://www.dnv.com/resources/reports/greener_shipping_north_america.asp, accessed January 23, 2012

152 http://www.joc.com/truckload/truckload-rates-rise-10-percent-2012-ftr-says, accessed Dec. 6, 2011.

153 America's Marine Highway, April 2011, p. 63

154 American Jobs Creation Act of 2004 (Public Law 108-357)

Qualified vessels that operate in the Puerto Rican trade are included in the terms of the tonnage tax but those same vessels could not also serve the contiguous U.S. maritime trades and retain the favorable tax status. If the tonnage tax law was changed, a U.S. flagged vessel that serves Puerto Rico could be allowed to carry cargo between U.S. coastal ports without jeopardizing its favorable tax status.

5.1.6 INCENTIVES

Create tax or other incentives to support and promote the use of marine transportation and offset costs – Financial incentives in the form of M-95 user tax breaks, carbon credits, or other types of governmental funding could be offered to encourage shippers and logistics providers, including truckers, to opt for Marine Highway service routes. These incentives would be premised, and awarded based on the public (economic and environmental) benefits resulting from the use of those services and quantified according to nationally set standards. Such incentives would be most useful and justified in the early years of Marine Highway service development, or an individual operation's service, with the long term objective of self-sustaining operations.

Examples of incentives that could be created specifically to support new Marine Highway operations or related vessel technology:

- A tax credit for the adoption of low emission, alternative fueled power plants in new vessel construction or retrofits of existing vessels. This financial assistance also could be extended to vessels that, while not specifically intended for Marine Highway service, operate substantially within the designated North American ECA, 200 nautical miles from the coastline.

- A sellable, tradable tax credit could be used to reward users of, or investors in, Marine Highway services to support new operations that meet specific sustainability criteria. The credits, which could be applied beyond the marine mode, could be used by a certified provider of sustainable freight services or be transferred to customers of that service, thereby fostering use of alternative logistics services, clean fuels, and energy saving technologies for domestic goods movement. Necessary to this incentive would be establishing mechanisms for certifying a freight service provider, quantifying the public benefits, and auditing performance.

- A tax credit that could be applied to new vessel construction specific to Marine Highway service. This credit could be in combination with Title XI financing, or not, with the combined policy objective of encouraging recapitalization of domestic-service qualified vessels while stimulating domestic shipyard construction activity for a new market.

- Coupled with the potential use of LNG for Marine Highway vessels, a program to encourage the installation of LNG distribution facilities in ports could be modeled on state or Federal level programs to incentivize land vehicle alternative fueling stations. The benefits of cleaner natural gas fuel are stimulating the adoption of LNG for powering vessels in other markets, such as Europe, and are being actively considered in the Navy/MARAD dual use initiative.

An example of a state level incentive centered on Marine Highway service utilization and intermodal transportation can be found in recent activity in the port industry:

- House Bill 2385 enacted by the Virginia General Assembly and signed into law in 2011 created a Barge and Rail Usage Tax Credit in the amount of $25 per TEU transported to or from an 'international trade facility' in the state by these modes rather than by truck on the state's highways.

Similarly, examples of port use incentives can be found at the state level:

- Georgia's "Business Expansion Support Act" (BEST) Port Authority Tax Bonus Credit is available for industries that locate, or expand, in Georgia and use the state's ports. This incentive offers additional job tax credits to businesses that add the required threshold of jobs and increase their port traffic through Georgia's port facilities by ten percent in one year from the base level. The base level of port traffic is set at 75 tons, ten TEUs or five containers. The total tax credit amount cannot exceed 50 percent of the taxpayer's state income liability for a single year. These credits can be carried forward ten years if jobs and port traffic remain in service and above the base-level increases.[155]

- The South Carolina's International Trade Incentive Program (ITIP) provides an income tax credit to companies that increase their shipping through the state's port facilities by five percent over base year totals. To qualify, a company engaged in manufacturing, warehousing or distribution must have 75 net tons of non-containerized cargo or ten loaded TEUs transported through a South Carolina port for their base year. The total amount of tax credits allowed to all qualifying companies is limited to $8 million per calendar year.[156]

- In North Carolina, new or existing port customers who pay state income tax and use the state's ports can qualify for a tax credit on cargo wharfage and handling fees paid to the North Carolina State Ports Authority. The credit is the amount by which the current year's fees exceed the average of the past three years. The credit applies to taxes due the State – up to 50 percent of the total tax liability for each tax year. Any unused credit may be carried forward for five years for a total credit of up to $2 million. [157]

- The Louisiana Legislature passed House Bill 215 into state law in July 2009, included two incentives to encourage shippers to make greater use of Louisiana's ports. The first, an 'export-import' credit, allow for a $5 per ton tax credit to Louisiana-based shippers that utilize the state's ports for the export or import of cargos. The second credit encourages private investment in port facilities through a five percent per year tax credit valid for 20 years against private investments of greater than $5 million (resulting in an effective credit over 20 years for the entire capital investment).[158]

Similar incentive strategies could be a model for increasing the use of Marine Highway services and add to the financial viability of those services. A tax credit of $25 per load such as the one applied in Virginia would reduce total M-95 service costs by two to five percent.

5.1.7 Niche Markets

Shippers interviewed over the course of the study noted that niche cargos—specifically overweight commodities (i.e. tile, steel, building materials); hazardous materials, chemical products, fertilizer; and beverages—were the most promising markets for Marine Highway services. In the instance of heavy and hazardous freight, this is primarily due to the fact that rail and truck rates can be five to 20 percent higher to transport these cargos.

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155 Georgia Ports Authority

156 South Carolina Department of Commerce

157 North Carolina State Ports Authority

158 West Calcasieu Port, Ports Association of Louisiana

The competitive modal rates presented in Section 4 took into account the movement of a "standard" loaded container or trailer. Since marine transportation of heavy or hazardous cargo could potentially incur lower operating costs than other modes, a service may be able to provide more competitive rates to shippers compared to rail or trucking.

5.1.8 DRAYAGE COSTS

Drayage costs can be reduced through the application of trucking industry practices that address empty non-revenue movements, as well as creating "bundled services" similar to RailEx that combine modes for customers. A Marine Highway service carrier could also negotiate lower rates with trucking companies or exclusively employ its own trucking personnel to transport the freight as a means of reducing drayage costs.

5.1.9 START UP SUPPORT

Provide initial federal start up support of emerging transportation alternative - The Marine Highway System in the U.S. is currently at a nascent stage of development similar to the construction of the U.S. Interstate Highway System in the 1950s and to the railway system in the late 1800s. Opponents of a federally supported Marine Highway System may recall that the development of the highway system was authorized and funded under the Federal Aid Highway Act of 1956 and remains federally funded with money shared among the states. Likewise, the Pacific Railway Act of 1862 was authorized and heavily backed by the federal government, which provided the first transcontinental railroad network linking the eastern U.S. with California.

U.S. government funding to support the initial development of the Marine Highway System in the form of federal grants, subsidies, loan guarantees or capital investment would improve the potential for financial success of M-95 services.

5.2. FINANCIAL VIABILITY

To become integrated into the domestic goods movement network, Marine Highway services will most likely need to become commercially viable and function without continued financial support from government agencies. Based on the analyses undertaken in this study, it is apparent that no single strategy will accomplish this goal; rather the effort will require a comprehensive approach that involves multiple targeted strategies. Those strategies listed herein, when combined together, indicate that a self-sustaining service may be possible. Table 5-1 presents the potential of a combination of these strategies if they were successfully implemented.

The combined impact of these factors equates to a potential increase in revenue relative to cost on the order of 25 to 35 percent. As the above analysis suggests, some services may be financially viable in certain circumstances. In evaluating the data in Table 5-1, it is important to note that the potential results build on a 'best case' in which 90 percent vessel utilization in both directions is assumed. As such, actual performance of a service with lower or less-balanced utilization will be less than the optimal figures shown at the high-end of the ranges.

TABLE 5-1: IMPACT OF ECONOMIC STRATEGIES ON PERCENTAGE OF REVENUES TO COSTS PER LOAD

Best Case Options	1- New England <-> Mid-Atlantic	2- NY/NJ <-> Florida*	2- NY/NJ <-> Florida*	3 - Del. River <-> Florida	3 - Del. River <-> Florida	5- East Coast Pendulum
Vessel	11 – RoCon ATB 14 kt	21 - Lo/Lo Feeder 18 kt	12 –RoCon Large 18kt	21 – Lo/Lo Feeder 18 kt	12 –RoCon Large 18kt	03 -Ro/Ro Med 24 kt
Rev/Cost per Load	**48%**	**85%**	**75%**	**88%**	**76%**	**49%**
External Funding of 50% of Vessel Cost	7%	8%	12%	8%	12%	13%
Increase in Competing Modal Rates	10%	10%	10%	10%	10%	10%
30% Increase in Fuel (Modal Cost Variation)	1-4%	1-4%	1-4%	1-4%	1-4%	2-6%
Tax Incentive of $25 Per Load	5%	2%	2%	2%	2%	3%
Resulting Rev/Cost per Load**	**48- 74%**	**85-109%**	**75- 103%**	**88-112%**	**76-104%**	**49-81%**

*2nd Best Case Vessel

**Range reflects potential results if any combination of the enumerated improvements is realized

Source: Mercator International and Parsons Brinckerhoff Analysis

The findings of this study suggest that the successful implementation of the identified M-95 services on a financially sustainable basis will require improvements to fundamental economic and cost/rate structures prevailing at the time of writing. The economic strategies presented can serve as a chart to those entities interested in implementing a Marine Highway service.

5.3. OTHER SELF-SUSTAINING M-95 CHARACTERISTICS

Numerous factors go into the decision of what is needed for shippers and transportation providers to select Marine Highway services. The future value of those services is not only contingent on cost; operational and policy factors also contribute to whether those services could ultimately capture the necessary domestic volumes that will allow for viable services. The following criteria should be used in identifying opportunities to improve freight system performance measures for the M-95 Corridor.

5.3.1 VOLUME AND CAPACITY

Typically, as cargo volumes increase, so do the viability and cost-effectiveness of the marine transportation service. Cargo volumes must be sufficient to support frequent services and fully utilized vessels (with both headhaul and backhaul cargo). The profitability of a Marine Highway service is directly correlated with the number of trailers and containers that are transported on the ship. With some exceptions, the larger the vessel, the more profitable it is.

Large volumes are also required for cost-effective terminal operations. Marine terminals are capital intensive and large cargo volumes are therefore required to offset the fixed costs of terminals and cargo handling. Although each terminal is a specific situation, typically a minimum annual volume of 100,000-150,000 containers is required for a terminal to be viable.

In this analysis, an increase in cargo volumes is not a principal solution to the gap between revenues and costs. The study's sensitivity analysis incorporated very high utilization rates on vessels that could not only serve the smaller markets established in the market analysis, but also larger markets that may result from future market growth. The higher utilization sensitivity analysis assumed that there would be additional cargo volumes that could fill a vessel up to a 65 or 90 percent capacity. Therefore, since the results in Table 5-1 already reflect 90 percent utilization in both directions, further improvement from this scenario is unlikely.

5.3.2 FREQUENCY

A critical factor in delivering time sensitive products is sailing frequency of service with shippers preferring the flexibility to move products daily. In order to capture more discretionary cargos that will commit to a Marine Highway service, it is expected that the service would need to provide at least two published weekly vessel sailings, with three to five sailings being more favorable. Additional vessel sailings offer more schedule flexibility to shippers and reduces cargo dwell time at port terminals. A higher number of vessels in service would also lessen the impact if vessels were taken out of service for military operations.

5.3.3 RELIABILITY

Tied to frequency is shippers' needs for reliability of cargo to move through the supply chain in a predictable and reliable manner; this is particularly the case for those shippers using an 'inventory-in-transit' approach to managing their cargo. While frequency of service alone would provide some degree of reliability (in terms of regularity of scheduled service), the need to maintain on-schedule performance in the face of a range of weather conditions, seasonal peaks, and other variables also needs to be emphasized in planning a service.

5.3.4 CARGO TYPE

The greatest potential for increasing the utilization of the M-95 Corridor appears to involve domestic cargos with lower value and heavier weights, domestic cargos moving over relatively long distances and domestic cargos requiring the development of short haul services to address congestion and "missing links" in local transportation infrastructure. International cargos offer limited potential for increasing utilization of the Corridor because most international goods move to inland regions that are not connected to a Marine Highway Corridor. Also, the potential for feeder services is expected to be limited as the transfer costs outweigh the benefits of services.

Marine Highway use is expected to involve a step function with initial customers having less time-sensitive cargo. Services may well have to start by identifying niche markets and focusing on high weight and low value cargo that is less dependent on fast transit times and high frequency of service. A broader customer base and variety of products could be expected once more frequent and consistent services were offered.

To support an initial customer base, it may be possible that rules toward facilitating overweight cargos and hazardous material intermodal movements on the M-95 would need to be developed. Currently, commercial vehicle weight standards differ among the U.S., Canada and Mexico. Weight issues arise for trucks transiting from Canada or Mexico into the U.S. because the U.S. has tighter restrictions for commercial vehicles. U.S. weight permitting restrictions may need to be increased to allow for heavier cargos that match Mexico and Canada standards for drayage of cargo related to Marine Highway and rail transport only. The first and last movement could be handled by a truck within a radius of 50 to 100 miles. Not limited by highway weight restrictions, the waterway system can be more cost-efficient than other modes for moving heavy cargo depending on the route.

5.3.5 Balance

Cargo balance contributes to the viability of a Marine Highway service with headhaul cargo demand supported by return loads. Where the demand for containers/trailers exceeds their availability from prior loads, transportation providers will have to pass the cost of repositioning empty containers/trailers on to the shipper. In many instances, this incremental cost could hamper the competiveness of the service.

As noted previously, in addition to scenarios entailing a 25 percent market capture, the study included analyses with vessel utilization at 65 percent and 90 percent in both directions. In a typical service, achieving 65 percent utilization on a regular basis is achievable, with 90 percent utilization levels normally being more reflective of peak periods than 'steady-state' operations. In some cases, service along specific corridors achieved the 65 percent or 90 percent levels prior to the 25 percent capture rate, implying that to fully serve the market, additional vessel(s) may be required.

5.3.6 Location

Terminals need to be well located to maximize service while minimizing costs. The study findings indicate that future Marine Highway terminals should be located at smaller, niche ports rather than major international cargo hub ports. In addition, domestic terminals for Marine Highway service use should be separate from international cargo operations in order to avoid the costs and delays associated with international cargo handling such as requirements for DHS security and U.S. Customs. Smaller ports may require federal investment to upgrade terminal infrastructure to support a Marine Highway container or Ro/Ro service.

M-95 port terminals should be able to accommodate vessels that have been identified as being most suitable for use in a Marine Highway service. In general these vessels have a design draft of approximately 25 feet, a length of about 500 to 750 feet and a width of about 90 to 106 feet. Marine highway services require timely access to berths to maintain scheduled service. Terminals should be located a minimal distance away from the primary shipping channel so as not to adversely impact vessel speed due to travelling long distances along slower, restricted channels. Terminal locations should also ideally be located near unconstrained highways and waterways to expedite the movement of cargo and maintain the service schedule. Gate facilities should be sufficiently sized to avoid truck queuing delays.

All potential port locations considered in this study have existing or proposed terminal facilities that could accommodate the proposed M-95 vessel dimensions and increased capacity for domestic cargos.[159]

5.3.7 Distance

The further the distance between O/D port pairs, the more a Marine Highway service becomes a viable and cost-effective option. This is because as the distance that cargo is transported aboard a service increases, the fixed costs associated with HMT, cargo handling, and local drayage comprise a

159 The lateral clearance of the hurricane barrier and the New Bedford-Fairhaven swing bridge could be a navigational constraint with respect to a potential ECMH service at the Port of New Bedford if vessels consistent with the "American Marine Highway Design Project" study are utilized. The lateral (horizontal) clearance of the hurricane barrier is 150 feet. The swing bridge has a lateral clearance of 95 feet. Of the proposed dual-use vessels, only two vessels have a beam that would allow safe passage of the vessel through the swing bridge. The two most cost-effective vessels for the New England-Mid-Atlantic service were the Ro-Ro vessel design 03 with a proposed beam of 93.5 feet and the ATB vessel 11 with a proposed design beam of 105.6 feet.

lower fraction of overall service cost; conversely the variable costs of actually transporting cargo on a Marine Highway service, which are more favorable than 'per-mile' truck and rail costs, comprise a greater portion of total costs, resulting in more competitive service over longer distances. The most economically viable services in this study were the Mid Atlantic to Florida services. The distance between the Mid Atlantic port pairs (NY/NJ and Delaware River) and Florida port pairs (Canaveral and Miami) ranges between 918 and 1,159 miles.

Since the revenue to cost ratio increases proportionally to the distance between port pairs, extending Atlantic Coast services to connect with more distant ports along the U.S. Gulf Coasts warrants consideration to achieve possible operating cost reduction benefits from longer haul services for more viable East Coast services moving between more distant ports such as those along the Gulf Coast. There may be, however, an 'upper bound' in distance beyond which it would be difficult to maintain a viable cost structure and to provide the frequency and regularity of service desired by shippers.

MARAD is in a tri-lateral agreement with Canada and Mexico on coastwise trade and NAFTA trade, regarding the interpretation of "Marine Highway." The definition with which this study is based upon does not include U.S. NAFTA partners, who are party to the agreement, except for the Canadian ports along the Great Lakes-Saint Lawrence Seaway System.

If the U.S. tonnage tax policy were revised to allow vessels that operate in Puerto Rico trade lanes to also provide Marine Highway services in the contiguous coastwise trade without losing their favorable tax status, those operators might consider adding Marine Highway services to their operations.

5.3.8 VESSELS

To attract new customers, offer competitive services and represent the public benefits such as fuel efficiency and environmental improvement, the U.S. domestic fleet will likely need to be expanded. Competitive coastal service development will depend on new ships designed to meet present day and future efficiency and environmental requirements. Current vessel financing tools have been found to be inadequate for purposes of financing AMH vessel construction. Title XI is a mainstay in American built vessel finance but would require adjustments in its rules to be more accessible for construction of vessels for Marine Highway services.

5.3.9 ENVIRONMENTAL

Whereas some environmentalists point to marine transportation as a source of air and water pollution, the maritime industry sees itself as "green." Whether the mode can provide a net environmental benefit is a crucial issue for the development of Marine Highway services, especially to the extent that government support, based on determinations of social benefit, may be needed by the mode to gain a foothold in the market. Studies indicate that on a tonnage basis—carrying efficiency—vessels perform very well and that translates into fuel and emissions benefits when compared with other modes.

While some of the vessels in the existing U.S. domestic fleet are approaching the end of their design life, an unprecedented number of U.S. Flag container vessels (some with roll-on/roll-off capabilities) are currently being built or repowered in U.S. shipyards for use in domestic trade. The majority of these vessels are employing cutting-edge alternative fuel technologies to maximize their fuel efficiency and minimize their air emissions to meet (and likely exceed) present day and future environmental requirements. The construction of this new tonnage presents an opportunity to deploy the next generation of vessels designed with Marine Highway service requirements in mind.

In addition, the development of GIS models are needed to provide decision makers with comparative data on carbon emissions, fuel usage, and transit time in considering route and service alternatives.

5.3.10 Integrated Door To Door Service

It is not enough simply to provide good service port-to-port. The customer—which could be the cargo owner, ocean carrier, trucker, or 3PL —will be concerned with the complete logistic chain all the way to the goods' point of destination. To be competitive Marine Highway services will need to be designed to integrate land and water modes. With that in mind, examining with trucking interests how the two modes can best complement each other to achieve 'door to door' services will be required in planning new services.

5.3.11 Education

Based on discussions and other interactions with shippers and stakeholders associated with the Marine Highway System, it became clear to the study team that raising awareness and understanding of the potential for Marine Highway services would be important to promoting its success. Limited past and present use of such services has created the perception that the water mode would be slow and would face severe challenges in meeting the needs of shippers.

Discussions with shippers addressing the proposed vessel types and service frequencies envisioned for future M-95 Corridor, resulted in their interest level generally increasing as new perceptions were created. Some shippers said that they may consider Marine Highway services as a mode for transporting some of their cargos, provided that required cost and service parameters are met. A targeted outreach program should be considered, aimed at helping stakeholder agencies promote the concept of such services, and helping shippers and logistics providers understand how such a service might work for them. Such a program would address such factors as cost, vessel types, frequency of service, and public benefits associated with Marine Highway services.

5.3.12 Partnerships

In this early stage, before its being readily adopted in the commercial world, a principal reason for considering Marine Highway service development is the public benefits that could result. Such issues as the avoided cost of highway maintenance, net reductions in freight related emissions and fuel use, improvements in landside congestion, and added capacity to the transportation system through the marine mode can be the basis for government collaboration among regional, state and federal government agencies toward defining common objectives and strategies. This can be done through the aegis of organizations like the I-95 Corridor Coalition or, on a smaller scale and in the example of the 64 Express COB service, among MPOs and with the involvement of state agencies and the federal government. The potential value of new "lanes" on the M-95 Corridor and what public support, in the form of incentives and other short term subsidies, might be warranted for their development can be assessed through such collaboration.

Similarly the involvement of commercial stakeholders is important at this stage. Private sector non-federal stakeholders input would be invaluable to identify appropriate policies to encourage Marine Highway service development. The same is true for developing any government policies having to do with Marine Highway operations. The initiation of a domestic marine service may raise issues that prompt consideration of new regulation in areas such as security and environment. For new services struggling to keep costs down and build a customer base avoiding overly burdensome regulation is important.

Class I railroads and trucking companies have in recent decades demonstrated the possibilities and benefits of intermodal coordination. Agreements such as that between J.B. Hunt and BNSF and, more recently, Norfolk Southern have produced very profitable synergies for both truck and rail. There is potential for such partnerships between marine transportation and the other modes, especially trucking, which will continue to struggle with driver and regulatory challenges to their operations.

The "dual use" initiative represents a partnership of the departments of Defense and Transportation and a strategy that, if implemented, may emerge as the surest and most unambiguous expression of government policy support for Marine Highway services. Among the subjects under study by the Navy and MARAD is a potential policy package that would be among the recommendations for a "dual use" program. Those recommendations may suggest policy approaches to incentivize development of commercially viable services, and thus fulfill the defense need for a sea lift capability without having the cost of maintaining the Ready Reserve Force as it is known now.

5.4. Conclusion

The nation's transportation infrastructure and supply chain system is critical to the timely flow and continual supply of food, water, medicines, fuel and other commodities to U.S. citizens. Reliance on an overburdened U.S. land-based freight transportation system with limited additional capacity will impact the future movement of goods in domestic and global supply chains, productivity and competitiveness of the U.S. economy, and sustainability of the environment.

Domestic marine transportation services could be part of the solution to enhance the capacity and performance of the U.S. freight transportation system. A self-sustaining Marine Highway service would contribute to the public benefits of reduced congestion on roads and highways, fewer greenhouse gas emissions, improved safety, and additional sealift military resources that support national defense. In addition, the initiative has the potential of stimulating the national economy and creating jobs from increased participation in domestic and international trade along Marine Highway Routes.

To the same extent as it has provided developmental support in the past, the public sector has a vital role in ensuring the viability of domestic marine transportation to the point at which a Marine Highway service is feasible today or in the future.

"Some seem to think that the nation is now built for all time and that we can continue to prosper without expanding our transportation system. They are wrong. ... We must invest to maintain and strengthen the American 'Transconomy.'" — 2010 AASHTO President Larry (Butch) Brown

In the face of the country's current and future transportation and freight mobility needs, Marine Highway services have a promising role in an integrated and sustainable U.S. transportation system. However, their potential as a national resource is limited if it is not supported and strengthened by the nation's leadership.

SECTION 6: ENVIRONMENTAL ANALYSIS

The purpose of this environmental analysis is to provide an overview of the regulatory requirements, regulatory agency coordination and project specific environmental analysis that would be needed to implement the ECMHI along the M-95 Corridor in accordance with the National Environmental Policy Act of 1969[160] and other environmental laws and regulations. The major regulations likely to apply to the operation of M-95, as well as those that would pertain to specific cargos and potential landside development, should it be required or induced, are discussed. The information in this overview provides a framework for future environmental analysis as specific M-95 Corridor projects are proposed.

The ECMHI is a proposed project under MARAD's AMH Program. MARAD will prepare a programmatic NEPA document for the overall Program, in which the potential environmental impacts of the nationwide Marine Highway Program will be assessed. Each individual project, including M-95, would require a more site-specific impact analysis in a tiered NEPA document that builds on the baseline information of the programmatic NEPA document. The tiered NEPA document for ECMHI projects would incorporate the analyses and findings of the programmatic NEPA document for the overall program and the framework provided in this environmental overview.

6.1. PURPOSE AND NEED

The foundation of a NEPA environmental document is the project purpose and need statement. A preliminary purpose and need statement for the ECMHI is as follows:

- The purpose of the ECMHI is to advance the AMH Program along the M-95 Corridor.

- The need for AMH Program results from the requirements of the Energy Independence Security Act of 2007, Sections 1121, 1122, and 1123 of Public Law 110-140, which calls for the Secretary of Transportation to designate short sea transportation routes as extensions of the surface transportation system to focus public and private efforts to use the waterways to relieve landside congestion along coastal corridors.

  The ECMHI would divert trucks from I-95 to reduce traffic congestion, lower road maintenance and repair costs, and reduce greenhouse gas (GHG) emissions and oil consumption.

6.2. STUDY AREA

The study areas for this environmental overview include the marine environment of the Atlantic Coast of the U.S. for the overall M-95 Corridor operation with a focus on the four states in which the focal ports and are located: Massachusetts, New Jersey, Maryland and Florida. Similarly, the study areas for potential port-related landside development are the Port of New Bedford, Port of Baltimore, New Jersey Ports (NY/NJ) and Delaware River) and Port Canaveral. A general review of other potential port nodes of the ECMHI is also provided.

160 42 USC 4321 et seq.

6.3. REGULATORY SETTING

The following sections present a brief overview of the international, federal, state and port specific levels regulations likely to apply to the establishment and operation of M-95. Applicable regulations may pertain to operations, specific cargos and land-based activities should landside development be required or induced in the future. Based on the results of the market analysis, it is assumed that port-specific capital improvements would not occur until M-95 Corridor services have become well established. General reviews of environmental regulations and permits that may be associated with port specific capital improvements are summarized herein and described in detail in Appendix L for informational purposes and to facilitate future planning efforts.

6.3.1 INTERNATIONAL ENVIRONMENTAL COMPLIANCE REQUIREMENTS

Applicable international regulations generally refer to pollution prevention regulations and ballast water management regulations to prevent the dissemination of non-native species. The primary international regulations applicable to M-95 are the International Convention of the Prevention of Pollution from Ships (MARPOL 73/78) and the North American Agreement on Environmental Cooperation.

6.3.2 FEDERAL ENVIRONMENTAL COMPLIANCE REQUIREMENTS

Federal laws applicable to the establishment and operation of M-95 are aimed at managing and minimizing adverse impacts to important resources such as air and water, to protect rare and commercially import species and habitats, to manage development in potentially hazardous areas, to safely manage hazardous substances and cargos, and to protect to human population. Key federal regulations applicable to the implementation and operation of M-95 are:

- National Environmental Policy Act (42 USC 4321 et seq.)
- Act to Prevent Pollution from Ships (33 USCS 1901)
- Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (33 CFR 151.2035(a))
- Clean Air Act (CAA), Sections 101-131 (USC § 7401-7431)
- Clean Water Act (CWA), Sections 301 and 401 (33 USC 1251 et seq.)
- Coastal Zone Management Act (16 USC 1451 et seq.)
- Marine Mammal Protection Act (16 USC 1361 et seq.)
- Marine Protected Areas
- Endangered Species Act (16 USC 1531 et seq.)
- Magnuson-Stevens Act (16 USC 1801-1882)
- National Marine Sanctuaries Act (16 USC 1431 et seq.)
- Right Whale Ship Strike Reduction Rule (50 CFR 224.105)
- Executive Order 13547—Stewardship of the Ocean, Our Coasts, and the Great Lakes
- Executive Order 12898 – Environmental Justice in Minority Populations and Low-Income
- Executive Order 13045 – Protection of Children from Environmental Health Risks and Safety Risks
- Resource Conservation and Recovery Act (42 USC Part 6901)
- Emergency Planning and Community Right-To-Know Act (42 USC 116)

These regulations and their applicability to M-95, as well as additional federal regulations that would become applicable should land, shoreline or in-water development occur to support M-95 are summarized in Table 6-1 and discussed in detail in Appendix L.

TABLE 6-1: FEDERAL LAW SUMMARY

Environmental Resource	Statute, Law, Regulation, Policy	Responsible Agency	Permit Required	Coordination Required	Additional Analysis	Reporting Requirements	Plans, Policies, Procedures
OPERATIONS							
Water, Hazardous Materials and Wastes	Act to Prevent Pollution from Ships (33 USCS 1901)	USCG					X
Water, Biological Resources	Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (33 CFR 151.2035(a))	USCG					X
Air	Clean Air Act, Sections 101-131 (42 USC 7401-7431)*	State		X	X		
Water	Clean Water Act, Sections 301 and 401 (33 USC 1251 et seq.)*	USACE	X				
Land Use	Coastal Zone Management Act (16 USC 1451 et seq.)	State		X	X		
Biological Resources	Marine Mammal Protection Act (16 USC 1361 et seq.)	USFWS NMFS		X			
Biological Resources	Endangered Species Act (16 USC 1531 et seq.)	USFWS NMFS		X			
Biological Resources	Magnuson-Stevens Act (16 USC 1801-1882)	NMFS		X	X		
Biological Resources	National Marine Sanctuaries Act (16 USC 1431 et seq.)	NOAA	X	X			
Biological Resources	Right Whale Ship Strike Reduction Rule (50 CFR 224.105)	NMFS				X	X
Biological Resources, Water	Executive Order 13547—Stewardship of the Ocean, Our Coasts, and the Great Lakes	National Ocean Council					X
Socioeconomics	Executive Order 12898 – Environmental Justice in Minority Populations and Low-Income Populations	Federal agencies			X		
Socioeconomics	Executive Order 13045 – Protection of Children from Environmental Health Risks and Safety Risks	Federal agencies			X		
CARGO SPECIFIC							
Hazardous Materials and Wastes	Resource Conservation And Recovery Act (42 USC Part 6901)	USEPA	X			X	X
Hazardous Materials and Wastes	Emergency Planning and Community Right-To-Know Act (42 USC 116)	State				X	X

Environmental Resource	Statute, Law, Regulation, Policy	Responsible Agency	Permit Required	Coordination Required	Additional Analysis	Reporting Requirements	Plans, Policies, Procedures
PORT-SPECIFIC CAPITAL IMPROVEMENTS							
Water Resources, Biological Resources	Marine Protection, Research and Sanctuaries Act (P.L. 92-532)	USEPA USACE	X				
Water Resources	Rivers and Harbors Act, Section (33 USC 401 et seq)	USACE	X				
Cultural Resources	National Historic Preservation Act (16 USC 470)	State SHPO		X			
Cultural Resources	Native American Graves Protection and Repatriation Act (PL 101-601)	State SHPO		X			
Water Resources	Executive Order 11988 – Floodplain Management	Federal agencies			X		
Water Resources, Biological Resources	Executive Order 11990 – Protection of Wetlands	Federal agencies			X		

Source: TEC Inc.

*Land side development may trigger other aspects of regulation (CWA Section 404 and Title V CAA)

6.3.3 STATE ENVIRONMENTAL COMPLIANCE REQUIREMENTS

At the state level, environmental laws will generally provide a level of environmental protection that is the same or more stringent than that provided by federal law. States may also be responsible for the enforcement of federal law, such as the provisions of CAA and the CWA. In many cases the level of stringency for a particular environmental resource is dependent on its importance to a particular state. For instance, those states with ongoing public health problems related to air quality may have more stringent emissions regulations than a state with no air quality issues. The implementation and operation of M-95 must conform to the applicable acts, plans, policies and regulations of each state.

These applicable environmental regulations for each of the key port states (Massachusetts, New Jersey, Delaware and Florida) and their applicability to the implementation and operation of M-95 are summarized in Table 6-2 through Table 6-5 and discussed in detail in Appendix L. Additional state regulations that would become applicable should and land, shoreline or in-water development occur to support M-95 are also summarized in the state summary tables and discussed in detail in Appendix L.

MASSACHUSETTS

TABLE 6-2: MASSACHUSETTS ENVIRONMENTAL LAW SUMMARY

Environmental Resource	Statute, Law, Regulation, Policy	Permit Required	Consultation Required	Additional Analysis	Reporting Requirements	Plans, Policies, Procedures
OPERATIONS						
Water	Massachusetts Oceans Act of 2008					X
Biological Resources	Massachusetts Endangered Species Act (MGL Chapter 131A)		X			
Water	Massachusetts Clean Waters Act (MGL c. 21 s. 26-53)	X				X
Water	Public Waterfront Act (MGL c. 91)		X			X
Air	Global Warming Solutions and Green Communities Act (MGL c. 21N)					X
Air	Massachusetts Clean Air Act (M.G.L. 111, §§ 142A-142J: Massachusetts Clean Air Act; 310 CMR 7.00: Air Pollution Control)	X	X			
Water	Massachusetts Coastal Management Program		X	X		
CARGO SPECIFIC						
Hazardous Materials and Wastes	Massachusetts Hazardous Waste Management Act (MGL c. 21C)	X			X	X
Hazardous Materials and Wastes	Massachusetts Oil and Hazardous Material Release Prevention and Response Act (MGL c. 21E; 310 Mass. Code Reg. 40)				X	X
PORT-SPECIFIC CAPITAL IMPROVEMENTS						
Land Use, Biological Resources	Massachusetts Wetlands Protection Act (MGL Chapter 131, Section 40; 310 CMR 10.00: Wetlands Regulations)	X	X			
Land Use, Biological Resources	Rivers Protection Act (MGL c. 258, Acts of 1996)		X	X		
Cultural Resources	Massachusetts General Laws Chapter 9, sections 26-27C)		X	X		
Cultural Resources	Massachusetts General Law Chapter 6, sections 179-180, and Chapter 91, Section 63				X	
Land Use, Cultural Resources, Recreation	Massachusetts Community Preservation Act (MGL. c. 44B)					X
Land Use	Massachusetts Coastal Estuarine Land Conservation Program					X

Source: TEC Inc.

New Jersey

Table 6-3: New Jersey Environmental Law Summary

Environmental Resource	Statute, Law, Regulation, Policy	Permit Required	Consultation Required	Additional Analysis	Reporting Requirements	Plans, Policies, Procedures
OPERATIONS						
Water	New Jersey Water Quality Planning Act (N.J.A.S. 58:11A-1 to 16)					X
Air	New Jersey Air Pollution Control Act (N.J. S.A. 26:2C-1 to 25.2)		X			X
Air	New Jersey Air Pollution Emergency Control Act (N.J. S.A 26:2C-25.1)					X
Biological Resources	New Jersey Endangered Species Act (N.J. S.A. 23:2A-1 to 13)		X			X
CARGO SPECIFIC						
Hazardous Materials and Wastes	New Jersey Spill Compensation and Control Act (N.J.S.A. 58:10-23.11)				X	X
Hazardous Materials and Wastes	Toxic Catastrophe Prevention Act (NJAS 13:1-k19)		X			X
PORT-SPECIFIC CAPITAL IMPROVEMENTS						
Biological Resources	Freshwater Wetlands Protection Act (N.J.S.A. 13:9B-1 et seq)	X	X			
Land Use	Coastal Area Facility Review Act (N.J.S.A. 13:19)		X			
Land Use	Waterfront Development Law (N.J.S.A. 12:5-3)		X			
Biological Resources	The Wetlands Act of 1970 (N.J.S.A. 13:9A)	X				
Biological Resources	Tidelands Act (N.J.S.A. 12:3)	X				
Water	New Jersey Water Pollution Control Act (N.S.J.A. 58:10A-I et seq.)	X				
Cultural Resources	New Jersey Historic Preservation Regulations		X			

Source: TEC Inc.

MARYLAND

TABLE 6-4: MARYLAND ENVIRONMENTAL LAW SUMMARY

Environmental Resource	Statute, Law, Regulation, Policy	Permit Required	Consultation Required	Additional Analysis	Reporting Requirements	Plans, Policies, Procedures
OPERATIONS						
Biological Resources, Water	Chesapeake Bay Agreement					X
Land Use	Coastal Zone Consistency/Coastal Zone Management Program		X	X		
Biological Resources	Nongame and Endangered Species Conservation Act (Annotated Code of Maryland10-2A-01)		X			
CARGO SPECIFIC						
Hazardous Materials and Wastes	Standards Applicable to Transporters of Hazardous Waste (COMAR 26.13.04)	X				X
PORT-SPECIFIC CAPITAL IMPROVEMENTS						
Biological Resources	Areas of Critical State Concern		X			
Biological Resources, Water	Baltimore County Code, Sec. 14-331 to 14-350		X			X
Biological Resources, Water	Chesapeake Bay Critical Area Law		X		X	X
Biological Resources	Tidal Wetlands Act and Program	X	X			
Biological Resources	Non-tidal Wetlands Protection Act and Program		X			
Land Use	Waterway Construction Statute	X	X			X
Land Use	Shore Erosion Control Program		X			X
Water	Stormwater Management		X			
Cultural Resources	Maryland Historical Trust		X			

Source: TEC Inc.

FLORIDA

TABLE 6-5: FLORIDA ENVIRONMENTAL LAW SUMMARY

Environmental Resource	Statute, Law, Regulation, Policy	Permit Required	Consultation Required	Additional Analysis	Reporting Requirements	Plans, Policies, Procedures
OPERATIONS						
Water	Florida Water Resources Act of 1972 (FS 373)	X	X			X
Air, Water	The Air and Water Pollution Control Act (FS 403.011-403.44)	X			X	X
Biological Resources	The Florida Environmental Land and Water Management Act of 1972 (FS 380.12 - 380.10)		X			
Water	Water Resource Implementation Rule (FAC 62-40)					X
Water	Florida Surface Water Quality Standards (FAC62-302)				X	X
Biological Resources	Florida Sovereignty Submerged Lands Management (FAC 18-20)		X			X
Land Use	Florida Coastal Zone Management Program		X	X		
Air	Air Pollution Control – General provisions (FAC 62-204)		X	X		
Biological Resources	Florida Endangered and Threatened Species Act of 1977 (Section 379.2291, F.S.)		X			
CARGO SPECIFIC						
Hazardous Materials and Waste	Florida Hazardous Waste Rule (FAC 62-730)	X			X	X
PORT-SPECIFIC CAPITAL IMPROVEMENTS						
Water	Surface Water Improvement and Management Act (FS 373.451)					X
Water	Regulation of Stormwater Discharge (FAC 62-25)	X				
Water	Florida National Pollutant Discharge Elimination System Stormwater Program (FS 403.0885)	X				
Water	Florida's Impaired Waters Rule (FAC 62-303)				X	X
Water	Florida Watershed Restoration Act (FS 403.067)				X	X
Biological Resources	Warren S. Henderson Wetlands Protection Act of 1984 (FS 403.91-403.929)	X				
Biological Resources	Delineation of the Landward Extent of Wetlands and Surface Waters (FAC 62-301)					X
Cultural Resources	Florida Historical Resources Act (FS 267.011)		X			

Source: TEC Inc.

6.4. ENVIRONMENTAL ANALYSIS –CORRIDOR WIDE

The movement of cargo from land based routes to coastal routes would have beneficial and potentially adverse effects on the coastal marine environment as well as implications to water and air quality along the corridor. The key issues associated with the expansion of short sea shipping (e.g. Marine Highway services) are traffic, underwater noise, air emissions, collisions with marine mammals, dissemination of invasive species and spills from accidents and routine maintenance.[161]

6.4.1 TRAFFIC

EXISTING CONDITIONS

The I-95 corridor is 1,917 miles long with approximately 1,040 miles traversing through urban areas. Among these 1,040 miles, over 60 percent is currently under heavy congestion. The average daily traffic in the entire corridor is over 72,000 with maximum daily traffic reaching as high as over 300,000. Average daily truck traffic is over 10,000 with maximum daily truck traffic reaching as high as over 31,000.[162]

Land-based infrastructure expansion opportunities are limited in many critical bottleneck areas due to geography or very high right-of-way acquisition costs, particularly in urban areas where surface traffic congestion is the most severe. In many locations, existing infrastructure is suffering from overuse and will place growing demands on scarce public and private resources simply to sustain it.[163]

IMPACTS

MARAD, in its 2011 Report to Congress on AMH, reported that “America’s Marine Highway can play a role in alleviating this congestion on some of our surface transportation corridors (including I-95), with its abundant capacity to carry freight to and from many locations across the country” because many of the areas of greatest land-based congestion are also the same areas that Marine Highway operators could best serve through waterborne transport.

The Transportation Research Board of the National Academies for the National Cooperative Freight Research Program suggested in a 2010 report that use of Marine Highway services could potentially ease two types of congestion along the I-95 corridor; congestion in and around container terminals, stemming from the growth in world trade and consisting primarily of international 20-ft and 40-ft shipping containers; and congestion on highway corridors, where the shipping containers are primarily 48-ft and 53-ft domestic containers or trailers moving between points that have a Marine Highway service alternative.[164]

According to AFL estimates, M-95 has the potential to transfer more than 1,000,000 twenty-foot equivalent units/year from land to Marine Highway services. AFL estimates that it will help the nation eliminate 200 million truck miles annually, which will result in savings of $27 million annually in maintenance savings and $12 million annually in congestion benefits.[165] However, there

161 Friends of the Earth 2010

162 FHWA 2011

163 MARAD 2011

164 NCFRP 2010

165 AFL 2010

are opposing viewpoints suggesting the impact of the Marine Highway System on traffic would be less beneficial.[166]

Research associated specifically with M-95 indicates that M-95 vessels have the maximum potential to shift of approximately 2,000 trucks per week from land route to M-95, assuming most cargo on M-95 is diverted from truck rather than rail.

In addition to the benefits of a shift in truck traffic from I-95 to M-95, there would likely be a corresponding increase in truck traffic at the ports resulting from increased drayage in local areas. Site-specific traffic studies are needed to fully understand the overall potential traffic effects of M-95.

The increase in vessel traffic has the potential to increase vessel collisions at sea. The highest vessel casualty rates are generally located near shipping channel intersections and major port entrances.[167] However, these impacts can be minimized via compliance with International Maritime Organization (IMO) traffic separation schemes, ship reporting procedures and port plans.

6.4.2 Noise

Existing Conditions

Ambient Noise

Ambient noise in the marine environment along the U.S. Atlantic coast is derived from multiple sources including: wind and waves, precipitation, geologic noise and biological noise.
Wind and waves are common and interrelated sources of ambient noise in the ocean. Other factors being equal, ambient noise levels tend to increase with increasing wind speed and wave height. Surf noise is a form of wave noise localized near the land-sea interface.[168]

Precipitation on the ocean surface also contributes sound to the ocean. In general, noise from rain or hail is an important component of total noise during periods of precipitation. Rain can increase natural ambient noise levels and heavy precipitation associated with large storms can significantly affect ambient noise levels at a considerable distance from the storm's center.[169] In addition, thunder and lightning are loud, explosive events that have a short-term local effect on ambient noise.

Noise from earthquake, volcanic and hydrothermal vent activity can contribute significantly to ambient, particularly in geologically active areas. Movement of sediment by currents across the ocean bottom can also be a significant source of ambient noise.[170]

Biological sources of underwater noise are sounds created by animals and can contribute significantly to the ambient noise levels in certain areas of the ocean. Marine mammals are major contributors but some crustacea (e.g., snapping shrimp) and fish (e.g., drumfish) can also be significant.[171]

166 Ashar 2011
167 Dobbins and Jenkins 2010
168 NSF 2007
169 Navy 2001 in NSF 2007
170 NSF 2007
171 NSF 2007

Anthropogenic Noise

Most man-made noises that may affect marine mammals or other marine animals come from a few general types of activities that occur on or beneath the ocean: transportation (surface vessels and aircraft), dredging, construction, hydrocarbon and mineral exploration and extraction, seismic surveys, sonars, explosions, and ocean acoustic studies. Surface vessels are a major contributor to ocean ambient noise. The NOAA Fisheries Acoustics Program is developing acoustic exposure policy guidelines; however, it is currently unknown when these guidelines will become finalized.

Impacts

Five types of vessels have been considered for M-95 trade; Ro/Ro Small with a design speed of 18 knots; Ro/Ro Medium with a design speed of 24 knots and Ro/Ro medium with a design speed of 20 knots, a RoCon ATB medium with a design speed of 14 knots and a container feeder with a design speed of 18 knots.[172] Large commercial vessels produce relatively loud and predominately low frequency sounds, the exact characteristics of which depend on vessel type, size, and operational mode. Most (83 percent) of the acoustic field surrounding large vessels is the result of propeller cavitation (when air spaces created by the motion of propellers collapse).

When ships cavitate, relatively little acoustic energy is transmitted into the water from on-board machinery or movement of the vessel through the water. In contrast to earlier data obtained for ships with largely obsolete propulsion systems, acoustic source levels are not a function of speed for modern diesel vessels across the majority of their nominal operations. Source (propeller) depth is also important in terms of long range propagation. This is a potentially significant historical factor in ambient noise trends due to shipping, as propeller depths have increased with increasing vessel size.[173]

According to a report by AFL, vessels at a design speed of 16 knots can accommodate a very small propeller load (about 320kw/m2 disk area) resulting in a nearly cavitation free propeller – meaning a silent propeller.[174] This vessel design speeds provided for this ECMHI analysis range from 18-20 knots and further research is needed to identify measures that can help lessen noise generated by maritime traffic associated with M-95. Incorporating noise reduction measures into ship design would mitigate the impact of increased noise from vessel traffic.

Whether and how human-generated sounds in the ocean affect marine life has become an issue of increasing awareness, within the scientific and regulatory community as well as among the general public. Consequently, there is much interest and effort involved in understanding associated environmental impacts and, where appropriate and practical, developing ways of minimizing them. Increased noise levels associated with shipping can interfere with communication, foraging, prey evasion and other important life history functions in marine mammals. It can also disrupt their behavior and may act synergistically with other human-induced stressors with detrimental effects.[175] During preliminary agency outreach for the ECMHI, NMFS indicated that a noise study would be required to assess the impacts of ECMHI projects on aquatic species.[176]

172 HEC 2011

173 NOAA 2004

174 AFL 2010

175 Okeanos 2008

176 Tammy Adams, NMFS, Personal communication December 2011

Ship traffic associated with M-95 would occur at such a distance from the shoreline as to make the noise impacts negligible to humans and wildlife in shoreline communities and natural and recreational areas. These impacts may be more noticeable in the port areas discussed in Section 2.

6.4.3 AIR QUALITY

Air quality is defined by ambient air concentrations of specific pollutants determined by the USEPA to be of concern related to the health and welfare of the general public and the environment and are widespread across the U.S. The primary pollutants of concern, called "criteria pollutants," include carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), suspended particulate matter less than or equal to ten microns in diameter (PM_{10}), fine particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$), and lead. Under the CAA, the USEPA has established National Ambient Air Quality Standards (NAAQS)[177] for these pollutants. These standards represent the maximum allowable atmospheric concentrations that may occur while ensuring protection of public health and welfare, with a reasonable margin of safety.

Air quality in a given location is described by the concentration of various pollutants in the atmosphere. A region's air quality is influenced by many factors including the type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions. Pollutant emissions typically refer to the amount of pollutants or pollutant precursors introduced into the atmosphere by a source or group of sources. Pollutant emissions contribute to the ambient air concentrations of criteria pollutants, either by directly affecting the pollutant concentrations measured in the ambient air or by interacting in the atmosphere to form criteria pollutants. Primary pollutants, such as CO, SO_2, lead, and some particulates, are emitted directly into the atmosphere from emission sources. Secondary pollutants, such as O_3, NO_2, and some particulates are formed through atmospheric chemical reactions that are influenced by meteorology, ultraviolet light, and other atmospheric processes.

Areas that comply with NAAQS are designated as attainment areas. Areas that violate ambient air quality standards are designated as non-attainment areas. Areas that have improved air quality from non-attainment to attainment are designated as attainment/maintenance areas. Areas that lack monitoring data to demonstrate attainment or non-attainment status are designated as unclassified and are treated as attainment areas for regulatory purposes.

EXISTING CONDITIONS

Air quality within the I-95 corridor ranges from very good to deteriorated, with a strong south to north alignment that relates to the more rural predominance of the southern coastal region compared to the heavily populated and industrialized northern coastal portion of the corridor.

Table 6-6 summarizes the air quality in the regions where the M-95 ports are located.

[177] 40 CFR Part 50

TABLE 6-6: CLASSIFICATION UNDER THE NAAQS OF REGIONS WITH PORT AREAS INCLUDED IN THE ECMHI STUDY

Locality	Nonattainment or Maintenance						
	O_3	NOx	SO_2	CO	PM_{10}	$PM_{2.5}$	Attainment
[1]New Bedford, MA	•						
[1]New York/New Jersey	•			▫	•	•	
[1]Delaware River:							
Paulsboro, NJ	•					•	
Trenton, NJ	•			▫		•	
Chester, PA	•					•	
Philadelphia, PA	•			▫		•	
[1]Baltimore, MD	•			▫		•	
[1]Wilmington, NC							✓
[1]Port Canaveral, FL							✓
[2]Portland, ME	▫						
[2]Wilmington DE	•					•	
[2]Charleston, SC							✓
[2]Savannah, GA							✓
[2]Miami, FL							✓

Notes: •denotes nonattainment designation. For PM2.5, nonattainment can be for annual standard, 24-hour standard, or both.
▫denotes maintenance area. Maintenance areas have been nonattainment at once time, achieved attainment and now must follow approved plans to ensure continued attainment.
✓denotes an area that is, and always has been, in attainment for all criteria pollutants.
[1] Primary ports in this study.
[2]Secondary ports in this study.
Source: TEC

Ground-level ozone forms when emissions of NOx and volatile organic compounds (VOCs) "cook" in the sun. For this reason, NOx and VOCs are considered ozone precursors. Ozone exposure is linked to acute respiratory problems, aggravated asthma, reduced lung capacity, inflamed lung tissue, and impairment of the body's immune system. The CAA[178] sets out specific requirements for a group of northeast states that make up the Ozone Transport Region (OTR). States in the OTR are required to submit a State Implementation Plan and install a certain level of controls for the pollutants that form ozone, even if they meet the ozone standards.

These states are also members of the Ozone Transport Commission (OTC), an organization whose objective are to advise USEPA on ozone transport issues and to develop and implement regional ground-level smog solutions for the east coast of the U.S. The states in the Ozone Transport Region are: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, and the Washington, D.C. Metropolitan Statistical Area, including the northern Virginia suburbs. While the OTC has no rulemaking authority, model rules and programs designed through the OTC process must then be taken by the individual states through their own rule adoption processes conforming to their state's requirements.

The Northeast States for Coordinated Air Use Management is a 501(c)(3) nonprofit association of air quality agencies in the Northeast. The Board of Directors consists of the air directors of the six New England states (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont), New Jersey, and New York. Their purpose is to provide scientific, technical, analytical,

178 CAA 1990

and policy support to the air quality and climate programs of the eight Northeast states. A fundamental component of their efforts is to assist member states in implementing national environmental programs required under the CAA and other federal legislation.

Another important consortium of governments is the Mid-Atlantic/Northeast Visibility Union, which was formed by the Mid-Atlantic and Northeastern states, tribes, and federal agencies to coordinate regional haze planning activities for the region. The Union was formed to encourage a coordinated approach to meeting the requirements of USEPA's regional haze rules and reducing visibility impairment in major national parks and wilderness areas in the Northeast and Mid-Atlantic region.

Mobile Sources

A variety of mobile sources are used to move goods. These typically include ships, harborcraft, cargo-handling equipment, and drayage.

Cargo ships

Air emissions from cargo ships are generated by propulsion engines, auxiliary engines which run electrical generators for auxiliary vessel power requirements (lighting, etc.), and may include auxiliary boilers which provide heat for fuel treatment and other on-board uses (hot water) when the ship is at port. Historically, propulsion engines burn heavy fuel oil or intermediate fuel oil and auxiliary engines typically run using Marine Diesel Oil, Marine Gas Oil or Residual Fuel Oil. When the ship is en-route, emissions are generated by the propulsion engine(s) and the auxiliary engine(s). At port, emissions are generated by the auxiliary engine(s) and the boiler, if one is part of the ship design.

Harborcraft

Tugs assist ships with maneuvering in and out of harbors and ports and berthing. These boats are operated using both propulsion and auxiliary engines. Diesel fuel is used to power the engines.

Cargo-handling Equipment (CHE)

A variety of vessel designs are included in the assessment: Ro/Ro, combination Ro/Ro and container carrier (RoCon), feeder container cargo (stacked) and Ro/Ro and passenger vessel. Ro/Ro and Passenger vessels have minimal cargo handling requirements because all cargo are wheeled, and is loaded and unleaded via ramps from shore to ship and vice versa, and moves within the vessel using internal ramps. The primary cargo-handling equipment required for on- and off-loading of these vessels are shore ramps and equipment to drive the wheeled trailers on and off the ship.

Container carrier vessels require the same cargo-handling equipment as Ro/Ros, and may additionally require ship/shore cranes and straddle carriers or similar equipment for movement of on-deck or open deck stacked containers. The use of wheeled cassettes for stacking containers would alleviate the need for cranes, and would be similar to the requirements needed for unloading the individual wheeled containers in Ro/Ros.

Feeder container ships require the same CHE as standard ocean-going container ships, which include cranes and straddle carriers or similar equipment for movement of the containers to storage or for loading onto drayage.

DRAYAGE

Transport of goods to the origin port and then to final destination after off-loading at the destination port involves the use of drayage – heavy duty diesel freight trucks, which use diesel fuel. These trucks, which typically range from cube trucks to standard long haul freight size, are used for movements within a port and for short distances within the region where a port is located. Many of the dray trucks today are older and dirtier than trucks used on highways, and contribute to serious public health and environmental challenges at ports and surrounding areas. Model year 1994 and older dray trucks emit approximately 60 times the $PM_{2.5}$ emissions than model year 2007 and newer trucks. $PM_{2.5}$ is linked to premature deaths, heart attacks, childhood asthma and increased emergency room and hospital visits.

6.4.4 IMPACTS

The implementation of short sea cargo hauls to replace land-based truck freight movement would result in a modal shift in geographic locations where cargo activities occur. Additional information would be required to fully assess the impacts of these changes to air quality both along the eastern seaboard and locally, particularly in areas where air quality is a significant issue due to criteria pollutant nonattainment designations. In preliminary coordination with the USEPA, it was recommended that assessment of air quality impacts be achieved through the use of various models, such as MOVES, STEEM and others. The applicability of CAA Conformity requirements will need to be addressed for individual port locations subject to changes as a result of implementation of M-95 short sea cargo movements. Overall, it is likely that GHG emissions would be reduced, primarily due to the efficiency on a per unit cargo basis, of ship movements versus truck movements.

Freight movement evaluated in this study includes short sea cargo ships, harborcraft, cargo-handling equipment, and drayage operating within a 50-mile radius of the port terminal. Factors influencing air emissions from these mobile sources include, at a minimum, the fuel used, the amount of fuel consumed which is dependent on a number of factors, engine age/design, and empty miles.

CARGO SHIPS AND HARBORCRAFT

Beginning in 2012, the coastal waters of the U.S. will fall into an ECA, which will extend 200 nm out from included shorelines.[179] Ships complying with ECA standards[180] will reduce their emissions of NOx, SOx, and $PM_{2.5}$. Beginning in 2015, fuel used by all vessels operating in the ECA cannot exceed 0.1 percent fuel sulfur (1000 ppm). This requirement is expected to reduce PM and SOx emissions from these vessels by more than 85 percent. Beginning in 2016, new engines on vessels operating in the ECA must use emission controls that achieve an 80 percent reduction in NOx emissions.

Because the M-95 Corridor falls within the 200-mile jurisdiction of the ECA, ships traversing this route will be required to meet the emission standards, which require using low sulfur fuels. Additionally, new vessels transporting cargo along the route will be outfitted with new engines, meeting the more stringent NOx standard as well as reducing GHG emissions compared to emissions from engines in use today. The net result is that the vessels operating with the M-95 Corridor will produce fewer emissions than vessels currently in use along the eastern seaboard.

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179 IMO 2010

180 With limited exceptions, including for certain "public vessels" (as defined in 40 C.F.R. § 1043.20), all vessels that operate in the North American ECA are required to be in compliance with the Annex VI ECA fuel oil sulfur standard. Note, most vessels under 400 gross tonnage are likely already in compliance with the standard as the majority of these vessels operate using solely distillate fuel oil that meets the Annex VI ECA fuel oil sulfur limit.

Tugs in use at harbors and ports along the eastern seaboard will also be required to burn low sulfur fuel, with similar benefits as those associated with the cargo-carrying vessels.

Overall, the use of M-95 is expected to generate an increase in marine traffic off of the east coast of the U.S., and a decrease in highway traffic for heavy duty diesel trucks traversing I-95 and corollary roads. Accordingly, these changes in freight transportation will translate to emission increases for maritime traffic and emission decreases for truck traffic, as compared to no changes in the current state of goods transport for the east coast. An assessment of the exact impacts and quantification of emissions for comparative analysis is beyond the scope of this study, but would be further investigated within a more comprehensive environmental review of cargo transportation using M-95. This analysis will be required to evaluate impacts, particularly in the Northeastern section of the corridor, where nonattainment air quality issues are widespread and states are mandated to institute actions and technologies to assure improvements in air quality to re-achieve attainment status.

CARGO-HANDLING EQUIPMENT

CHE produces minor emissions in comparison to ship emissions, on a per unit cargo basis, but are land-based and therefore will contribute to the air quality within specific localities where the movement of cargo along the M-95 Corridor would occur. In some cases, cargo-handling equipment may need to be augmented, especially with regard to ramp emplacement at ports that currently are not capable of offloading goods from the short sea vessels proposed for use on the M-95 Corridor.

Ports may also need to augment cargo-handling equipment in order to meet the increased demand for cargo loading and/or delivery at the port. Although diesel-powered equipment has historically been the primary type of equipment in use, a number of replacements that incorporate cleaner fuels and newer technology have become commonplace, particularly as a result of requirements for air quality improvements at west coast ports. These include electric equipment, natural-gas fueled or bio-fueled equipment, and smart systems that reduce unnecessary trips and improve performance during loading and offloading of cargo.

While it is likely that more cargo-handling equipment will be used at ports along the M-95 Corridor, the use of cleaner fuels and advanced technologies will likely result in an overall decrease in emissions as compared to current cargo-handling equipment operational scenarios. If CHE usage is increased across the board at a port location, then some increase in emissions over baseline would be anticipated. The impact of CHE usage would have to be further evaluated on a port-by-port basis in subsequent NEPA analyses associated with the implementation of the ECMHI in specific regions along the eastern seaboard.

DRAYAGE

Drayage provides the least efficient but most nimble mobile source in the Marine Highway Program goods transportation network. Due to legislation aimed at reducing emissions from on-highway diesel engines, emissions from newer trucks will be lower than for trucks in use today. Additionally, USEPA recently (June 2011) instituted the Smartway Drayage Program, which is designed to track emissions, replace older dirtier trucks with cleaner, newer ones, and achieve reductions in PM and NOx. Implementing programs to reduce dray emissions would be particularly important for northeast ports where VOC, NOx and PM emissions are a widespread issue.

Additional methods to reduce emissions from drays could include the use of a common chassis pool, automated terminal appointment systems, and flexing access point times to reduce congestion. Limiting the use of trucks to local delivery areas, which are defined as residing within a

50-mile radius, reduces the overall impact of these emissions for the whole transit, given that diesel trucks carrying individual containers is the least efficient form of cargo movement in the transit chain. Increased use of drays at some ports could result in locally increased air emissions. The extent of an increase in emissions, if any, would have to be evaluated on a port-by-port basis.

6.4.5 Biological Resources

Existing Conditions

Marine Protected Areas

Marine protected areas located along the U.S. Atlantic Coast are depicted by region in Figure 6-1 through Figure 6-3.

Marine Mammals

WHALES

Several species of whales may be encountered along the U.S. Atlantic coast including North Atlantic right whale (*Eubalaena glacialis*)- federally endangered, humpback whale (*Megaptera ovaeangliae*)-federally endangered, Minke whale (*Balaenoptera acutorostrata*), fin whale (*Balaenoptera physalus*)-federally endangered, blue whale (*Balaenoptera musculus*)-federally endangered, sei whale (*Balaenoptera borealis*)-federally endangered and sperm whale (*Physeter catodon*)-federally endangered.

Of species known to be hit by ships, fin whales are struck most frequently; right whales, humpback whales, and sperm whales are hit commonly.

Of these species, only the rarest, North Atlantic right whale, has critical habitat areas designated and is offered special protection due to its susceptibility to ship strikes. NMFS designated critical habitat for right whale in 1994 (59 FR 28805) (Figure 6-4). Right whales were determined as in danger of extinction in U.S. waters in all or a significant portion of their range due to commercial over-utilization.[181]

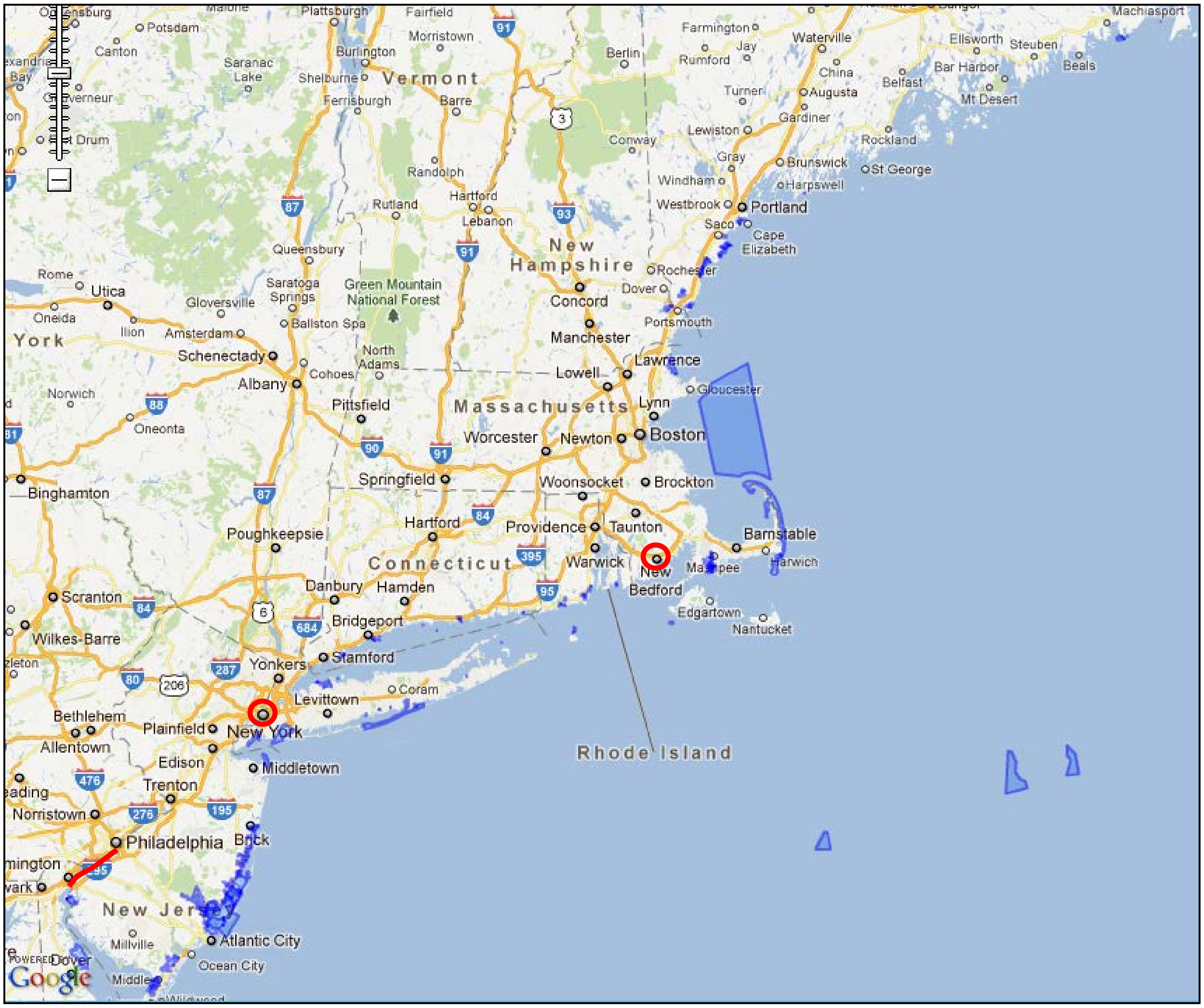
NMFS has taken both regulatory and non-regulatory steps to reduce the threat of ship collisions, including:

- Mandatory vessel speed restrictions in Seasonal Management Areas (Figure 6-5)
- Voluntary speed reductions in Dynamic Management Areas and a seasonal Area To Be Avoided (Figure 6-6)
- Recommended shipping routes (Figure 6-7 through Figure 6-10)
- Modification of international shipping lanes
- Aircraft surveys and right whale alerts
- Ship speed advisories
- Mandatory Ship Reporting Systems: ships greater than 300 gross tons enter two key right whale habitats – one off the northeast U.S. and one off the southeast U.S. –are required to report to a shore-based station. In return, ships receive a message about right whales, their vulnerability to ship strikes, precautionary measures the ship can take to avoid hitting a whale, and locations of recent sightings.

[181] NMFS 2011a

On June 1, 2009, the North-South lanes of the Traffic Separation Scheme servicing Boston were modified to reduce the threat of vessel collisions with right whales and other whale species. The change narrows each of the lanes from two miles to 1.5 miles making the width of the lanes consistent with the East-West Boston Traffic Separation Scheme lanes. This modification moves ships away from the greatest density of right whales and thus minimizes the overlap between whales and ships.[182]

Figure 6-1: Northeast U.S. Marine Protected Areas

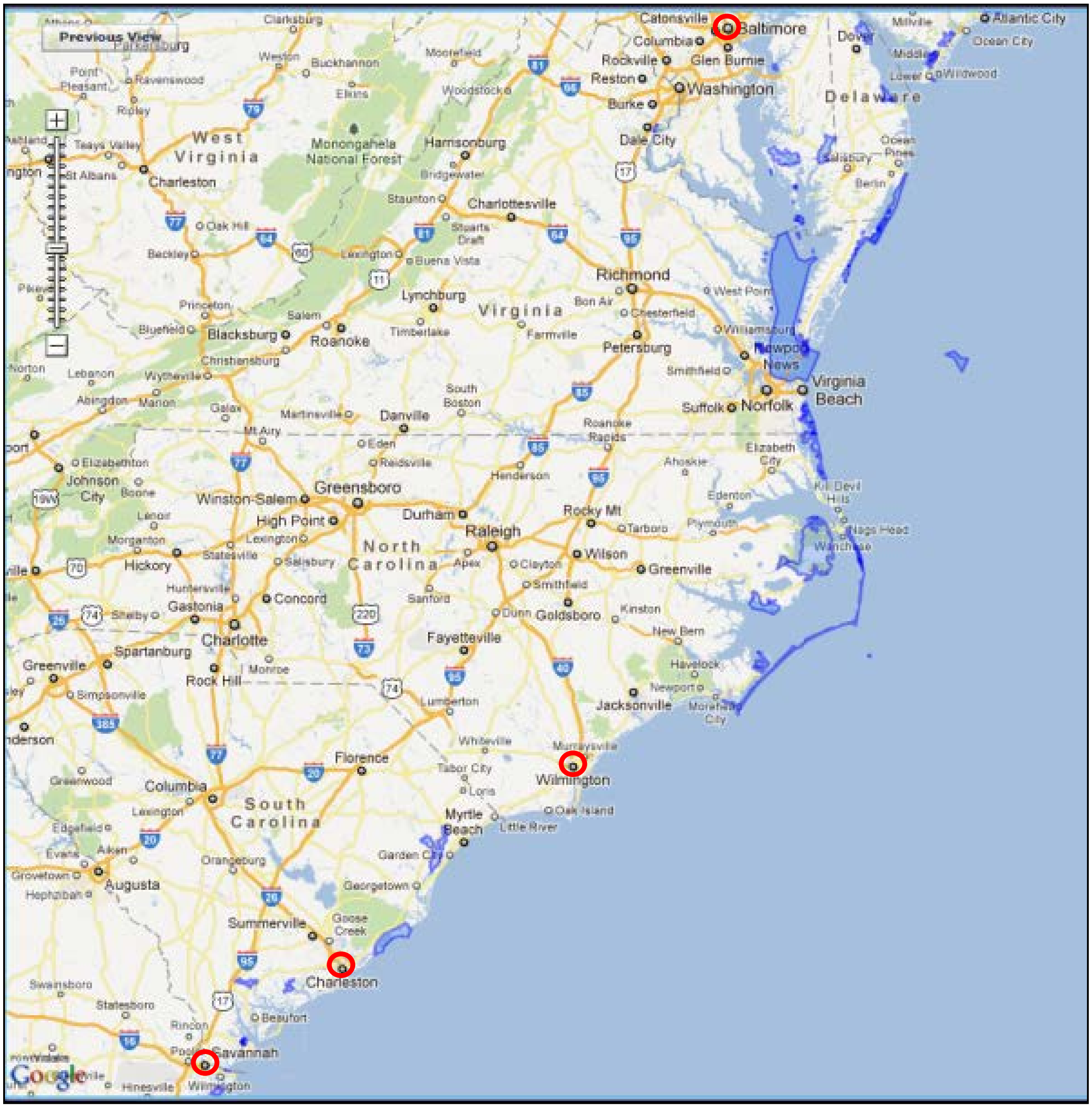


Red Areas Indicate Project Area Port Nodes

Source: TEC

182 NMFS 2011a

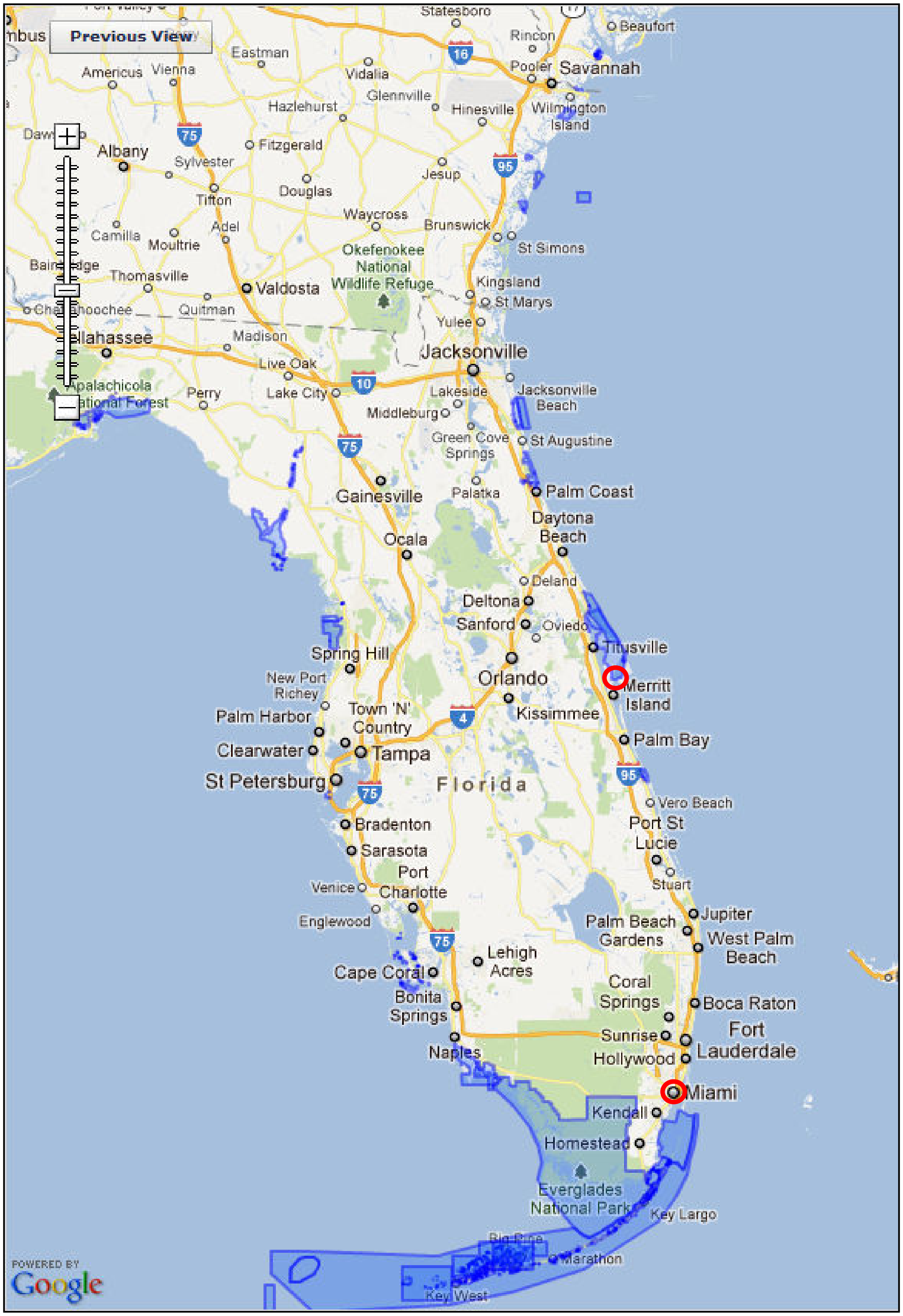
FIGURE 6-2: U.S. MID-ATLANTIC MARINE PROTECTED AREAS



Red Areas Indicate Project Area Port Nodes

Source: TEC

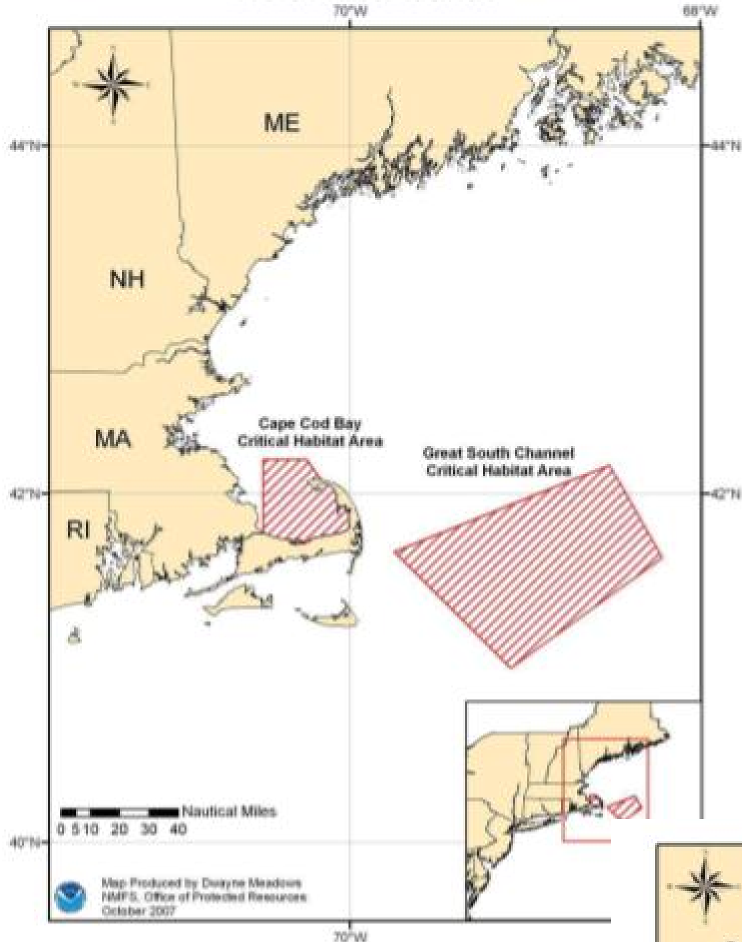
FIGURE 6-3: SOUTH EAST U.S. MARINE PROTECTED AREAS

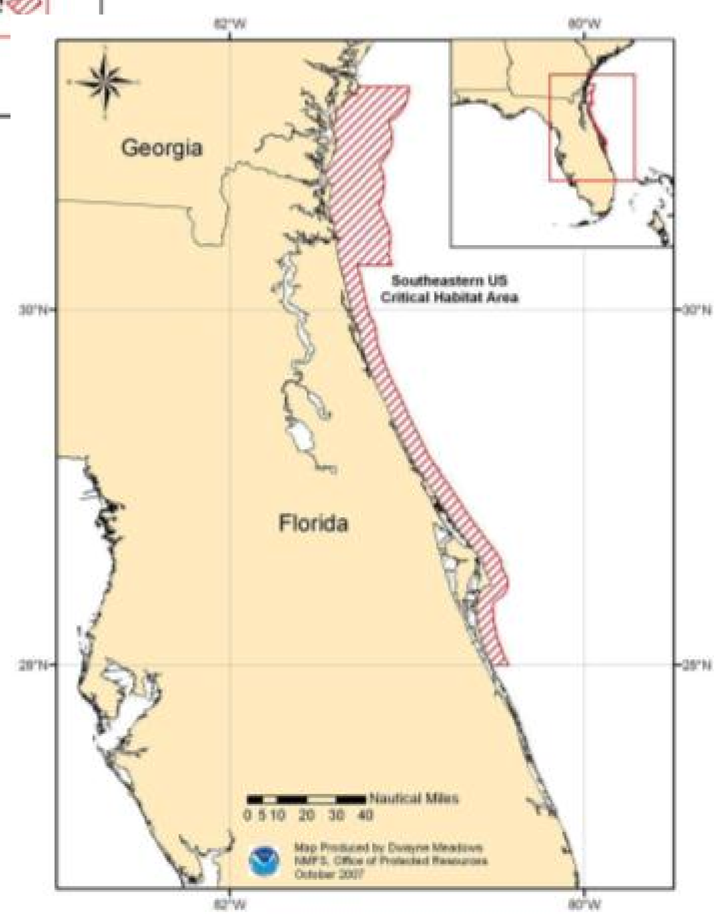


Red Areas Indicate Project Area Port Nodes

Source: TEC

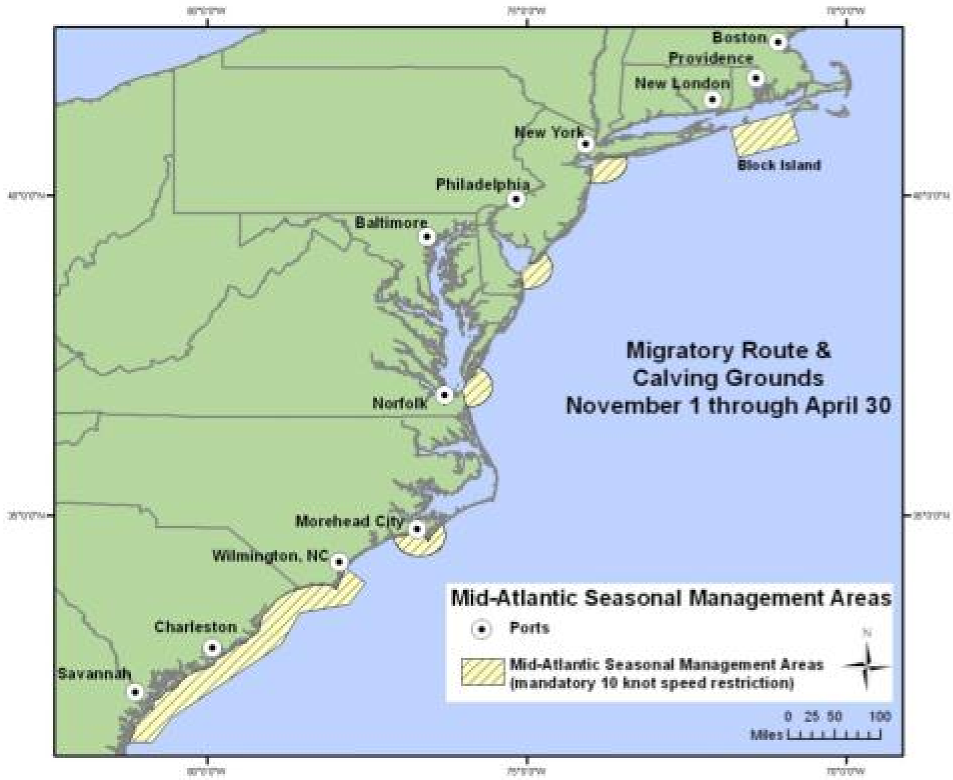
FIGURE 6-4: NORTHERN RIGHT WHALE CRITICAL HABITAT

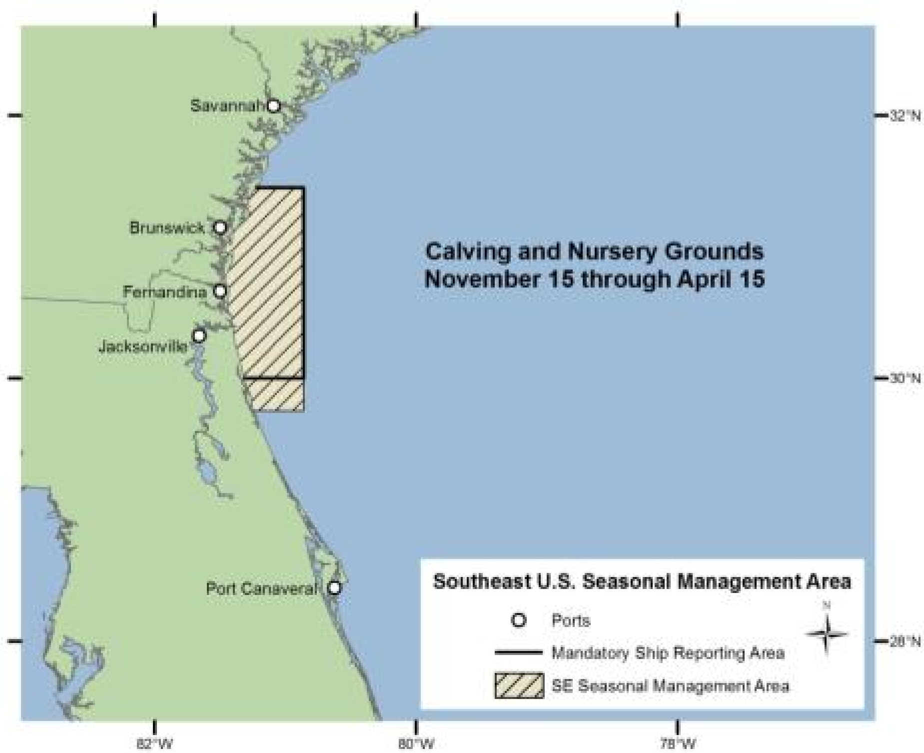




Source: NMFS 2011a

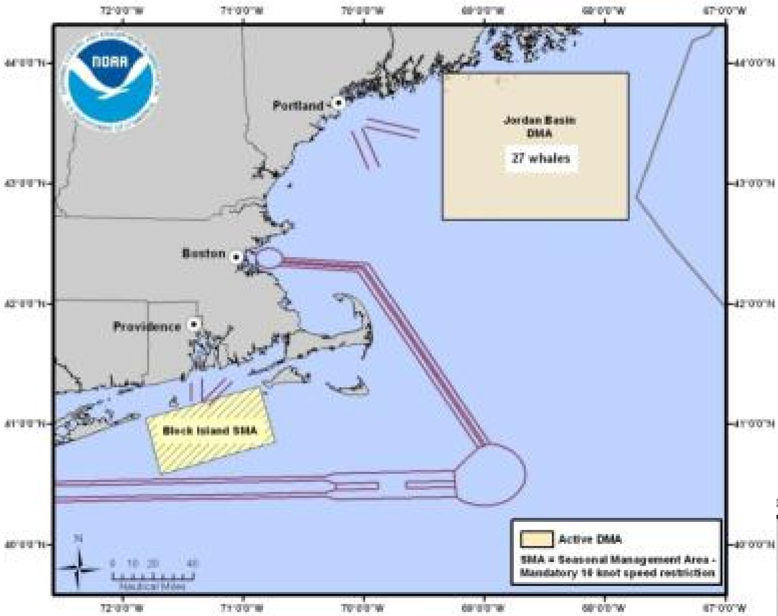
FIGURE 6-5: NORTH ATLANTIC RIGHT WHALE SEASONAL MANAGEMENT AREAS

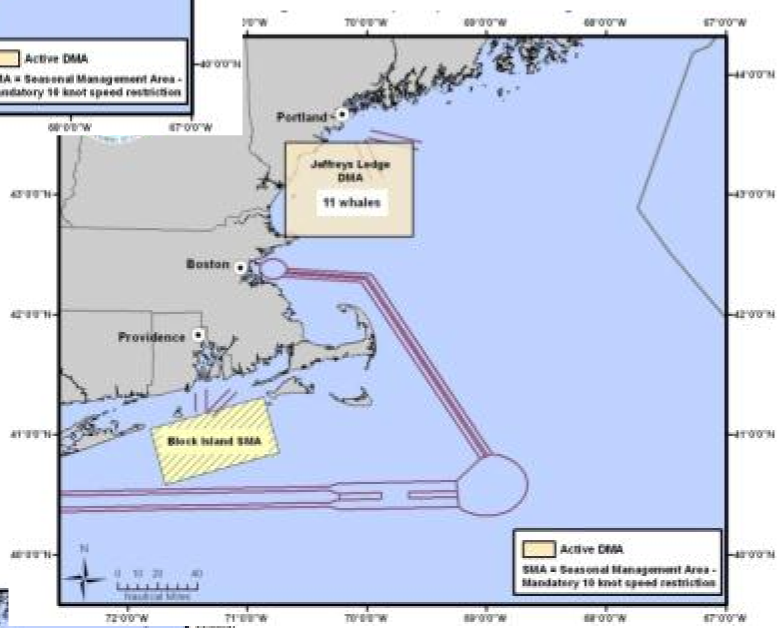


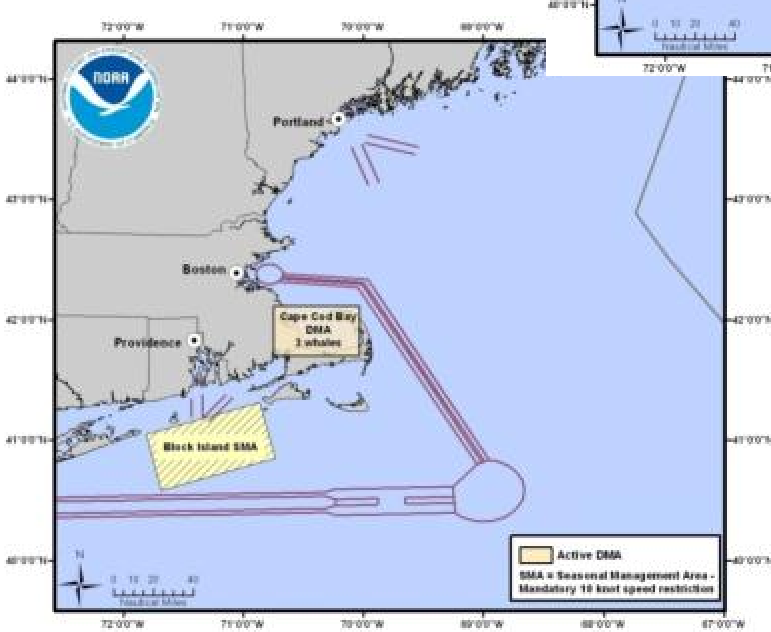


Source: NMFS 2011a

FIGURE 6-6: NORTH ATLANTIC RIGHT WHALE DYNAMIC MANAGEMENT AREAS

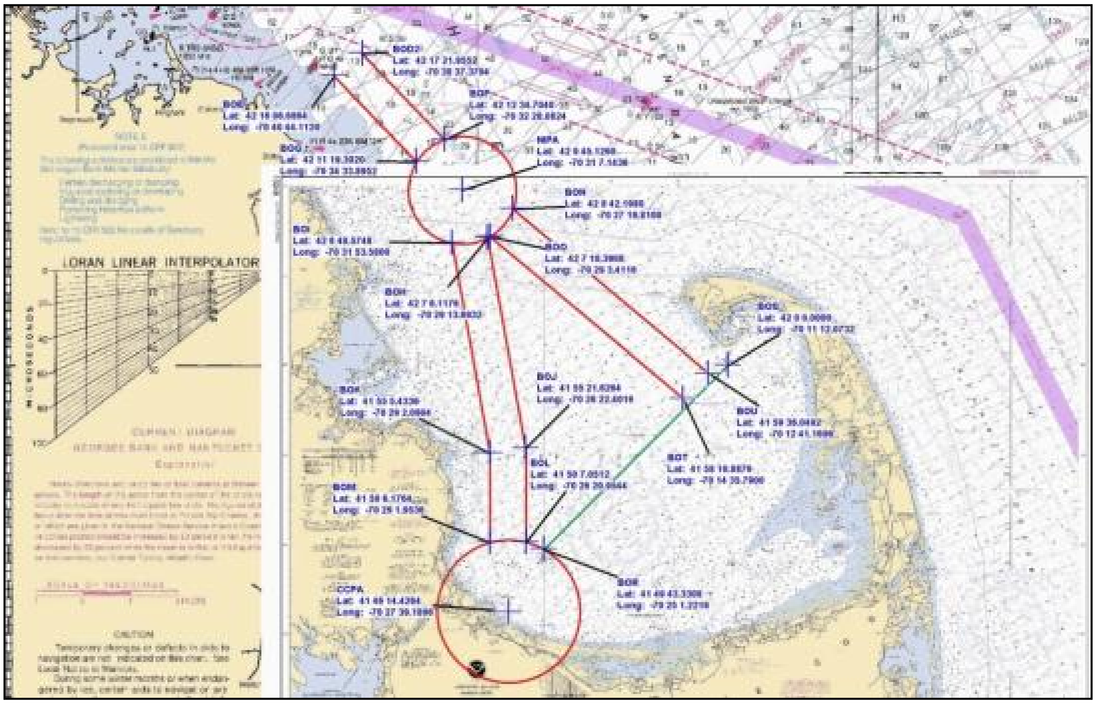






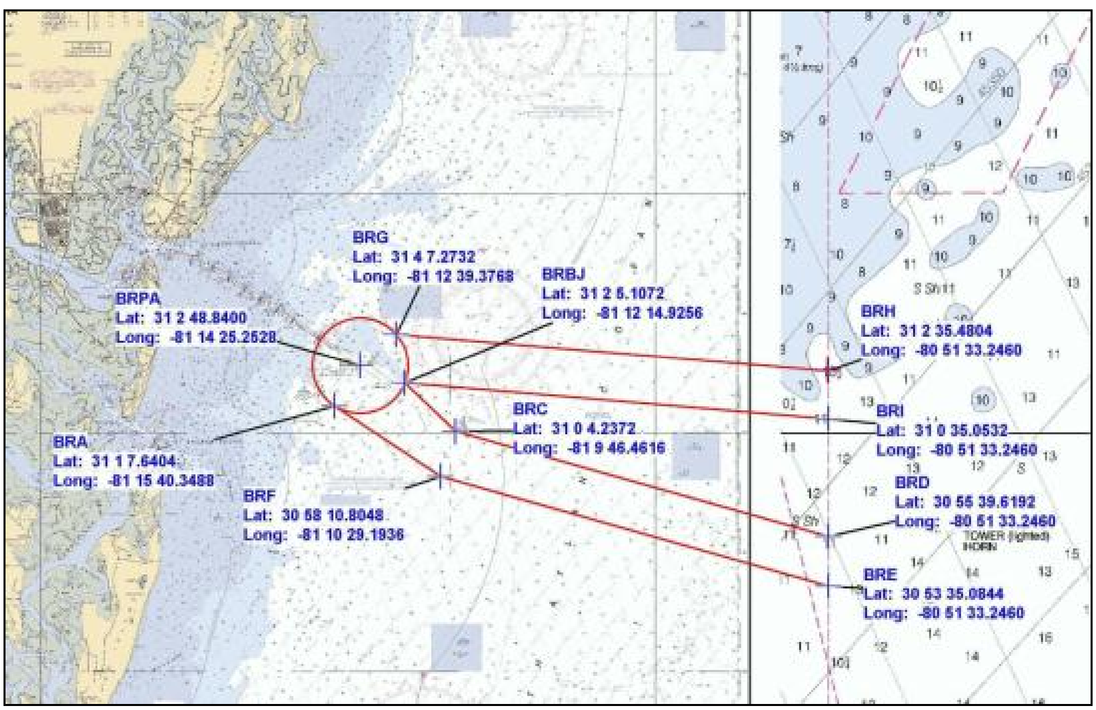
Source: NMFS 2011a

FIGURE 6-7: RECOMMENDED SHIPPING ROUTES (CAPE COD BAY, MA) TO REDUCE SHIP STRIKES TO NORTH ATLANTIC RIGHT WHALES



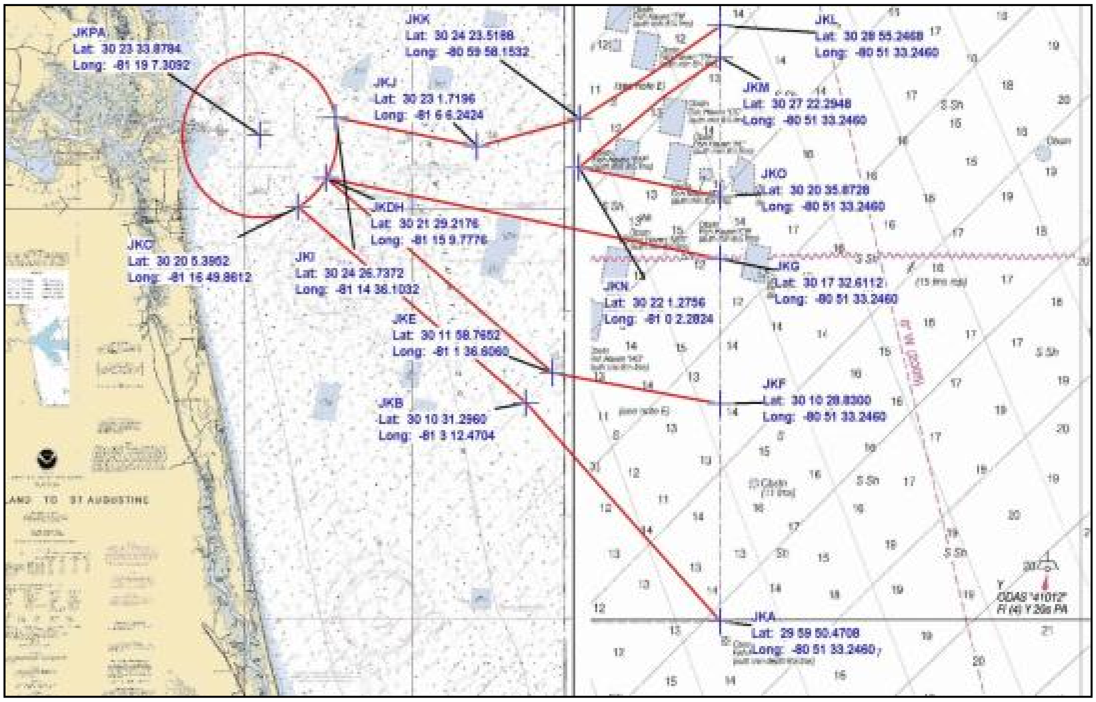
Source: NMFS 2011a

FIGURE 6-8: RECOMMENDED SHIPPING ROUTES (BRUNSWICK, GA) TO REDUCE SHIP STRIKES TO NORTH ATLANTIC RIGHT WHALES



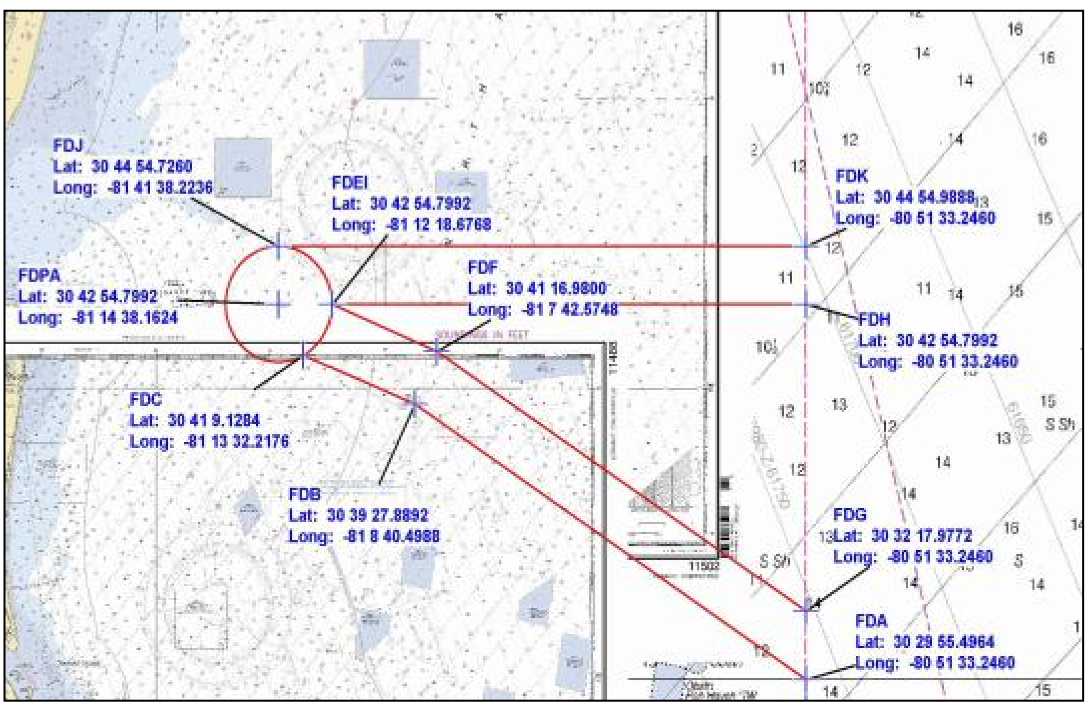
Source: NMFS 2011a

FIGURE 6-9: RECOMMENDED SHIPPING ROUTES (JACKSONVILLE, FL) TO REDUCE SHIP STRIKES TO NORTH ATLANTIC RIGHT WHALES



Source: NMFS 2011a

FIGURE 6-10: RECOMMENDED SHIPPING ROUTES (FERNANDINA, FL) TO REDUCE SHIP STRIKES TO NORTH ATLANTIC RIGHT WHALES



Source: NMFS 2011a

DOLPHINS AND PILOT WHALES

Several dolphin species may occur along the Atlantic coast including:

- short-finned pilot whales (*Globicephala macrorhynchus)*
- short-beaked common dolphins (*Delphinus delphis)*
- common bottlenose dolphins (*Tursiops truncatus)**
- Atlantic spotted dolphins(*Stenella frontalis)*
- pantropical spotted dolphins (*Stenella attenuate*)*
- striped dolphins (*Stenella coeruleoalba)*
- harbor porpoises (*Phocoena phocoena*)

(*Depleted in portions of their range)

Generally speaking the greatest threats to these species are from encounters with fishing gear, hunting, viral infections and toxic pollution. Ship strikes to these species have been recorded, but are not as common as with larger marine mammal species (i.e. whales).[183] All dolphin and pilot whale species are protected under the Marine Mammal Protection Act.

SEA TURTLES

Five species of sea turtles are known to occur off of the Atlantic coast, all of which are protected under the Endangered Species Act.

- green turtle (*Chelonia mydas*)-federally threatened/endangered
- hawksbill turtle (*Eretmochelys imbricata*)-federally endangered
- Kemp's ridley turtle (*Lepidochelys kempii*)-federally endangered
- leatherback turtle (*Dermochelys coriacea*)-federally endangered
- loggerhead turtle (*Caretta caretta*)-federally threatened

Major threats to sea turtles in the U.S. include, but are not limited to: destruction and alteration of nesting and foraging habitats; incidental capture in commercial and recreational fisheries; entanglement in marine debris; and vessel strikes. To effectively address all threats to sea turtles, NOAA Fisheries and the USFWS have developed recovery plans to direct research and management efforts for each sea turtle species.[184]

FISH

Numerous species of fish occur along the U.S. Atlantic coast, many of which are important species for commercial harvesting or are prey species for commercially harvested species. Commercially important fish species are managed under the Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267). This Act established an essential fish habitat (EFH) for important species and requires federal agencies to consult with NMFS on activities that may adversely affect EFH. EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, or growth to maturity".[185] Three fisheries management councils are responsible for managing fish stocks on the Atlantic coast: the northeast fisheries management council, the Middle Atlantic Fisheries Management Council and the South Atlantic Fishery Management Council.

183 IWC 2011

184 NMFS 2011b

185 SAFMC 1998

Habitat Areas of Particular Concern (HAPCs) are a subset of EFH. Fishery Management Councils are encouraged to designate HAPCs under the Magnuson-Stevens Act. HAPCs are identified based on habitat level considerations rather than species life stages as are identified with EFH. EFH guidelines published in federal regulations define HAPCs as types or areas of habitat within EFH that are identified based on one or more of the following considerations:

- The importance of the ecological function provided by the habitat;
- The extent to which the habitat is sensitive to human-induced environmental degradation;
- Whether, and to what extent, development activities are or will be stressing the habitat type; and
- The rarity of the habitat type.[186]

The managed fish species along the Atlantic coast are summarized in Table 6-7.

Table 6-7: Managed Fish Species of the U.S. Atlantic Coast

New England Fishery Management Council	
American Plaice, *Hippoglossoides platessoides*	Witch Flounder, *Glyptocephalus cynoglossus*
Atlantic Cod, *Gadus morhua*	Yellowtail Flounder, *Limanda ferruginea*
Atlantic Halibut, *Hippoglossus hippoglossus*	Red Deepsea Crab, *Chaceon quinquedens*
Atlantic Herring, *Clupea harengus*	Barndoor Skate, *Dipturus laevis*
Goosefish, *Lophius americanus*	Clearnose Skate, *Raja eglanteria*
Haddock, *Melanogrammus aeglefinus*	Little Skate, *Leucoraja erinacea*
Ocean Pout, *Macrozoarces americanus*	Rosette Skate, *Leucoraja garmani virginica*
Offshore Hake, *Merluccius albidus*	Smooth Skate, *Malacoraja senta*
Pollock, *Pollachius virens*	Thorny Skate, *Amblyraja radiata*
Redfish, *Sebastes spp.*	Winter Skate, *Leucoraja ocellata*
Red Hake, *Urophycis chuss*	Silver Hake, *Merluccius bilinearis*
Sea Scallop, *Placopecten magellanicus*	American Plaice, *Hippoglossoides platessoides*
Silver Hake, *Merluccius bilinearis*	Sea Scallop, *Placopecten magellanicus*
White Hake, *Urophycis tenuis*	Atlanic Cod, *Gadus morhua*
Windowpane, *Scophthalmus aquosus*	Atlantic Herring, *Clupea harengus*
Winter Flounder, *Pseudopleuronectes americanus*	Haddock, *Melanogrammus aeglefinus*
Middle Atlantic Fishery Management Council	
Atlantic Mackerel, *Scomber scombrus*	Spiny Dogfish, *Squalus acanthias*
Atlantic Surfclam, *Spisula solidissima*	Summer Flounder, *Paralichthys dentatus*
Black Sea Bass, *Centropristis striata*	Tilefish, *Lopholatilus chamaeleonticeps*
Bluefish, *Pomatomus saltatrix*	Northern Shortfin Squid, *Illex illecebrosus* (2nd edition)
Butterfish, *Peprilus triacanthus*	Longfin Inshore Squid, *Loligo pealeii* (2nd edition)
Longfin Inshore Squid, *Loligo pealeii*	Bluefish, *Pomatomus saltatrix*
Northern Shortfin Squid, *Illex illecebrosus*	Black Sea Bass, *Centropristis striata* (2nd edition)
Ocean Quahog, *Arctica islandica*	Spiny Dogfish, *Squalus acanthias*
Scup, *Stenotomus chrysops*	

186 50 CFR 600.815(a)(8)

South Atlantic Fisheries Management Council	
Almaco Jack, *Seriola rivoliana*	Misty Grouper, *Epinephelus mystacinus*
Atlantic Spadefish *Chaetodipterus faber*	Mutton Snapper, *Lutjanus analis*
Banded Rudderfish *Seriola zonata*	Nassau Grouper, *Epinephelus striatus*
Bank Sea Bass, *Centropristis ocyurus*	Ocean Triggerfish, *Canthidermis sufflamen*
Blackfin Snappper, *Lutjanus buccanella*	Queen Snapper, *Etelis oculatus*
Black Grouper, *Mycteroperca bonaci*	Queen Triggerfish, *Balistes vetula*
Black Margate, *Anisotremus surinamensis*	Red Grouper, *Epinephelus morio*
Black Sea Bass, *Centropristis striata*	Red Hind, *Epinephelus guttatus*
Black Snapper, *Apsilus dentatus*	Red Porgy, *Pagrus pagrus*
Blueline Tilefish, *Caulolatilus microps*	Red Snapper, *Lutjanus campechanus*
Blue Stripe Grunt, *Haemulon sciurus*	Rock Hind, *Epinephelus adscensionis*
Cero, *Scomberomorus regalis*	Rock Sea Bass, *Centropristis philadelphica*
Cobia, *Rachycentron canadum*	Rock Shrimp, *Sicyonia brevirostris*
Coney, *Epinephelus fulvus*	Saucereye Porgy, *Calamus calamus*
Cubera Snapper, *Lutjanus cyanopterus*	Scamp, *Mycteroperca phenax*
Dog Snapper, *Lutjanus jocu*	Schoolmaster, *Lutjanus apodus*
Dolphin Fish, *Coryphaena hippurus*	Scup, *Stenotomus chrysops*
French Grunt, *Haemulon flavolineatum*	Sheepshead, *Archosargus probatocephalus*
Gag Grouper, *Mycteroperca microlepis*	Silk Snapper, *Lutjanus vivanus*
Golden Crab, *Chaceon fenneri*	Snowy Grouper, *Epinephelus niveatus*
Golden Tilefish, *Lopholatilus chamaeleonticeps*	Spanish Mackerel, *Scomberomorus maculatus*
Goliath Grouper, *Epinephelus itajara*	Speckled Hind, *Epinephelus drummondhayi*
Graysby, *Epinephelus cruentatus*	Spiny Lobster, *Panulirus argus*
Gray Snapper, *Lutjanus griseus*	Tiger Grouper, *Mycteroperca tigris*
Gray Triggerfish, *Balistes capriscus*	Tomtate, *Haemulon aurolineatum*
Greater Amberjack, *Seriola dumerili*	Vermilion Snapper, *Rhomboplites aurorubens*
Hogfish, *Lachnolaimus maximus*	Wahoo, *Acanthocybium solanderi*
Jolthead Porgy, *Calamus bajonado*	Warsaw Grouper, *Epinephelus nigritus*
King Mackerel, *Scomberomorus cavalla*	Whiteboned Porgy, *Calamus leucosteus*
Knobbed Porgy, *Calamus nodosus*	White Grunt , *Haemulon plumieri*
Lane Snapper, *Lutjanus synagris*	Wreckfish, *Polyprion americanus*
Lesser Amberjack, *Seriola fasciata*	Yellowmouth Grouper, *Mycteroperca interstilitialis*
Little Tunny, *Euthynnus alletteratus*	Yellowtail Snapper, *Ocyrus chrysurus*
Mahogany Snapper, *Lutjanus mahogoni*	*Litopenaeus setiferus, Farfantepenaeus duorarum, Farfantepenaeus aztecus*
Margate, *Haemulon album*	

The New England Fisheries Management Council designated HAPCs for two of its managed species - Atlantic cod and Atlantic salmon. The Council designated a gravel/cobble bottom area on Georges Bank as an HAPC for juvenile Atlantic cod and eleven Maine rivers as HAPC for juvenile Atlantic salmon (Dennys, Machias, East Machias, Pleasant, Narraguagus, Ducktrap, Kennebec, Penobscot, St. Croix, Tunk Stream, and Sheepscot Rivers) as HAPCs for Atlantic salmon. The Altlantic cod HAPC is located outside of the M-95 operating area and would not be affected.

The Mid-Atlantic Fisheries Management Council has designated HAPCs for summer flounder.[187] HAPC for this species is described as "all native species of macroalgae, seagrasses, and freshwater and tidal macrophytes in any size bed, as well as loose aggregations, within adult and juvenile summer flounder EFH". Submerged aquatic vegetation is defined as "rooted, vascular, flowering plants that, except for some flowering structures, live and grow below the surface". Macroalgae is also designated because it serves a similar ecological function. The Council did not propose any special regulations for the areas designated as HAPCs and encourages states to take the measures necessary to protect HAPCs. Maps or geographic coordinates of the designated HAPCs were not available.

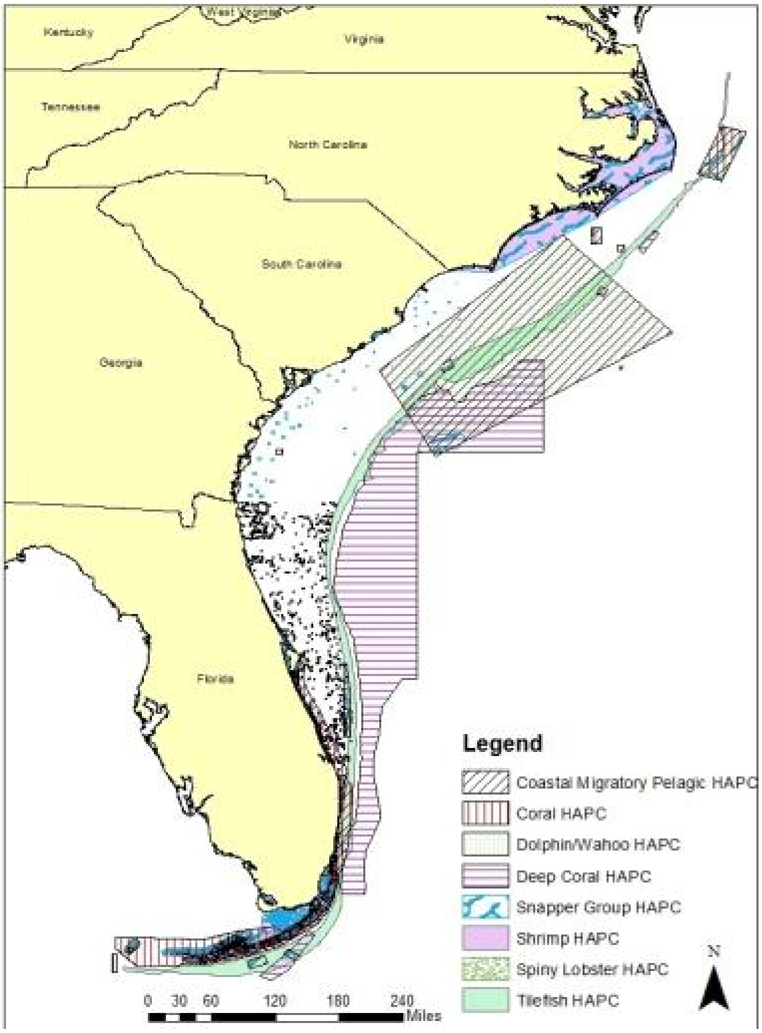
The South Atlantic Fisheries Management Council designated the following areas as HAPCs for the species within its jurisdiction (Figure 6-11):

- Penaeid shrimp *(Litopenaeus setiferus), (Farfantepenaeus duorarum), (Farfantepenaeus aztecus)*
  - all coastal inlets
  - all state-designated nursery habitats of particular importance to shrimp
  - state-identified overwintering areas.

- Red drum (*Sciaenops ocellatus)*
  - all coastal inlets
  - all state-designated nursery habitats of particular importance to red drum
  - documented sites of spawning aggregations in NC, SC, GA, and FL described in the Habitat Plan
  - other spawning areas identified in the future
  - and submerged aquatic vegetation-identified areas

187 NOAA 2011

FIGURE 6-11: HAPC FOR FISH SPECIES MANAGED BY SAMFC



Source: South Atlantic Fisheries Management Council

- Snapper-grouper management unit:
    - medium to high profile offshore hard bottoms where spawning normally occurs
    - areas of known or likely spawning aggregations
    - nearshore hard bottom areas
    - the Point
    - the Ten Fathom Ledge
    - Big Rock
    - the Charleston Bump
    - mangrove habitat
    - seagrass habitat
    - oyster/shell habitat
    - all coastal inlets
    - all state-designated nursery habitats of particular importance to snapper grouper
    - pelagic and benthic Sargassum
    - Hoyt Hills for wreckfish
    - the Oculina Bank Habitat Area of Particular Concern
    - All hermatypic (type involved in reef formation) coral habitats and reefs
    - Manganese outcroppings on the Blake Plateau
    - Council-designated Artificial Reef Special Management Zones (SMZs)

- Coastal Migratory Pelagic Species:
    - sandy shoals of Cape Lookout, Cape Fear, and Cape Hatteras from the shore to the ends of the respective shoals (shoreward of the Gulf stream)
    - the Point
    - the Ten-Fathom Ledge
    - Big Rock
    - the Charleston Bump
    - Hurl Rocks
    - the Point off Jupiter Inlet
    - Worm reefs off the central east coast of Florida
    - nearshore hard bottom south of Cape Canaveral
    - the Hump off Islamorada, Florida
    - the Marathon Hump off Marathon, Florida
    - the "Wall" off the Florida Keys
    - Pelagic sargassum
    - Atlantic coast estuaries with high numbers of Spanish mackerel and cobia (abundance based on ELMR data) including Bogue Sound, New River, and Broad River

- Spiny Lobster (*Palinuridae):*
    - Florida Bay
    - Biscayne Bay
    - Card Sound
    - Coral/hard bottom habitat from Jupiter Inlet, Florida through the Dry Tortugas, Florida

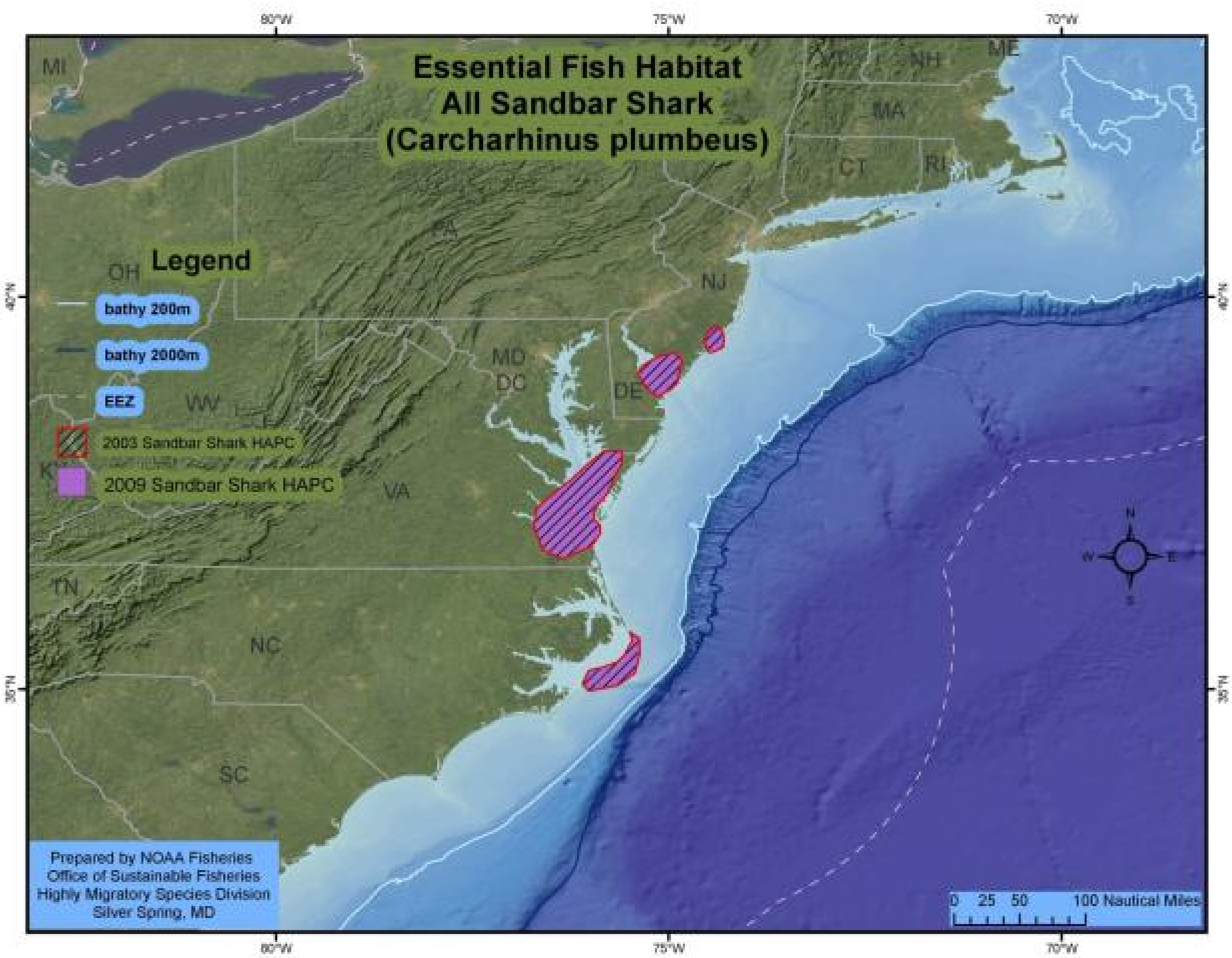
- Coral, coral reefs, and live/hard bottom habitat:
    - 10-Fathom Ledge
    - Big Rock
    - the Point
    - Hurl Rocks
    - the Charleston Bump

- Gray's Reef National Marine Sanctuary
- Worm reefs off the central east coast of Florida
- Oculina Banks off east coast of Florida from Ft. Pierce to Cape Canveral
- Nearshore hard bottom off east coast of Florida from Cape Canaveral to Broward County
- Offshore hard bottom off the east coast of Florida from Palm Beach County to Fowey Rocks
- Biscayne Bay
- Biscayne National Park
- the Florida Keys National Marine Sanctuary

NMFS designated HAPCs for sandbar shark, but not for any other Atlantic highly migratory species due to a general lack of scientific information detailing highly migratory species-habitat associations.

The Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks[188] designated "important nursery and pupping grounds" in several Atlantic coast estuaries as HAPCs for sandbar sharks, specifically shallow areas and the mouth of the Great Bay, New Jersey, lower and middle Delaware Bay, lower Chesapeake Bay, Maryland, and near the Outer Banks, North Carolina in areas of Pamlico Sound adjacent to Hatteras and Ocracoke Islands and offshore those islands (Figure 6-12).

FIGURE 6-12: HAPC FOR SANDBAR SHARK



188 NMFS 1999

Invasive Species

The introduction of foreign species to a new environment often occurs as a result of the unintentional transport of species via airplanes, ships, trucks, packing materials and shipping containers.[189] The ballast water of ships is one principal pathway of this type of introduction.[190] Ballast is any material whose weight is utilized to balance or stabilize an object.[191] A ship takes in water as ballast when its hold is empty for balance and stability and discharges it when it loads new cargo, maintaining equilibrium. It usually picks up ballast water at port, where water is shallow and often contains the eggs and larvae or organisms found in that geographic area. Occasionally, these organisms survive their migration to a new destination. When the water is discharged, these species have the potential to become invasive species in their new environment.[192] The IMO contends that the introduction of invasive species is one of the greatest threats to Earth's oceans, alongside marine pollution, overexploitation of marine resources and the physical alteration/destruction of marine habitats.[193]

6.4.6 Impacts

Impacts to biological resources from operation of M-95 would be minimized through coordination with the various state and federal agencies and compliance with existing regulations promulgated to protect biological resources and prevent the release of pollutants to the environment. In consultation with NMFS, an analysis of noise impacts on marine mammals as well as an analysis of ship strike potential would be required to determine impacts to marine mammal species.
An EFH assessment would be required to determine impacts to fish species managed under the Magnasun-Stevenson Act. The assessment would take into account the various species and lifestages present along the corridor and in specific port areas as well as HAPC.

Impacts from invasive species would be minimized through compliance with the USCG comprehensive National Ballast Water Management program. This program applies to all vessels equipped with ballast water tanks that operate in U.S. waters and are bound for ports or places in the U.S. The program requires mandatory ballast water management practices for all vessels that operate in U.S. waters and requires the reporting and recordkeeping of ballasting operations by all vessels.[194] Compliance with port specific ballast water management plans and rules would further reduce potential impacts.

6.5. Environmental Analysis – Specific To Ports

The corridor-wide environmental impacts resulting from the implementation of the ECMHI would also be experienced at the specific port communities as well as additional impacts that may result at each specific port location. Additional environmental concerns expressed at the port level include noise and air quality impacts to portside communities and cities along the coastal corridors, induced roadway demand at port areas, socio-economic effects, spills from operation and maintenance and impacts from induced port infrastructure development and dredging (Friends of the Earth 2008).

189 MacPhee 2001 in Demassa and Hanson 2006

190 CBD 2001a in Demassa and Hanson 2006

191 IMO 2006a

192 Clout and De Poorter 2005 in Demassa and Hanson 2006

193 IMO 2006a in Demassa and Hanson 2006

194 33 CFR Part 151 Subparts C and D

While the implementation and operation of M-95 has the potential to alleviate congestion along the I-95 corridor, the potential exists for local traffic in specific port areas to increase, resulting in additional congestion and associated noise. In order to fully realize the potential impacts of M-95 to traffic and noise a detailed noise and traffic study should be performed at each specific port so that potential impacts to the port communities can be fully identified, minimized and mitigated.

Additionally, the transfer of highway traffic to the Atlantic coast has the potential to affect air quality at the specific ports of call. These air quality impacts would be the direct result of emissions from ships, trucks and personal vehicles and port machinery (cranes, etc.). Individual, port specific air quality analyses are required to assess any localized air quality impacts resulting from M-95.

It is assumed that the four key ports analyzed in this section have or are in the process of obtaining the infrastructure required to support the ships and ship traffic associated with M-95 and that no additional capital improvements would be required. However, in the event that additional development is needed, compliance with federal and state regulations would be required to identify, minimize and mitigate any potential environmental impacts associated with the development.

6.5.1 Massachusetts - Port of New Bedford

New Bedford/Fairhaven Harbor has maintained status as one of the leading fishing ports of the nation. The harvesting, processing and supporting industry to the local fishing industry is directly linked to the ability of vessels to navigate safely within New Bedford/Fairhaven Harbor. Continued access to shore-side locations is an integral component of the Harbor Plan's vision to maintain and expand existing maritime, industrial, and recreational visitor harbor uses and to continue New Bedford/Fairhaven Harbor as a working, productive port and economic asset for the City, Town and Commonwealth.

Biological Resources

Existing Conditions

Buzzards Bay is classified as a Massachusetts Ocean Sanctuary; however, Buzzards Bay and New Bedford Harbor are not classified as Marine Managed Areas by NMFS. According to the Massachusetts Ocean Resource Information System, all of Buzzards Bay and New Bedford Harbor south of I-95 are classified as priority Habitats of Rare Species. Therefore, one or more federal or state threatened, endangered or species concern species may occur in this area. Coordination with Massachusetts Division of Fisheries and Wildlife would be required to identify any state-listed species with the potential to be affected by the proposed project as well as mitigation measures.

Whales, dolphins, porpoise

Buzzards Bay is not considered a high-use habitat for whales, dolphins, or porpoises; however, these species have occasionally been observed or stranded in the Bay, because of its proximity to the southwest Gulf of Maine and Cape Cod Bay.[195] According to the Massachusetts Ocean Resource Information System, no core habitat for fin, humpback or north Atlantic right whales occurs in the vicinity of the Port of New Bedford.[196]

[195] Buzzards Bay National Estuary Program 2011

[196] MORIS 2011

Seals

The harbor seal (*Phoca vitulina*) is the most abundant marine mammal throughout New England and the only marine mammal species commonly found in Buzzards Bay. Harbor seals are present in the Bay between mid-October and early May. Although a few seals are observed throughout the year, most move north to coastal Maine and eastern Canada prior to the pupping season, which occurs from mid-May through early July. Harbor seals occur throughout the Elizabeth Island chain. The largest single concentration of seals generally occurs at Gull Island. Approximately 300-400 seals are found throughout the Elizabeth Islands and the remainder of Buzzards Bay throughout the winter.

In addition to the harbor seal, gray seals (*Halichoerus grypus)* are occasionally seen on rock ledges in the Bay, but in very small numbers.[197]

Sea Turtles

The leatherback turtle (*Dermochelys coriacea)* is the species most frequently encountered in Buzzards Bay, generally from July through November. The Kemp's ridley turtle (*Lepidochelys kempii*) is known to frequent areas adjacent to Buzzards Bay and it may be a potentially important foraging area for juvenile and sub-adult turtles of this species during late summer and early fall.[198]

Fish

The waters surrounding and including New Bedford Harbor are classified as EFH by the NMFS as defined under the Magnusun-Stevenson Act, for the species and life stages listed in Table 6-8. All of Buzzards Bay and New Bedford Harbor are considered to be Important Fish Resource Areas and Priority Habitats of Rare Species.[199]

As a result of the widespread PCB contamination and the accumulation of PCBs in marine biota, the Massachusetts Department of Public Health (DPH) established three fishing closure areas in New Bedford Harbor in September 1979 (Figure 6-13). These closures are still in effect. Area I, which includes the Port of New Bedford, is closed to all fishing: including finfish, shellfish, and lobsters. Area II is closed to the taking of lobsters and bottom-feeding finfish, such as eels, flounder, scup, and tautog. Area III is closed to lobstering only.[200]

Impacts

Operation of M-95 is anticipated to have little impact on existing biological resources in the Port of New Bedford as this area is already an active port with degraded water and sediment quality. The area is currently heavily developed to support water dependent activities such as shipping and commercial fishing. Additional analyses are required to fully realize impacts of M-95 of the biological resources of New Bedford Harbor.

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[197] Buzzards Bay National Estuary Program 2011

[198] Buzzards Bay National Estuary Program 2011

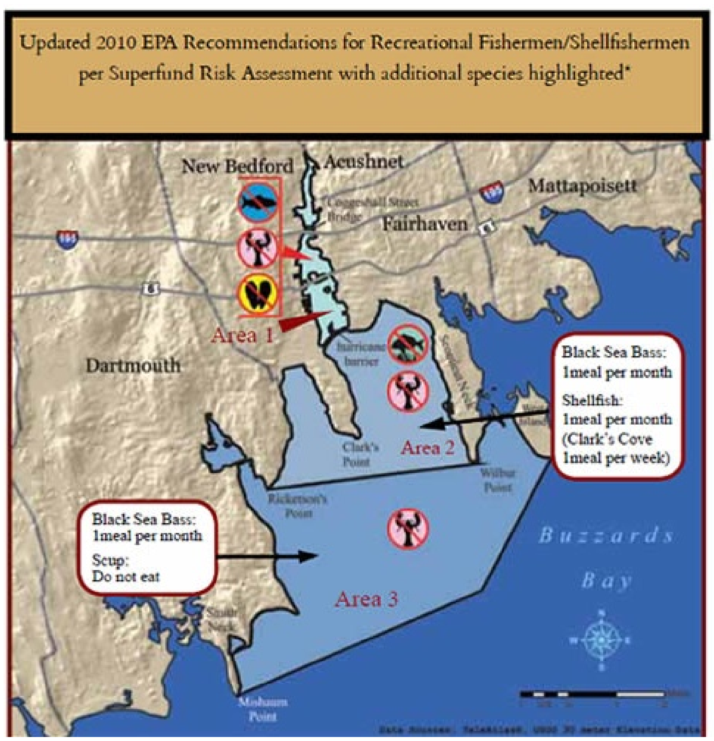
[199] MORIS 2011

[200] MORIS 2011

TABLE 6-8: EFH SPECIES IN THE PORT OF NEW BEDFORD HARBOR

Species	Eggs	Larvae	Juveniles	Adults
Atlantic cod *(Gadus morhua)*	X	X	X	X
haddock *(Melanogrammus aeglefinus)*	X	X		
red hake *(Urophycis chuss)*		X	X	X
winter flounder *(Pseudopleuronectes americanus)*	X	X	X	X
windowpane flounder *(Scophthalmus aquosus)*	X	X	X	X
American plaice *(Hippoglossoides platessoides)*			X	X
Atlantic sea herring *(Clupea harengus)*			X	X
bluefish *(Pomatomus saltatrix)*			X	X
long finned squid *(Loligo pealeii)*			X	X
Atlantic butterfish *(Peprilus triacanthus)*	X	X	X	X
Atlantic mackerel *(Scomber scombrus)*	X	X	X	X
summer flounder *(Paralichthys dentatus)*	X	X	X	X
scup *(Stenotomus chrysops)*	X	X	X	X
black sea bass *(Centropristis striata)*		X	X	X
surf clam *(Spisula solidissima)*			X	X
king mackerel *(Scomberomorus cavalla)*	X	X	X	X
Spanish mackerel *(Scomberomorus maculatus)*	X	X	X	X
cobia *(Rachycentron canadum)*	X	X	X	X
sandbar shark *(Carcharhinus plumbeus)*				X
bluefin tuna *(Thunnus thynnus)*			X	
little skate (*Raja erinacea*)			X	X
winter skate (*Leucoraja ocellata*)			X	X

FIGURE 6-13: FISHING CLOSURE AREAS IN NEW BEDFORD HARBOR



Source: USEPA 2011

WATER RESOURCES

EXISTING CONDITIONS

Surface waters in New Bedford Harbor are classified as "SB". These waters are designated as a habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation. In certain waters, habitat for fish, other aquatic life and wildlife may include, but is not limited to, seagrass.[201]

In 1979, New Bedford Harbor and Upper Buzzards Bay were closed to fishing due to PCB contamination and PCB accumulation in marine biota. The New Bedford Harbor site was added to the USEPA Superfund National Priorities List in 1982.[202]

WETLANDS

There are no extensive wetland areas in the Port of New Bedford as the majority of the shoreline has been hardened to support water dependent uses. Small areas of wetlands are located behind the hurricane barrier, on Palmers Island and other smaller islands and undeveloped areas within the harbor, and at a large undeveloped area near Riverside Cemetery just south of I-95. The majority of these wetland areas have experienced varying levels of human disturbance.

IMPACTS

Impacts to surface waters would be minimized through adherence to the CWA and the regulations of Annex IV of MARPOL. The CWA regulates sewage, gray water, bilge water, and a variety of other vessel discharges and discharges of sewage or "blackwater" are prohibited except for specific conditions stipulated under the MARPOL Annex. Additionally, compliance with state and local water quality regulations would further minimize impacts to surface waters. The port of New Bedford prohibits the sandblasting of vessels or undertaking major vessel repairs at its piers. Adherence to these prohibitions would minimize the likelihood of accidental releases of pollutants to the water. The Port of New Bedford monitors the waterfront for oil spills and floating debris daily, and ensures that operational activities do not interfere with natural resources. The Port is also responsible for containing spills. If a vessel is damaged, sinks, or otherwise spills oil in New Bedford Harbor, the Port deploys a 110 foot oil boom to isolate and contain persistent and non-persistent substances.[203]

SOCIOECONOMIC AND ENVIRONMENTAL JUSTICE

Socioeconomic and Environmental Justice issues are a concern at the Port of New Bedford. The general populous in the New Bedford port area is classified as an environmental justice population. Management of the port area and detailed analysis of the potential implications of increased marine and overland traffic to and from the port area is required to determine and mitigate any potential impacts of M-95 projects on these communities.

6.5.2 NEW JERSEY PORTS

The New Jersey port areas occur both in the NY/NJ harbor area and along the Delaware River. Generally speaking, these port areas have long histories of industrial use. The Port Authority of NY/NJ conceives, builds, operates and maintains infrastructure critical to the New York/New Jersey region's trade and transportation network. These facilities include America's busiest airport

201 314 CMR 4.00

202 EBASCO 1992

203 Port of New Bedford 2011

system, marine terminals and ports, the PATH rail transit system, six tunnels and bridges between New York and New Jersey, the Port Authority Bus Terminal in Manhattan, and the World Trade Center. The Port of NY/NJ is the third largest port in the nation.[204]

New Jersey also has several port areas located along the Delaware River, including Chester, Paulsboro, Camden and Trenton. The Delaware River Port Complex, which also includes ports in Delaware and Pennsylvania, is the largest freshwater port in the world and is the largest for steel and paper in North America. The Port is the East Coast's largest importer of cocoa beans and fruit and as much as seventy percent of the oil shipped to the Atlantic Coast moves through the Estuary. In 2008 the Delaware River Port Authority, the South Jersey Port Corporation and the Philadelphia Regional Port Authority signed the "Green Ports" initiative to improve the environment of the Ports and the Delaware River. Under the initiative the ports have been implementing various measures such as installing emission control devices on diesel equipment, developing green buffers between the community and the port and the use of energy-saving green concepts in new construction minimize or negating any environmental impacts the ports have on the environment.

Biological Resources

Existing Conditions

The Port of NY/NJ is located within Hudson-Raritan Estuary, an "Estuary of National Significance", as designated by the USEPA. As a result of hundreds of years of urban development in and around the New York and New Jersey Harbor region, the environment has suffered from the extensive loss and degradation of natural habitats that has reduced the diversity, abundance, function and integrity of the many ecosystems remaining within the area. The New York District of USACE, along with partners and stakeholders is undertaking restoration of the New York and New Jersey Harbor Estuary.

Numerous species of plants and animals, such as oysters, crabs, diamondback terrapins and waterfowl, and humpback whales can be found in the estuary. The Delaware Estuary supports the world's largest horseshoe crab population and its 1.1 million acres of wetlands provide critical habitat for 35 percent of the region's threatened and endangered species.[205]

Marine Mammals

Humpback whales have been recorded in the Hudson-Raritan estuary; however, marine mammals are not known to occur in the NY/NJ port area nor are they likely to occur in the Delaware River. Occasional sightings in the Delaware River have been recorded but are very rare. These species may be present in Delaware Bay.[206]

Turtles

Sea turtles do not occur in the NY/NJ port area. Diamondback terrapin (*Malaclemys terrapin*) may occur in small numbers in areas to the north and south of the port where some marsh habitat still exists, especially along the Arthur Kill.

Sea Turtle species do not occur in the Delaware River but may be present in Delaware Bay.[207]

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204 The Port Authority of New York and New Jersey 2011

205 Delaware Riverkeeper 2010

206 Delaware Riverkeeper 2010

207 Delaware Riverkeeper 2010

FISH

EFH has been designated in the NY/NJ port area for several finfish species and life stages (Table 6-9). The Port area encompasses two 10-minute by 10-minute squares provided for use in determining the presence of EFH by the NMFS.[208] Waters near the New Jersey port cities on the Delaware River are on classified as EFH by NMFS.

TABLE 6-9: EFH SPECIES OF THE NY/NJ PORT AREA

Species	Eggs	Larvae	Juveniles	Adults
Red hake	X	X	X	X
Winter flounder	X	X	X	X
Windowpane Flounder	X	X	X	X
Atlantic herring		X	X	X
Bluefish			X	X
Butterfish		X	X	X
Atlantic mackerel			X	X
Summer flounder		X	X	X
Scup	X	X	X	X
Black sea bass			X	X
King mackerel	X	X	X	X
Spanish mackerel	X	X	X	X
Cobia	X	X	X	X
Sand tiger shark		X		
Dusky shark		X	X	
Sandbar shark		X	X	X

Delaware Bay is an important fisheries area with containing several 10-minute by 10-minute squares provided for use in determining the presence of EFH by the NMFS.[209] The port areas that would accommodate the M-95 are outside of Delaware Bay area. Delaware Bay is also an important habitat area for blue crabs, oysters and horseshoe crabs.

The short-nosed sturgeon, a federally endangered species, has been recorded in the NY/NJ port area. This sturgeon occurs will occasional enter the port area during times of heavy rains, which reduce salinity in the port.[210] Shortnose sturgeon occur in the Delaware River from the lower bay upstream to at least Lambertville, New Jersey. Movement to the spawning grounds occurs in early spring (late March through early May) and is triggered partially by water temperature. Sturgeon typically arrive at their spawning areas when water temperatures are between 8-9 degrees Celsius (°C) and most spawning occurs when water temperatures are between 10°C and 15°C and lasts 5-17 days. The Scudders Falls region, north of Trenton, New Jersey and approximately 25 miles upriver from the project area, has been identified as a major spawning area.[211]

208 NMFS 2011c

209 NMFS 2011c

210 USACE 1999

211 O'Herron et al. 1993

BIRDS

The majority of birds that use the NY/NJ Port area are water birds. These include loons, grebes, cormorants, waders, waterfowl (Anseriformes), shorebirds, gulls and terns. A few areas along the west (NJ) side of the port area are shallow and hold the potential to attract waders such as herons and egrets, and at low tide shorebirds such as dowitchers, sandpipers and plovers.

Shooters Island Bird Sanctuary is located in Kill Van Kull near the southern extent of Newark Bay. This Island is part of the Harbor Herons Complex. This complex is considered significant habitat by USFWS because of the presence of major nesting colonies and foraging areas for herons, egrets, and ibises.[212]

The peregrine falcon has been removed from the federal Endangered Species list and remains listed as endangered in New York and New Jersey. Peregrine falcons are known to nest within the study area, primarily on bridges and buildings. The nesting adults tend to stay in the vicinity during winter. The NY/NJ metropolitan area is important for peregrines, in that it is along the migratory route for the highly migratory subspecies that nest in Canada.[213]

Several Important Bird Areas occur along the Delaware River in New Jersey between Delaware Bay and Trenton. These areas include: Hamilton-Trenton Marsh, Crystal Lake, Palmyra Cove Nature Park, National Park Dredge Spoils and Supawna Meadows National Wildlife Refuge. All of these areas have the potential to provide habitat for state and federally protected species.[214]

IMPACTS

Operation of M-95 is anticipated to have minimal impact on existing biological resources in the New Jersey port areas and Delaware River as these areas already support a large amount of shipping activity. The port areas are heavily developed to support water dependent uses. Shoreline areas that are valuable to breeding bird populations along the Delaware River would not be directly affected by M-95 as the Delaware River is already an important shipping corridor. Indirect impacts to potential habitat could be minimized with speed restriction in sensitive areas. Additional analyses are required to fully realize the impacts of M-95 on the biological resources of these New Jersey port areas. Coordination with NJDEP would be required to access the Natural Heritage Database for records of rare or endangered species and natural communities on or near the project area.

WATER RESOURCES

EXISTING CONDITIONS

Newark Bay is classified as SE3 saline estuarine waters by NJDEP with the designated uses of: (1) secondary contact recreation; (2) maintenance and migration of fish populations; (3) migration of diadromous fish; (4) maintenance of wildlife; and (5) any other reasonable uses. According to the Water Quality standards established by the NJDEP, fecal coliform in Class SE3 waters shall not exceed a geometric mean of 1500 counts/100 ml.

The interstate waters of the mainstem Delaware River are under the jurisdiction of the Delaware River Basin Commission and the use designations for the zones of the Delaware River Mainstem

212 USACE 1999
213 USACE 1999
214 NJ Audubon 2011

from Trenton to the Atlantic Ocean (Zones 2-6) are contained in the DRBC Water Quality Regulations. The designated uses per Zone are as follows:

Zone 2 is that part of the Delaware River extending from the head of tidewater at Trenton, New Jersey, R.M. (River Mile) 133.4 (Trenton-Morrisville Toll Bridge) to R.M. 108.4 below the mouth of Pennypack Creek, including the tidal portions of the tributaries thereof. The designated uses for this zone are; public water supplies after reasonable treatment, industrial water supplies after reasonable treatment, agricultural water supplies, maintenance and propagation of resident fish and other aquatic life, passage of anadromous fish, wildlife, recreation and navigation.

Zone 3 is that part of the Delaware River extending from R.M. 108.4 to R.M. 95.0 below the mouth of Big Timber Creek, including the tidal portions of the tributaries thereof. The designated uses for this zone are; public water supplies after reasonable treatment, industrial water supplies after reasonable treatment, agricultural water supplies, maintenance and propagation of resident fish and other aquatic life, passage of anadromous fish, wildlife, recreation (secondary contact) and navigation.

Zone 4 is that part of the Delaware River extending from R.M. 95.0 to R.M. 78.8, the Pennsylvania-Delaware boundary line, including the tidal portions of the tributaries thereof. The designated uses for this zone are: industrial water supplies after reasonable treatment, maintenance of resident fish and other aquatic life, passage of anadromous fish, wildlife, recreation below river mile 81.8 (secondary contact above river mile 81.8) and navigation.

Zone 5 is that part of the Delaware River extending from R.M. 78.8 to R.M. 48.2, Liston Point, including the tidal portions of the tributaries thereof. The designated uses for this zone are: industrial water supplies after reasonable treatment, maintenance resident fish and other aquatic life, propagation of resident fish and other aquatic life (river mile 70.0 to 48.2), passage of anadromous fish, wildlife, recreation and navigation.

Zone 6 is Delaware Bay extending from R.M. 48.2 to R.M. 0.0, the Atlantic Ocean, including the tidal portions of the tributaries thereof. The designated uses for this zone include: industrial water supplies after reasonable treatment, maintenance and propagation of resident fish and other aquatic life, maintenance and propagation of shellfish, passage of anadromous fish, wildlife, recreation, and navigation.[215]

WETLANDS

Numerous wetland areas exist along the banks of the Delaware River between its mouth and Trenton, NJ. The increase in ship traffic has the potential to increase erosion of these areas from increased wave action produced by ship wakes.

IMPACTS

Impacts to surface waters within the port areas of New Jersey and along the Delaware River would be minimized through adherence to the CWA and the regulations of Annex IV of MARPOL. The CWA regulates sewage, gray water, bilge water, and a variety of other vessel discharges and discharges of sewage or “blackwater” are prohibited except for specific conditions stipulated under the MARPOL Annex. Additionally, compliance with state and local water quality regulations would further minimize impacts to surface waters. Adherence to rules and regulations of the various port

[215] 18 CFR 410

management plans would further minimize the likelihood of adverse impacts to water quality stemming from accidental releases of pollutants.

Potential impacts to wetlands could be minimized by reducing vessel speeds in areas containing sensitive wetlands.

SOCIOECONOMIC AND ENVIRONMENTAL JUSTICE

Socioeconomic and Environmental Justice issues are a concern at the New York/New Jersey port area and in the major port cities along the Delaware River such as Camden and Trenton. These areas exhibit higher percentages of low income and/or minority residents than their respective counties as a whole and would require further consideration during the preparation of NEPA documents for M-95. Key questions for the impact assessment concern whether M-95 projects would create adverse effects and, if so, would they disproportionally affect minority or low-income populations.

6.5.3 MARYLAND - PORT OF BALTIMORE

The Port of Baltimore is one of America's busiest deep water ports. It is located on a 32-square-mile area of the Patapsco River and its tributaries, approximately 12 miles northwest of the Chesapeake Bay. From its central location nearly 150 miles inland from the Atlantic Ocean, the Port of Baltimore can easily provide service to America's Midwestern markets as well as other ports along the Atlantic Coast.[216]

BIOLOGICAL RESOURCES

EXISTING CONDITIONS

WHALES, DOLPHIN, PILOT WHALES AND SEALS

There are few marine mammals that are known to infrequently visit the Chesapeake Bay. Species have been identified through rare sightings or strandings along the shore. Sightings have been made primarily in the Lower Bay and not in the Baltimore Harbor area. These marine mammals include humpback, pilot, and mink whales, manatees, dolphins, porpoises, and harbor seals. No federally threatened or endangered species are present in Baltimore City or Harbor.[217]

SEA TURTLES

Sea turtle species are not known to be present in Baltimore City or Harbor.[218]

FISH

The Harbor Channels supports a small commercial finfish industry. Five key species (Atlantic menhaden, American eel, yellow perch, white perch, and striped bass) make up 95 percent of the average (1990-2002) total annual harvest.[219]

Because of reduced water quality and degraded benthic habitat in the Harbor area, the abundance and diversity of finfish in the project area is also expected to be low. Anadromous species,

216 USACE BD 2011
217 USACE-BD 2005
218 USACE-BD 2005
219 USACE-BD 2005

particularly alewife (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*) migrate through the Patapsco subestuary en route to and from spawning areas in the upper nontidal section of the river. Anadramous fish restoration efforts have been made in the Harbor to help reinvigorate the spawning run. Previous studies have concluded that the Harbor provides nursery and adult habitat for a number of fish species.[220] Patapsco River and Baltimore Harbor are not classified as EFH by NMFS, however, the Chesapeake Bay main stem is classified as EFH.

BIRDS

There are three documented colonial waterbird nesting sites within the harbor area. Two of the sites are located on the shoreline of the Patapsco River, and the other site is on the shoreline of the Bay mainstream, approximately two miles south of Hart-Miller Island. A large area within the Harbor has been designated as waterfowl Sensitive Species Project Review Area by Maryland Department of Natural Resources. The waterfowl Sensitive Species Project Review Area essentially borders the Patapsco River on both shorelines as well as around Hart-Miller Island.[221]

IMPACTS

Operation of M-95 is not anticipated to impact existing biological resources in the port of Baltimore as these areas already support a large amount of shipping activity. The port area is heavily developed to support water dependent uses. Shoreline areas that are valuable to breeding bird populations along the Patapsco River would not be directly affected by M-95 as the River is already an important shipping corridor. Indirect impacts to potential habitat could be minimized with speed restriction in sensitive areas. Coordination with the Maryland Department of Natural Resources Wildlife and Heritage Service would be required to identify any state protected species in the project area as well as potential mitigation measures, if required.

WATER RESOURCES

EXISTING CONDITIONS

Historically, the water quality in Baltimore Harbor was considered of poor quality. Although discharge management strategies and watershed management practices have decreased nutrient and toxics loading in the Harbor since 1975, nutrient enrichment and eutrophication are still apparent.[222] The water quality in the Harbor is impacted by the heavy volume of urban runoff combined with industrial and commercial discharges. Nutrient levels are relatively high and algae blooms are frequent. Waters below the pycnocline frequently become hypoxic (dissolved oxygen less than two mg/L) during the summer months.[223]

WETLANDS

The Maryland western shore watershed lies in the north central region of the Chesapeake Bay watershed. This watershed contains a total of 11,389 acres of estuarine wetlands, 413 acres of lacustrine wetlands, 16,740 acres of palustrine wetlands, and two acres of riverine wetlands. Of these wetlands, 3,021 are less than three acres in size. A total of 1,126 of the wetlands are between three and ten acres in size, and 512 of the wetlands are greater than ten acres in size.[224]

220 CENAB 1997 in USACE-BD 2005
221 USACE-BD 2005
222 EA 2003a in USACE-BD 2005
223 CENAB 1997 in USACE-BD 2005
224 CBP 2004i in USACE-BD 2005

Impacts

Impacts to water quality from the operation of M-95 are anticipated to be minimal. Impacts to surface waters within the Port of Baltimore would be minimized through adherence to the CWA and the regulations of Annex IV of MARPOL. The CWA regulates sewage, gray water, bilge water, and a variety of other vessel discharges and discharges of sewage or "blackwater" are prohibited except for specific conditions stipulated under the MARPOL Annex. Additionally, compliance with state and local water quality regulations would further minimize impacts to surface waters. Maryland Port Administration (MPA) and its partners monitor water quality, bottom sediments, and aquatic life to ensure that contaminants are being contained.[225]

MPA's Spill Prevention, Control, and Countermeasures Plans require the use of containment techniques and counter measures to prevent oil spills from reaching navigable waters. MPA has assisted Port tenants in developing and/or upgrading plans for their own facilities.[226] MPA also funds a navigation system designed to ensure ship safety and protect coastal marine resources from spills. The Upper Chesapeake Bay Physical Oceanographic Real-Time System (PORTS®) provides ship masters and pilots with accurate, real-time information required for safe vessel loading and transit. The system prevents ship groundings and collisions that could potentially result in catastrophic environmental harm.[227]

Impacts to wetlands could be minimized by reducing vessel speeds in areas containing sensitive wetlands.

Socioeconomic and Environmental Justice

Socioeconomic and Environmental Justice issues are a concern at the port of Baltimore. Some areas exhibit higher percentages of low income and or minority residents than their respective counties as a whole and would require further consideration during the preparation of NEPA documents for M-95. Key questions for the impact assessment concern whether M-95 would create adverse effects and, if so, would they disproportionally affect minority or low-income populations.

6.5.4 Florida - Port Canaveral

Port Canaveral was dedicated in 1953. A Special Act of the Florida state legislature created the independent governmental agency that operates the Port – the Canaveral Port Authority. The Port is a multiple-use facility composed of cruise ship berths, cargo berths, U.S. Navy, USCG, and Military Sealift Command berths.

Biological Resources

Existing Conditions

Port Canaveral is home to several protected species such as manatees, sea turtles, and rare offshore sightings of right whales in the months from November to April.[228]

Marine Mammals

Thirty-five marine mammal species have records in nearshore waters of the mid to northern Florida Atlantic coast. Of these 35 species, only 15 are expected to occur regularly in the region

225 MPA 2011
226 MPA 2011
227 MPA 2011
228 CPA 2011

(Table 6-10). Some marine mammal species occur in the area year-round (e.g., bottlenose dolphins and beaked whales), while others (e.g., northern right and humpback whales) occur seasonally as they migrate through the area. Harbor and hooded seals are extralimital to this area, which is well south of this species' typical ranges.[229]

Table 6-10: Marine Mammal Species that Regularly Occur in the Port Canaveral Region

Common Name	*Scientific Name*	(Federal Status) occurrence
North Atlantic right whale	*Eubalaena glacialis*	(Endangered) Regular
Humpback whale	*Megaptera novaeangliae*	(Endangered) Rare
Minke whale	*Balaenoptera acutorostrata*	Rare
Bryde's whale	*Balaenoptera edeni/brydei**	Regular
Sei whale	*Balaenoptera borealis*	(Endangered) Rare
Fin whale	*Balaenoptera physalus*	(Endangered) Rare
Blue whale	*Balaenoptera musculus*	(Endangered) Rare
Sperm whale	*Physeter macrocephalus*	(Endangered) Regular
Pygmy sperm whale	*Kogia breviceps*	Regular
Dwarf sperm whale	*Kogia sima*	Regular
Cuvier's beaked whale	*Ziphius cavirostris*	Regular
True's beaked whale	*Mesoplodon mirus*	Rare
Gervais' beaked whale	*Mesoplodon europaeus*	Regular
Blainville's beaked whale	*Mesoplodon densirostris*	Regular
Sowerby's beaked whale	*Mesoplodon bidens*	Extralimital
Rough-toothed dolphin	*Steno bredanensis*	Rare
Bottlenose dolphin	*Tursiops truncatus*	Regular
Pantropical spotted dolphin	*Stenella attenuata*	Regular
Atlantic spotted dolphin	*Stenella frontalis*	Regular
Spinner dolphin	*Stenella longirostris*	Rare
Striped dolphin	*Stenella coeruleoalba*	Regular
Clymene dolphin	*Stenella clymene*	Regular
Short-beaked common dolphin	*Delphinus delphis*	Rare
Fraser's dolphin	*Lagenodelphis hosei*	Rare
Risso's dolphin	*Grampus griseus*	Regular
Melon-headed whale	*Peponocephala electra*	Rare
Pygmy killer whale	*Feresa attenuata*	Rare
False killer whale	*Pseudorca crassidens*	Rare
Killer whale	*Orcinus orca*	Rare
Long-finned pilot whale	*Globicephala melaena*	Extralimital
Short-finned pilot whale	*Globicephala macrorhynchus*	Regular
Harbor porpoise	*Phocoena phocoena*	Extralimital
Harbor seal	*Phoca vitulina*	Extralimital
Hooded seal	*Cystophora cristata*	Extralimital
West Indian manatee	*Trichechus manatus*	(Endangered) Rare

Source: Navy 2008

229 Navy 2008

The North Atlantic right whale, while not found within the confines of the Port, has been occasionally found in the Atlantic Ocean off the coast of Brevard County. The Port has participated and supported the Right Whale Monitoring Program for many years. There have been few incidences of right whale-ship incidents along the Florida Atlantic coast, with none being reported as far south as Brevard County.[230]

The Port area is frequented by the West Indian manatee.[231] Port Canaveral has had a Manatee Protection Plan for the harbor in place since 1996. Port Canaveral designed and was the first in Florida to implement manatee plates at its commercial piers. The metal bumpers protect manatees from being crushed by holding the ship away from the seawall. Every port in the state now uses the manatee plates.[232]

The manatee can be found in Canaveral Harbor year round and precautions and monitoring are already undertaken to ensure they are not impacted during normal operations.[233] These programs would continue to be implemented and as a result impacts to this species would be minimal under the ECMHI.

SEA TURTLES

Five species of sea turtle are found in the waters offshore of Brevard County (Loggerhead, green, leatherback, hawksbill and Kemp's ridley), and of these, three have been documented as nesting on Brevard County beaches. These species include the loggerhead, leatherback, and green sea turtles. It is important to note however, that there are no sea turtles nesting in Port Canaveral. However, Algal communities within the Port and the Trident Basin serve as a source of nutrition for juvenile green sea turtles. Loggerhead turtles do not typically forage in the harbor at Port Canaveral but can occasionally be found swimming in the harbor. Leatherback turtles seldom use the inshore waters of Brevard County and only are known to frequent the area during nesting periods.[234]

Waters along the Atlantic Coast of the U.S. serve as developmental habitats for immature loggerhead, green, and Kemp's ridley sea turtles[235] that take up residency during the summer months.[236] The area has many sounds and estuaries containing extensive seagrass beds and a diversity of bottom-dwelling fauna that provide sea turtles cover as well as forage.[237] As seasonal water temperatures increase, juvenile loggerhead, green, and Kemp's ridley sea turtles migrate northward along the U.S. Atlantic Coast in search of feeding grounds and return in the fall, traveling at least as far as Cape Hatteras, as waters cool. Large concentrations of sea turtles may occur along the northern Florida Atlantic coast during the spring and fall migration periods. These large concentrations result from the combination of migrating individuals and the presence of year-round residents.

230 Jensen and Silber 2003; Cole, et al 2005 in Port Canaveral 2011
231 Port Canaveral 2011
232 CPA 2011
233 Port Canaveral 2011
234 Port Canaveral 2011
235 Musick and Limpus 1997 in Navy 2008
236 Keinath et al. 1996 in Navy 2008
237 Keinath et al. 1996; Musick and Limpus 1997 in Navy 2008

Fish

Port Canaveral is classified as EFH for 37 fish species as well as brown shrimp, white shrimp, pink shrimp, and spiny lobster (Table 6-11). Six coastal migratory pelagic fish species have also been included as a result of their distribution patterns along the Florida coast. In addition, the nearshore bottom and offshore reef habitats of South Florida have also been designated as HAPC.[238]

Table 6-11: EFH in Port Canaveral

Gray Triggerfish *Balistes capriscus*	Schoolmaster *Lutjanus apodus*
Queen Triggerfish *Balistes vetula*	Gray Snapper *Lutjanus griseus*
Ocean Triggerfish *Canthidermis sufflamen*	Dog Snapper *Lutjanus jocu*
Yellow Jack *Caranx bartholomaei*	Mahogany Snapper *Lutjanus mahogoni*
Blue Runner *Caranx crysos*	Lane Snapper *Lutjanus synagris*
Crevalle Jack *Caranx hippos*	Yellowtail Snapper *Ocyurus chrysurus*
Bar Jack *Caranx rubber*	**Cobia *Rachycentron canadum***
Greater Amberjack *Seriola dumerili*	**Little Tunny *Euthynnus alletteratus***
Dolphin *Coryphaena hippurus*	**King Mackerel *Scomberomorus cavalla***
Spadefish *Chaetodipterus faber*	**Spanish Mackerel *Scomberomorus maculates***
Black Margate *Anisotremus surinamensis*	**Cero *Scomberomorus regalis***
Porkfish *Anisotremus virginicus*	Black Sea Bass *Centropristis striata*
Margate *Haemulon album*	Rock Hind *Epinephelus adscensionis*
Tomtate *Haemulon aurolineatum*	Goliath Grouper *Epinephelus itajara*
Smallmouth Grunt *Haemulon chrysargyreum*	Red Grouper *Epinephelus morio*
French Grunt *Haemulon flavolineatum*	Black Grouper *Mycteroperca bonaci*
Spanish Grunt *Haemulon macrostomum*	Gag *Mycteroperca microlepis*
Cottonwick *Haemulon melanurum*	Sheepshead *Archosargus probatocephalus*
Sailors Choice *Haemulon parra*	Jolthead Porgy *Calamus arctifrons*
White Grunt *Haemulon plumieri*	Brown Shrimp *Farfantepenaeus aztecus*
Blue Stripe Grunt *Haemulon sciurus*	Pink Shrimp *Farfantepenaeus duorarum*
Puddingwife *Halichoeres radiatus*	White Shrimp *Litopenaeus setiferus*
Hogfish *Lachnolaimus maximus*	Spiny Lobster *Panulirus argus*
Mutton Snapper *Lutjanus analis*	

(Bold indicates coastal migratory pelagic fish species)

Impacts

Operation of M-95 is anticipated to have minimal impacts on existing biological resources in the Port of Canaveral. This area already supports a large amount of shipping activity and no loss of habitat is anticipated from increased use of the existing port. The port area is heavily developed to support water dependent uses and has several programs and mitigation measures in place to reduce impacts to sensitive species. These programs would continue to be implemented under the ECMHI. Indirect impacts to potential habitat could be minimized with speed restriction in sensitive areas. Coordination with the Florida Fish and Wildlife Conservation Commission would be required to identify any state protected species in the project area as well as potential mitigation measures, if required.

238 SAFMC 1998 in Port Canaveral 2011

Water Resources

Existing Conditions

Water quality in the port is dependent, in part, on water exchange with the ocean, allowing the water in the harbor to be flushed with ocean water. Monthly water quality sampling has been performed continuously by Canaveral Port Authority since 1992. Based on the Port Canaveral Harbor Water Quality Monitoring 2006 Annual Report, Port Canaveral Harbor generally met requirements of its designation as a Class III predominantly marine water body, per 62-302 Florida Administrative Code. Class III marine waters are designated for recreation, propagation and maintenance of a healthy, well balanced population of fish and wildlife.[239]

The handling and storage of hazardous materials is an important part of the port's operations and the port deals with numerous types of hazardous materials in a variety of quantities. Inspections are conducted regularly to ensure compliance with hazardous materials regulations. All Port users are responsible for compliance with the applicable regulations regarding the handling, storage, usage, disposal and spillage of all hazardous materials as outlined in port tariffs.[240]

Wetlands

Wetland habitats within the port are limited primarily to the western perimeter adjacent to the Banana River, away from port operations. Treeless hydric savannah habitat occurs south of the port facilities. No seagrass has been identified within the Harbor or entrance channel, and it is unlikely that it occurs. The water depths and sediment conditions within the Harbor are not conducive for seagrass growth.[241]

Impacts

Impacts to water quality from the operation of M-95 are anticipated to be minimal. Impacts to surface waters within Port Canaveral would be minimized through adherence to the CWA and the regulations of Annex IV of MARPOL. The CWA regulates sewage, gray water, bilge water, and a variety of other vessel discharges and discharges of sewage or "blackwater" are prohibited except for specific conditions stipulated under the MARPOL Annex. Additionally, compliance with state and local water quality regulations would further minimize impacts to surface waters.

Port Canaveral regularly monitors the water quality of the harbor, Barge Canal and beaches from Jetty Park south to Cocoa Beach as well as stormwater that enters the harbor.[242] Port Canaveral has also recently completed a massive stormwater and wetland treatment pond system that will provide water quality treatment to the older marina and fishing areas of the west side of the port. These preventative controls and monitoring programs would aid in the mitigation of any potential impacts to water quality from M-95.

Socioeconomic and Environmental Justice

The ECMHI is not anticipated to disproportionately adversely affect any minority or low-income population; however, additional analyses are required to determine the population dynamics of the area and the potential adverse impacts of ECMHI.

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239 Port Canaveral 2011

240 CH2M Hill 2007

241 Port Canaveral 2011

242 CPA 2011

6.5.5 Additional Port Nodes

Portland, ME

The Port of Portland, located along the Gulf of Maine, supports an active fishing and lobstering industry, as well as cargo ships, cruise ships and research and recreational vessels. The area is characterized by rocky shorelines and supports numerous bird, fish and marine mammal species. Habitats and species of concern include, but are not limited to, kelp beds, hard bottom communities, stony corals, EFH (including HAPC), marine mammals, shorebird habitat and water quality. The area also contains DOD facilities and training areas.[243]

Wilmington, NC

The Port of Wilmington is located on the U.S. East Coast. Owned and operated by the North Carolina State Ports Authority, the Port of Wilmington offers terminal facilities serving container, bulk and breakbulk operations. The Port of Wilmington has berths and storage areas for containers and cargo.[244] Habitats and species of concern include but are not limited to wetlands, federal marine protected areas, EFH (including HAPC), marine mammal, sea turtles, shorebird habitat and water quality. The area also contains DOD facilities and training areas.[245]

Charleston, SC

The Port of Charleston is one of the busiest container ports along the Southeast and Gulf coasts. Top commodities at the port include agricultural products, consumer goods, machinery, metals, vehicles, chemicals and clay products. Habitats and species of concern include but are not limited to wetlands, federal marine protected areas, EFH (including HAPC), marine mammals, sea turtles, shorebird habitat and water quality.[247]

Savannah, GA

The Port of Savannah is comprised of two terminals; the garden City Terminal and the Ocean Terminal. Garden City Terminal is the fourth-largest container port in the U.S. and the largest single-terminal operation in North America. Ocean Terminal is dedicated breakbulk and Ro/Ro facility. Habitats and species of concern include but are not limited to wetlands, federal marine protected areas, EFH (including HAPC), marine mammals (including critical habitat) sea turtles, shorebird habitat and water quality.[249]

Miami, FL

The Port of Miami offers services to nearly two dozen of the world's leading cargo lines, reaching approximately 250 ports in more than 100 countries and supports both cargo and cruise ships. Habitats and species of concern include but are not limited to federal marine protected areas, EFH (including threatened and endangered and HAPC), marine mammals (including critical habitat) sea turtles, shorebird habitat and water quality. The area also contains DOD facilities and training areas.[251]

243 Navy 2005
244 North Carolina Ports 2011
245 Navy 2008
247 Navy 2008
249 Navy 2008
251 Navy 2008