January 2013

Bonner Bridge – NC 12 Transportation Management Plan

Phase II

Reconsideration of the Ferry Alternative Report

for

NC 12 Replacement of Herbert C. Bonner Bridge

(Bridge No. 11) over Oregon Inlet

TIP Project No. B-2500

Dare County, North Carolina

Federal Highway Administration

And

North Carolina Department of Transportation

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I. Introduction

Based on comments received during the interagency scoping process and public involvement for Phase II, FHWA determined that it was necessary to reassess the Ferry Alternative. The purpose of this report is to document the reassessment of the Ferry Alternative by the Federal Highway Administration ("FHWA") and the North Carolina Department of Transportation ("NCDOT") as part of the planning process for the second phase ("Phase II") of State Transportation Improvement Project No. B-2500, NC 12 Replacement of Herbert C. Bonner Bridge ("Project" or "B-2500"). See Appendix A for a Project Location Map. This update includes a review of the Ferry Alternative as documented through the B-2500 NEPA process, an overview of comments received since the Record of Decision and post-Hurricane Irene regarding potential ferry options, a brief overview of the North Carolina Ferry Division, a reevaluation of assumptions for conceptual ferry options, conclusions for updated ferry options using conventional vessels, and a review of other ferry vessel types and their potential implementation in the B-2500 study area. In light of comments received from governmental partners and the public during the scoping process for Phase II of the Project, FHWA and NCDOT determined that this update was warranted.

After completing this review of the Ferry Alternative, FHWA and NCDOT reaffirm the determination that the Ferry Alternative is not a reasonable alternative to fulfill the purposes and needs of the project. Because the Ferry Alternative is unreasonable, no additional study of the Ferry Alternative for Phase II is required by NEPA.

II. An Overview Of The Consideration Of Ferries In The B-2500 NEPA Process Through The Issuance Of The Record Of Decision On December 20, 2010

In 1991, the North Carolina Department of Transportation ("NCDOT") completed a feasibility study to examine possible replacement alternatives for the aging Herbert C. Bonner Bridge ("Bonner Bridge"). The range of alternatives developed was discussed in the 1993 Draft Environmental Impact Statement ("DEIS"). The use of ferries was among the alternatives considered by NCDOT to replace Bonner Bridge. In the DEIS, a conceptual ferry route, developed in consultation with the NCDOT Ferry Division, departed Bodie Island from the Oregon Inlet Marina complex and returned to land on the northern end of Hatteras Island, near the bulkhead site used during construction of the terminal groin, a distance of approximately 3 miles. See Appendix B for the 1993 Crossing Alternatives Diagram. As explained in the DEIS, the Ferry Alternative assumed the use of Hatteras Class ferry boats, which can carry 30 vehicles

at a time.[1] Ultimately, the Ferry Alternative did not compare favorably to several other conceptual study options for three primary reasons:

(1) it was substantially more expensive than other alternatives considered;

(2) it would decrease the present level of traffic service across Oregon Inlet (and increase emergency evacuation time); the decrease in traffic service would significantly impact the economies of Hatteras Island and Dare County; and

(3) this alternative would have significant impacts on the natural environment due to the extensive dredging necessary to create and maintain the ferry channel and basins.

As a result of these drawbacks and limitations, FHWA and NCDOT determined that the Ferry Alternative was not a reasonable transportation alternative. It was not carried forward as a detailed study alternative for B-2500.

In July 2002, the first meeting of the B-2500 NEPA/Section 404 Merger Team ("Merger Team") was held.[2] At this meeting, the purposes of and the needs for B-2500 were established. Whereas the 1993 DEIS considered alternatives for replacing only the bridge over Oregon Inlet (Bonner Bridge), the Merger Team in 2002 concurred that the B-2500 study area would be extended to Rodanthe in order to address areas of NC 12 which are vulnerable to threats of shoreline erosion, inlet formation, ocean overwash, and sand cover (i.e., "hot spots"). See Appendix A for location of the "hot spots" in the project study area. As set forth in the NEPA documents and memorialized in the Merger Agreement, the purposes behind B-2500 are the following:

[1] In addition to considering a Hatteras Class ferry boat, which could carry 30 vehicles at a time, the DEIS considered the use of potential air cushion vehicle (Hovercraft) ferries because they could "provide for a faster travel time between terminals and dredging of a [navigation] channel would not be required." DEIS Page 2-43. However, it was determined that Hovercraft were not "sound alternative[s]" to ferry boats. Id. The use of a catamaran (Hoverspeed) vessel was also considered because that "vessel can carry 80 automobiles and can travel at up to 50 miles per hour, much faster than the Hatteras Class ferry vessels." Id. However, the use of catamaran vessels was also found not to be a sound alternative to a ferry boat.

[2] The NEPA/Section 404 Merger Process is a streamlining effort that helps to avoid duplication of effort between the NEPA and [Clean Water Act] Section 404 processes, since the United States Army Corps of Engineers ("USACE") must meet the requirements of NEPA in order to issue a dredge and fill permit under the Clean Water Act. The goal of the Merger Process is to obtain stakeholder concurrence on key issues during the NEPA study so that those decisions do not need to be revisited during application for a USACE's permit.

- provide a new means of access from Bodie Island to Hatteras Island prior to the end of Bonner Bridge's service life;
- provide a replacement crossing that takes into account natural channel migration; and
- provide a replacement solution that will not be endangered by shoreline movement through year 2050.

These purposes correspond to the underlying needs of B-2500, upon which the Merger Team also agreed:

- while Bonner Bridge is approaching the end of its service life, demand for convenient daily and emergency access across Oregon Inlet is expected to continue;
- the need for bridge spans of sufficient height and width for navigation through anticipated areas of future natural channel migration, helping to reduce dredging of the inlet; and
- portions of NC 12 south of Bonner Bridge are threatened by shoreline erosion and overwash.

The Project's purposes and needs guided the merger team's selection of reasonable alternatives that would be carried forward for detailed environmental study. The identification of the detailed study alternatives relied on a screening process. Certain alternatives originally considered in the early 1990s – including the Ferry Alternative – remained unviable, impractical, or unreasonable when alternatives were screened and subsequent environmental documents were prepared.

In the 2005 Supplemental Draft Environmental Impact Statement ("SDEIS"), the analysis of the Ferry Alternative was further updated. As explained in the SDEIS, additional limitations of the Ferry Alternative included:

- approximately 59 acres of wetlands would be permanently used by ferry operating facilities on Bodie and Hatteras Islands;
- ferry service would increase inlet traffic and operate across and conflict with existing inlet traffic;
- limited transport capacity would dramatically increase the evacuation clearance time from Hatteras and Ocracoke islands;

- the USACE believes the ferry channel in the Oregon Inlet area would have stability problems;
- ferries would severely limit the movement of goods and services from the mainland to Hatteras Island;
- the use of ferries could alter access to Cape Hatteras National Seashore ("Seashore") and the Pea Island National Wildlife Refuge ("Refuge");
- a ferry terminal and ferry landing would be constructed within the boundaries of the Seashore;
- dredging the ferry navigation channel would affect benthos and fisheries;
- the permanent use of biotic communities for the operating facilities associated with the landings on Hatteras and Bodie islands would be substantial; and
- wintering waterfowl and migrating shorebirds would be moderately impacted because of loss of habitat caused by dredging basins and navigational channels and permanent habitat loss.

The Final Environmental Impact Statement ("FEIS") published in September 2008, also included a discussion about the Ferry Alternative. In addition to the reasons set forth in the DEIS and SDEIS, the FEIS provided more detail on the reasons this alternative was not selected for detailed study, including:

- the dredging required to implement and maintain the Ferry Alternative would be extensive and costly. A navigation channel 200 feet wide and 3 miles long (approximately 70 acres) across Oregon Inlet would have to be maintained to a depth of 14 feet[3] (assuming a direct route from the Bodie Island terminal and around Bodie Island to a Hatteras Island terminal near the southern terminus of Bonner Bridge). The creation of such a channel would result in the removal and disposal of approximately 1.8 million cubic yards of dredged material.
- The length of the navigation channel, and the amount of dredging required to maintain that channel, would increase to as much as 18 miles if the Hatteras Island terminal for the Ferry Alternative was placed at the

[3] A dredged navigation channel 200 feet wide and 14 feet below mean water level would allow two Hatteras Class ferries to safely pass.

emergency ferry dock that now exists in Rodanthe.[4] The area disturbed by a navigation channel 200 feet wide and 18 miles long is approximately 420 acres. The construction of this channel would increase the amount of dredged material during the construction of the navigation channel to 10.8 million cubic yards.

- the transition of the Oregon Inlet Marina complex into a permanent ferry terminal would require expansion of the existing basin and navigation channel and construction of bulkhead, slips, ramps and a terminal building and support facilities. These construction efforts would require 52 acres of land in and around the Marina complex and the adjacent (former) US Coast Guard Station. In Rodanthe, approximately 23 acres of land would be required to construct the necessary ferry terminal and associated facilities.

- loss of road access to Bodie Island across Oregon Inlet would isolate the communities on Hatteras Island (i.e., the time required to transport those requiring immediate medical aid would be increased; the ability of fire and police on Hatteras Island to receive timely assistance from other departments would be reduced; the daily operation time for removal of solid waste to a mainland landfill would be doubled; an alternative system for providing telephone and electric services would have to be developed).

- visitor levels would be affected by the lack of capacity on ferries and by the additional time it would take to cross Oregon Inlet.

In the FEIS consideration was also given to the use of air-cushion vehicle (Hovercraft) ferries, as they would provide faster travel times between terminals and would not require dredging a navigation channel. Despite these positive attributes, it was determined in 2008 that air-cushion vehicles would not be a viable alternative to a ferry boat because: (i) air-cushion ferries with more than a two- or three-car capacity were no longer manufactured[5]; (ii) assuming

[4] As noted in the FEIS, the 3-mile ferry route described in the DEIS was expanded to encompass an 18-mile route, with a proposed southern landing point in the village of Rodanthe. The extension of the ferry route was made so as to be consistent with the changes in the B-2500 study area; the study area was expanded to include the northern tip of Hatteras Island and the village of Rodanthe to encompass the "hot spots."

[5] Although air-cushion vehicles could be custom-manufactured for use between Bodie and Hatteras islands, no cost estimates for these custom-built vessels were available. A representative of British Hovercraft Corporation indicated that it was doubtful that custom-

air-cushion vehicles were available, the time saved by using a faster vehicle would be minimal in comparison to the total trip time, including the time required to load and unload the vessels; and (iii) some economies of scale, including the use of existing off-site maintenance facilities, would be lost if air-cushion vehicles were used because these vessels are completely different from any other vehicles used by NCDOT's Ferry Division. Hoverspeed (catamaran) vehicles were also considered because these vessels can carry 80 automobiles and travel up to 50 miles per hour.[6] Hoverspeed vessels were also not a sound alternative to ferries for the same time and economies of scale reasoning applicable to Hovercraft.

The FEIS concluded that the three basic flaws with the Ferry Alternative that were identified in the DEIS remained valid (and would even be exacerbated by the increased length of the route to Rodanthe if this alternative was implemented).

III. Comments Received Post-ROD And After Hurricane Irene

FHWA issued the Record of Decision ("ROD") for B-2500 on December 20, 2010. That document contained responses to comments received on the 2010 Environmental Assessment ("EA") and summarized the history of B-2500, the range of alternatives considered, the conclusions of the Section 4(f) evaluation, and the basis for designating the Parallel Bridge Corridor with NC 12 Transportation Management Plan ("PBC/TMP") as the Selected Alternative. After the ROD was issued, NCDOT began moving forward with the implementation of the PBC/TMP.

As a result of infrastructure and coastal conditions within the B-2500 project area following Hurricane Irene (August 2011), and pursuant to the process set forth in the ROD, FHWA and NCDOT initiated planning for Phase II in accordance with the TMP and the NEPA/Section 404 Merger Process. An informational/scoping Merger Team meeting was held in October 2011 in which participants were asked to provide comments on the portions of NC 12 breached during Hurricane Irene and the alternatives developed to date through the B-2500 environmental studies. Three Public Workshops were also held in December 2011 and January 2012 to solicit public comments and suggestions for Phase II.

Through the course of these meetings, Merger Team member agencies and the public submitted comments and questions regarding the potential utilization of ferries. Generally, these comments suggested that the Ferry Alternative needed to be reevaluated, which involved FHWA and NCDOT doing the following:

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manufactured vessels would be cost-effective even taking into account the amount of dredging required to operate ferry boats.

[6] Hoverspeed vehicles were designed specifically to compete with the English Channel tunnel.

- Update assumptions for the Ferry Alternative, re-engaging NCDOT's Ferry Division personnel as appropriate;

- Update cost estimates for a "modern" Ferry Alternative;

- Consider using high capacity, high speed ferries;

- Consider privatizing a ferry system for Hatteras Island in lieu of publicly-funded infrastructure.

As a result of the comments and requests for information, the Ferry Alternative was re-evaluated by FHWA with assistance from NCDOT as part of the Phase II NEPA process.

IV. NCDOT Ferry Division – Background

As of December 1, 2012, the NCDOT Ferry Division operates eight routes[7] with 22 ferries and employs over 450 permanent employees and 150 seasonal workers. The Ferry Division's operations are supported by 13 terminals, 9 Visitor/Welcome Centers, 4 staff dormitories (expanding to 6 in 2013), a full service shipyard, tugs, barges, a dredge, and other support vessels. Currently, the Ferry Division transports over 1.1 million vehicles per year (accommodating any car, trailer, or RV that can legally operate on the highway) and more than 2.5 million passengers across five separate bodies of water – the Currituck and Pamlico sounds and the Cape Fear, Neuse, and Pamlico rivers.

The Ferry Division is financed through an appropriation of state funds by the North Carolina General Assembly and through tolls collected on three of the operational routes.[8] The Ferry Division does not directly receive any federal funding to support its operations. The USACE regularly maintains the main federal navigation channels utilized by the Ferry Division at an average annual cost of $1 million. The costs to maintain the navigation channels vary from year to year and are dependent upon the weather, tide dynamics, coastal conditions, etc. The federal government depends on the NC Ferry Division to maintain approaches from the main navigation channel to the ferry terminals and for all emergency management.

During fiscal year 2012-2013, the North Carolina General Assembly appropriated approximately $44 million to the NCDOT Ferry Division including $34.5 million for operations,

[7] The routes operated over the course of the year by the Ferry Division include: Cedar Island to Ocracoke; Bayview to Aurora; Southport to Fort Fisher; Hatteras to Ocracoke; Cherry Branch to Minnesott Beach; Swan Quarter to Ocracoke; Currituck to Knotts Island; Stumpy Point to Rodanthe (emergency operation).

[8] Tolls are collected on the Cedar Island to Ocracoke, Swan Quarter to Ocracoke, and Southport to Fort Fisher routes.

$7 million to replace an aging dredge, and a one-time $2.5 million separate appropriation. The North Carolina General Assembly has mandated tolling on two additional ferry routes, beginning on July 1, 2013, bringing the total number of tolled ferry routes to five. The Cherry Branch to Minnesott Beach and Bayview to Aurora routes have been identified as the two additional routes to be tolled. This is expected to raise total annual toll collections to approximately $5 million. The appropriated monies and toll collections fund the annual operating cost for the NC Ferry Division as well as regular maintenance and replacement of the fleet.

V. Assumptions For The 2012 Ferry Alternative

In order to address the comments received during the Phase II scoping process, the historical assumptions underlying the Ferry Alternative needed to be revisited and updated as appropriate. FHWA consulted with the NCDOT Ferry Division regarding the baseline assumptions used to evaluate the Ferry Alternative during the B-2500 NEPA Process. The following assumptions were examined:

A. Current Traffic Demand

The FEIS estimated the year 2002 annual average daily traffic ("AADT") to be 5,400 vehicles per day that cross Oregon Inlet using the existing Bonner Bridge. A review of AADT maps for the years 2001-2011 (http://www.ncdot.gov/travel/statemapping/trafficvolumemaps/) indicates that demand to cross Oregon Inlet has averaged around 5,200 vehicles per day, with upward and downward fluctuations from year to year. FHWA and NCDOT have concluded that the estimated 5,400 vehicles per day used in previous NEPA documents is reasonably close to actual conditions for analysis purposes.

For purposes of reevaluating the Ferry Alternative, the AADT was converted and rounded from 5,400 vehicles per day to an annual demand of 2,000,000 vehicles per year.

In addition to assessments of options that carry 2 million vehicles per year, the NC Ferry Division examined options that carry 1,000,000 vehicles per year. It is noted, however, that such options would fail to satisfy the demand for continued convenient daily and emergency access across Oregon Inlet.

B. Vessel Type

The 2008 FEIS assumed the use of a Hatteras Class ferry vessel in the implementation of the Ferry Alternative based on prior discussions with the NCDOT Ferry Division. FHWA conferred with the NCDOT Ferry Division in late 2011 and throughout 2012 to reassess the use of this type of vessel. The NCDOT Ferry Division provided the following data regarding the classes of ferries currently in use in North Carolina.

NCDOT FERRY DATA							
Class	**Length**	**Vehicular Capacity**	**Draft[9]**	**Required Channel Depth**	**Cruising Speed**	**Cost (2011)**	**Crew Size**
Hatteras[10]	150’	26	4.5’	10-12’	12 mph	No longer constructed	7
River	180’	38	5.5’ (New designs 4.5’)	10-12’	12 mph	$12 million	7
Sound	220’	50	6.5’ (New designs 7.5’)	12-18’	21 mph	$15 million	7-8

[9] “Draft” is commonly defined as the distance from the surface of the water to the ship’s keel (i.e., how deep into the water the ship sits). To safely accommodate a vessel’s draft and other conditions, the depth of a navigation channel is typically at least twice that of a boat’s draft. For example, a boat with a draft of 4.5 feet would require a navigation channel depth of at least 9 feet.

[10] Although Hatteras Class ferries are currently in use by the NCDOT Ferry Division, these vessels are no longer being built.

Hatteras Class Ferry

Hatteras Class ferries are currently used by the NCDOT Ferry Division on the Hatteras Inlet route between the village of Hatteras and the northern tip of Ocracoke Island. Historically, this class of vessel was used in relatively shallow waters. However, the NC Ferry Division indicates it is no longer being built. As a result, this type of vessel should no longer be considered under the Ferry Alternative. For purposes of updating the Ferry Alternative vessel assumption, the remaining options are River Class or Sound Class ferries.



River Class Ferry

River Class ferries are used along several ferry routes: Hatteras Inlet (Hatteras – Ocracoke); Currituck Sound (Currituck – Knott's Island); Pamlico River (Bayview – Aurora); Cape Fear River (Southport – Fort Fisher); and the Neuse River (Cherry Branch – Minnesott Beach). The River Class ferry is gradually replacing the Hatteras Class ferry in NCDOT's fleet due to its greater vehicular capacity, better maneuverability, and comparable draft depth and cruising speed.



Sound Class Ferry

Sound Class ferries are used in Pamlico Sound for the Ocracoke to Cedar Island and the Ocracoke to Swan Quarter routes. Although Sound Class ferries have a higher vehicular capacity and cruising speed than either the Hatteras Class or River Class ferries, they are less maneuverable and have a greater draft depth than that of a River Class ferry.



As a result of the limitations noted above, the NCDOT Ferry Division advised FHWA that, based on the models currently in NCDOT's fleet, the River Class ferry is the vessel that should be used in a conceptual analysis of the Ferry Alternative because the prime tradeoffs (e.g., the environmental damage and expenses of dredging) are more severe with the Sound Class ferry. It is important to note that the water depth in Pamlico Sound in the general B-2500 project area is shallower than in the areas where Sound Class ferries are currently utilized by the NCDOT Ferry Division.

C. Location of Ferry Route

As previously studied, the conceptual location for a ferry route in the B-2500 project area had ferry terminals located on Bodie Island to the north and Hatteras Island to the south. Through the evolution of the NEPA process, the northern ferry terminal remained north of the Oregon Inlet Marina complex on Bodie Island; the southern terminal, however, was relocated from the northern end of Hatteras Island within the boundaries of Pea Island National Wildlife Refuge ("Refuge") to a point south of the Refuge within the village of Rodanthe. As previously

explained herein, the southern ferry terminal was relocated based on the results of environmental studies on Hatteras Island. These studies revealed that: (i) it would be difficult to maintain and stabilize the required ferry navigation channel in a cross-current direction across Oregon Inlet; (ii) continuous maintenance dredging of the navigation channel would be likely in order to maintain the route across Oregon Inlet; and (iii) moving the ferry terminal to Rodanthe would alleviate the difficulties of maintaining NC 12 through the Refuge. The relocation of the ferry terminal to Rodanthe resulted in an increase in the length of the ferry route from 3 miles (Bodie Island – Refuge) to almost 18 miles (Bodie Island – Rodanthe). See Appendix C for a figure showing the location of a conceptual ferry route from Bodie Island to Rodanthe.

FHWA conferred with the NCDOT Ferry Division to revisit the route location, based in part on scoping comments from the Southern Environmental Law Center suggesting a potential route from the mainland to Hatteras Island or a combination of routes from Bodie Island and the mainland to multiple points on Hatteras Island.

A route from the mainland to Hatteras Island would not meet the purposes and needs of B-2500. It would not satisfy the basic need for convenient daily and emergency access across Oregon Inlet. Correspondingly, it fails to satisfy a basic purpose to provide a new means of access from Bodie Island to Hatteras Island. Despite this flaw, FHWA nevertheless asked the NC Ferry Division to locate a theoretical route from the mainland to Hatteras Island. See Appendix C for the conceptual location of this route. Based on information received from the NCDOT Ferry Division, such a route would likely have some potential advantages over a Bodie Island to Hatteras Island route, including:

- Existing terminal facilities at Stumpy Point and Rodanthe could be used, although substantial expansions would be required;

- A route from Stumpy Point to Rodanthe would traverse deeper water toward the center of Pamlico Sound than a Bodie Island to Rodanthe route, reducing the amount of dredging required to create and maintain a navigation channel. It is likely the entire length of the route from Bodie Island to Rodanthe would require dredging due to shallow water depths relative to vessel draft; and

- Constructing/expanding at least one of the route terminals on the mainland could be less expensive than locating both terminals on barrier islands due to land cost.

Despite some technical advantages of a Stumpy Point to Rodanthe route, the high-cost items (ferry vessels, ferry crew, loading dock and maintenance personnel, shipyard/vessel maintenance) would remain similar to a Bodie Island to Rodanthe route. More importantly, the purpose and need for the project cannot be met by this route. Hence, FHWA and NCDOT

developed conclusions based on a conceptual Ferry route connecting Bodie Island directly to Hatteras Island.

VI. Conclusions For The Updated Ferry Alternative From Bodie Island To Hatteras Island Using Conventional Vessels

A. Traffic Service

Previous NEPA studies for the B-2500 Project concluded that a Ferry Alternative from Bodie Island to Hatteras Island could not serve the current or future traffic demand of Hatteras Island based on a maximum safe operating capacity analysis (see FEIS at 2-23). That maximum safe operating capacity analysis assumed ferry operations within only one navigation channel. The FEIS acknowledged that an additional ferry route could be operated in tandem with the conceptual route between Bodie Island and Rodanthe, but concluded that such a route would not be viable due to the increased need for ferry vessels and the additional dredging necessary to maintain a second navigation channel.

Some scoping comments suggested that conditions under which previous analysis was conducted may have changed after the impact of Hurricane Irene. FHWA and NCDOT have found no evidence to suggest, even post-Hurricane Irene, that traffic demand to access Hatteras Island will decrease over the long term. Refer to Section V. A. of this document for a discussion of current traffic demand and FHWA's conclusion.

Although the NC Ferry Division provided cost estimates for transporting 1 million vehicles per year across Oregon Inlet to Rodanthe, identified as Alternate A (Appendix E), this could only be a stand-alone solution from a traffic service standpoint if one assumes that traffic demand to/from Hatteras Island will decrease by approximately one-half in the future. This assumption is not reasonable considering the past decade of actual traffic that has crossed Bonner Bridge. FHWA and NCDOT have concluded that conditions have not changed since Hurricane Irene such that Alternate A is realistic.

Alternate B (i.e., transporting 2 million vehicles per year) is a more realistic traffic demand scenario for further analysis given the long-term consistency of traffic demand over the past decade and the continued requests for access to Hatteras Island by its residents, visitors, and government leadership. The actual traffic service provided by Bonner Bridge has averaged 1.8 million vehicles per year between years 2001 and 2011, with upward and downward fluctuations.

Although Alternate B, by definition, meets present demand for access between Hatteras Island and the Bodie Island, it would still have serious flaws related to the stated purpose and need of the project. Diminished convenience to motorists would be expected due to ferry

capacity constraints. Some motorists would be forced to structure their trips to avoid peak travel times or to forego travel between Hatteras Island and Bodie Island altogether. Provision of emergency and medical services would be impacted, emergency evacuation times increased, and public services such as waste management would be altered. These conclusions were reached in previous NEPA documents regarding a Ferry alternative and remain valid for an alternative using state of the industry conventional ferry vessels.

The NC Ferry Division estimates that it would need 38 River Class vessels on each day of the year to ferry a total of 2 million vehicles. Adding this many vessels would more than double the number of vessels currently in use by the NC Ferry Division.

B. Cost for Bodie Island to Rodanthe route carrying 2 Million Vehicles per year

Previous NEPA documents concluded the Ferry Alternative would be substantially more expensive than other transportation alternatives that were under consideration. FHWA requested that NCDOT revisit the Ferry Alternative to determine if this conclusion was still valid for conventional ferry vessels based on current information for updated assumptions described in Section V. As detailed in Appendix D, the total estimated cost for installing, operating, and maintaining a ferry system that will service the current traffic demand for the first year is $664 million. Each year after, normal annual recurring costs are estimated to be $94.5 million over the 50-year estimated life of the B-2500 project. If this route were to be operated and maintained at the current traffic carrying capacity for 50 years, the total estimated cost rises to $6.3 billion. These costs include the vessels, crew, docks, supporting facilities (including a new shipyard), terminal basin dredging[11], maintenance, and vessel replacement at 30 years.

From this information, FHWA and NCDOT have concluded, once again, that the Ferry Alternative would be substantially more expensive than any other transportation alternatives under consideration. FHWA also notes that if a ferry service were divided between multiple origins and destinations as one commenter suggested, the cost of the service would not be reduced in that the same quantities of personnel and equipment would be required. In fact, it is likely that costs would increase due to the provision and maintenance of multiple ferry channels.

C. Dredging

Previous NEPA documents had concluded that the Ferry alternative would have significant impacts on the natural environment due to the extensive dredging necessary to create and maintain the ferry channel and basins. FHWA and NCDOT reexamined this conclusion in light of any potential updates that may have been needed due to advances in conventional ferries

[11] The NCDOT Ferry Division included only estimated dredging costs for the basins and immediate approach channels. The estimates do not include costs for dredging the main navigation channels, which have historically been borne by the U.S. Army Corps of Engineers.

or changes to the conceptual route. Although a Hatteras Class vessel was assumed for the Ferry Alternative in previous NEPA documents, the NC Ferry Division now advises that a River Class vessel would be used along this route. Regardless of the change in vessel, the required channel depth remains within the range of 10-12 feet in the main channel and approaches, with deeper dredging required in the ferry basins. Previous analysis had already accounted for extending the ferry route from a total length of approximately 3 miles to a total length of approximately 18 miles to bypass areas prone to breach and overwash between northern Pea Island and Rodanthe.

It is still expected the dredging needed to construct and maintain an 18-mile long route from the Oregon Inlet Marina Complex (Bodie Island) to Rodanthe would significantly and permanently impact submerged aquatic vegetation and habitat, shallow water habitat, primary and secondary nursery areas, and shell bottom habitat. Previous analysis and conclusions listed in Section II of this report would remain substantively unchanged.

VII. Consideration Of Other Ferry Vessels and Options

A. High Speed Ferries

During the scoping process for Phase II of B-2500, some government agencies and members of the public suggested that advances in high speed, high capacity ferries could potentially make the Ferry Alternative competitive with other options studied in detail in the previous NEPA documents. FHWA conducted research on specific vessels suggested by commenters and further expanded its research to other high speed ferry vessels in use in the United States and internationally. Relevant statistics on specific watercraft are included in Appendix F.

Quadrimaran high-speed ferries of similar vehicle-carrying capacity to NCDOT's River Class conventional vessels (38 vehicles), such as the CNM Evolution (Quebec, Canada, 30 vehicles) and Lake Express Ferry (Wisconsin-Michigan, 46 vehicles), have drafts of 5 feet and 8.3 feet, respectively. These draft depths are equal to or greater than the draft depths for conventional vessels currently used by the NC Ferry Division. As well, the recommended channel depths would likely be greater than those for conventional vessels to safely accommodate the higher cruising speed.

Other high-speed vehicle ferries with greater vehicle-carrying capacities (up to 341 vehicles) were researched by FHWA. All had draft depths ranging between 7.8 feet and 13.75 feet, notably deeper than a conventional River Class ferry vessel. Large expanses of Pamlico Sound on the western side of Hatteras Island have water depths less than 10 feet. Because the draft depths and required channel depths for high-speed ferries equal or exceed those for conventional vessels, the expected dredging requirements for these vessels make further consideration unreasonable. FHWA is unaware of the existence of any vessel that meets all of the necessary requirements in the area (e.g., shallow draft, high-speed, and capability of carrying large volumes of cars and trucks). After examining the data gathered, FHWA has concluded that

advances in high speed, high capacity ferries have not yet reached a level that would make a Ferry Alternative competitive with other options in the B-2500 project area.[12]

B. Passenger-Only Ferries[13]

It was suggested during the B-2500 scoping phase that passenger-only high speed ferries should be considered as an alternative. FHWA and NCDOT, however, have concluded that passenger-only vessels are not a reasonable full-service transportation alternative given the rural character of the towns and villages along North Carolina's Outer Banks. Some commenters referred to passenger ferries that are used in New York City and Seattle, Washington as examples of viable passenger ferry concepts. In those metropolitan areas, the transportation infrastructure beyond the ferry terminals (e.g., mass transit, taxi service, sidewalks, etc.) make passenger ferries a viable means of transportation for urban residents. New York City and Seattle also benefit from multiple other modes of access (rail, seaports, roadway, and large airports). The character, development, resources, and transportation infrastructure of the Outer Banks stands in stark contrast to that of areas where passenger-only systems are successful.

[12] It should be noted that the River Class ferries currently used in Pamlico Sound by the NCDOT Ferry Division are among the lowest draft vessels available. These watercraft have a lower draft (and, as a result, require less dredging) than any of the high speed ferry vessels suggested by others or researched by FHWA.

[13] During the course of this reassessment, FHWA was made aware of the existence of two documents from May 1994: (i) "A Preliminary Analysis of the Feasibility of Operating High-Speed Passenger Ferries on the Rivers and Sounds of Northeastern North Carolina" ("Preliminary Analysis"); and (ii) the "Executive Summary" of the Preliminary Analysis. Neither document impacts any decisions made by FHWA regarding the Ferry Alternative. Both documents were commissioned by the Office of Tourism Development, Northeastern North Carolina Economic Development Commission ("Office of Tourism"), and a stated purpose of the Preliminary Analysis was to determine if high speed passenger ferries could be used to support tourism and leisure activities. As the Preliminary Analysis makes clear, "the use of high-speed car carrying vessels have not been factored into this preliminary feasibility analysis … [and] this type of vessel has not yet been built in the United States and is, therefore, outside the purview of this Report." Thus, the Preliminary Analysis does not help solve the transportation need which is the focus of project B-2500: the demand for vehicular access between Hatteras and Bodie Islands. Further, the examples of high-speed ferry operations in the Preliminary Analysis all are centered in metropolitan areas (i.e., New York, Seattle, San Francisco, San Pedro, Long Beach, San Diego, and Michigan). None of these then-working ferry systems are truly comparable to the human and natural environments of the Outer Banks. Further, the Preliminary Analysis supports the concerns shared by FHWA and NCDOT about environmental damage due to dredging (i.e., it was determined that water depths on the western shore of the Outer Banks were generally too shallow for navigation and that extensive dredging would be required if new ferry terminal sites were to be established in that area).

Hatteras Island needs a way to not only deliver people to the island, but also freight, equipment, durable goods, supplies, food, commercial products, etc. As a result, FHWA and NCDOT have concluded passenger-only ferries would not meet the transportation needs of the travelling public along the Outer Banks.

C. Privatized Ferry System

During the scoping process, it was suggested that a privately owned and operated ferry system should be considered by the agencies because the costs of new ferry technologies would be borne by the private sector, not the government. It is not reasonable to presume that a private ferry system could provide the needed capacity to service the entire system of villages that exist on Hatteras Island without encountering the environmental and economic challenges (e.g., extensive dredging and extraordinarily high costs) attributable to the Ferry Alternative and explained herein.

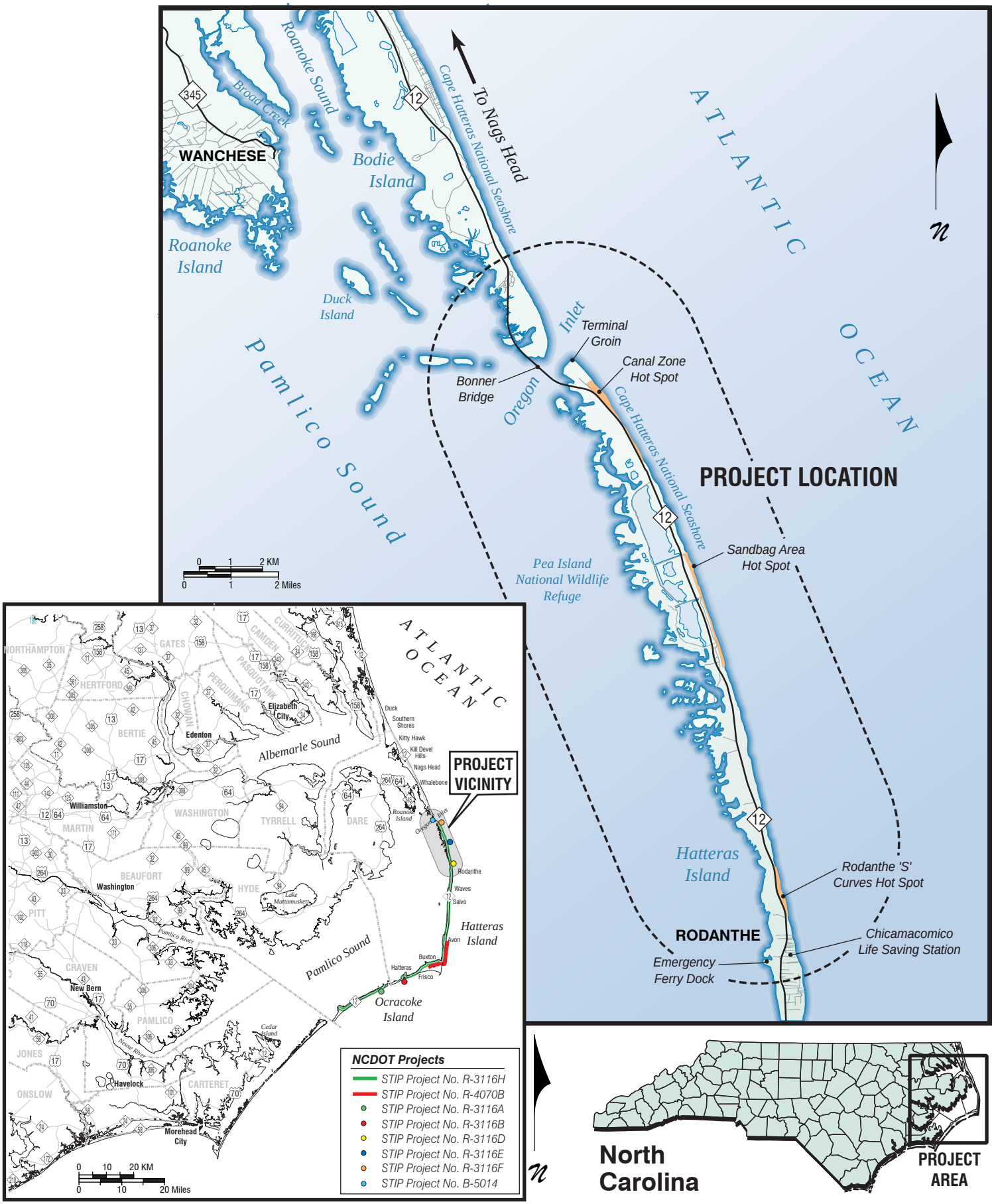
If private operators provided a ferry system, they would expect to make a profit. If they could not, the ferry service would need to be subsidized by the state of North Carolina. To meet the 50-year cost of transporting two million vehicles per year via ferry (ie., $6.3 billion) and without factoring in any profit margin, the average one-way ferry trip would cost $63 per motorist ($126 round trip). The highest price North Carolina currently charges for a ferry trip by a passenger vehicle is $15 one way or $30 round trip.

VIII. Conclusion

In light of the foregoing analysis, it is the conclusion of FHWA and NCDOT that the use of ferries to meet the transportation needs of Hatteras Island remains an unreasonable transportation alternative for Project B-2500.

APPENDIX A

B-2500 Project Location Map

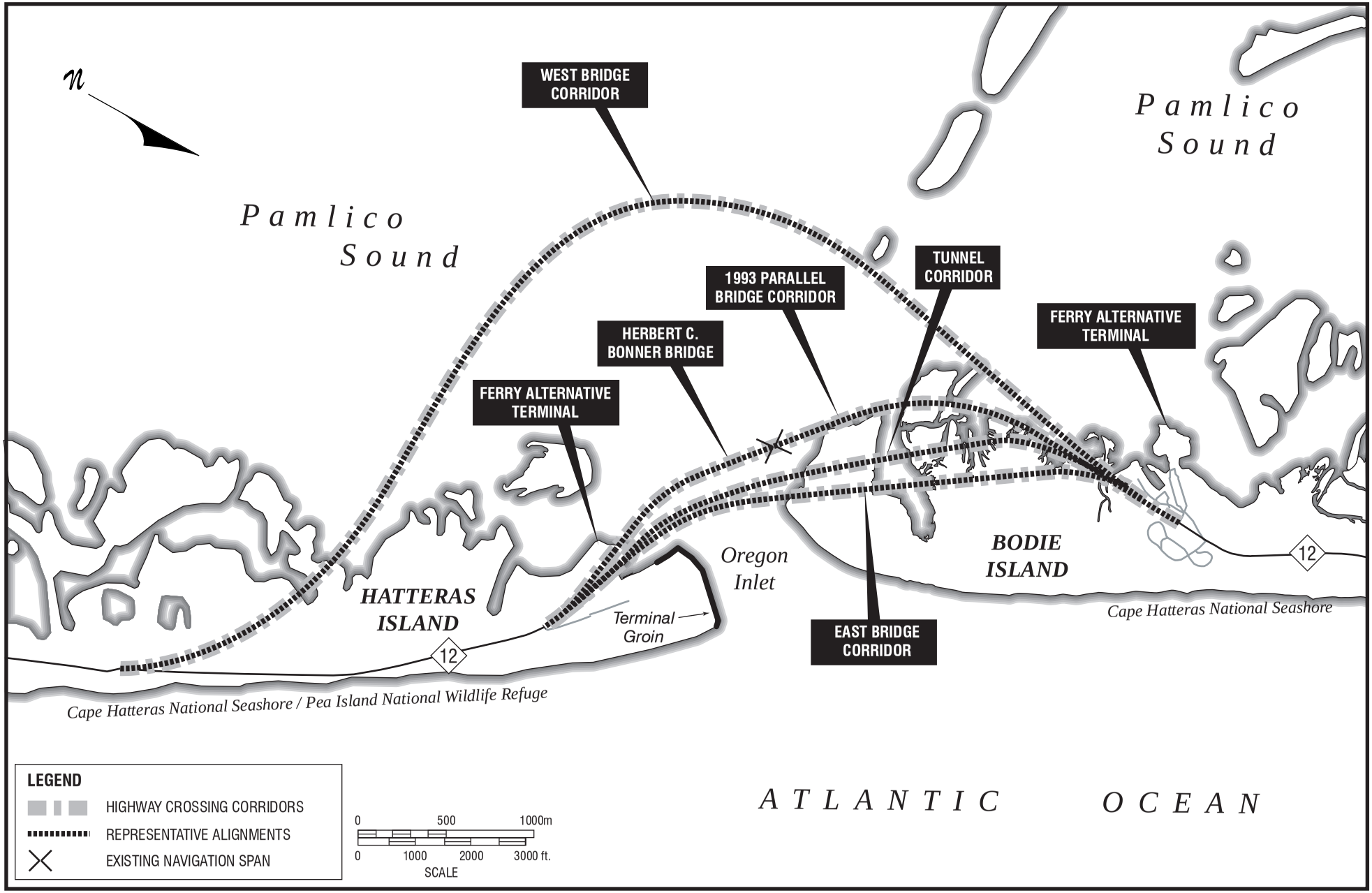


PROJECT LOCATION MAP

Figure 1-1

APPENDIX B

1993 Crossing Alternatives Diagram



1993 CROSSING ALTERNATIVES

Figure 2-1

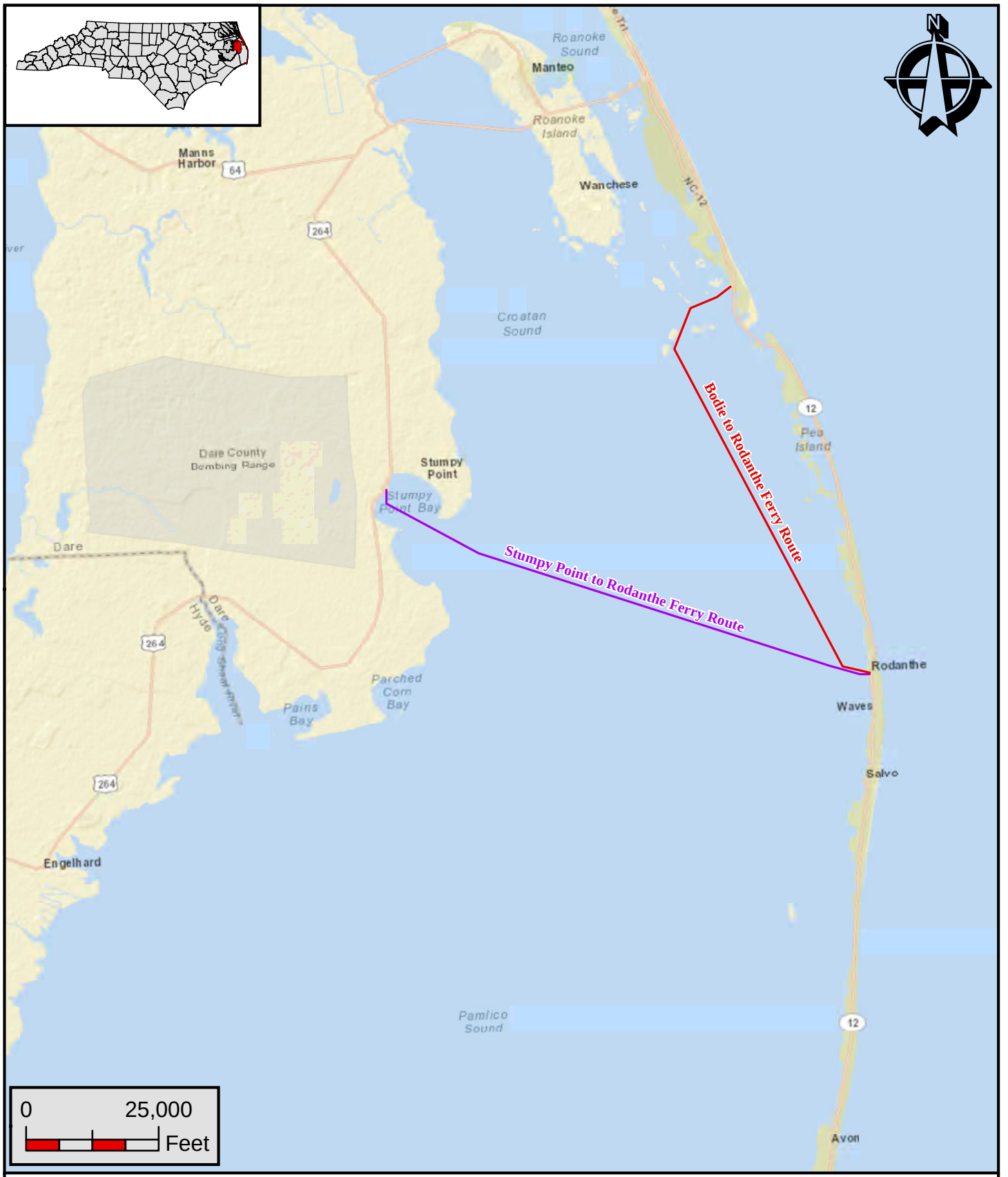
APPENDIX C

Conceptual Ferry Routes

Bodie Island to Rodanthe

&

Stumpy Point to Rodanthe



NORTH CAROLINA DEPARTMENT
OF TRANSPORTATION
DIVISION OF HIGHWAYS
PROJECT DEVELOPMENT AND
ENVIRONMENTAL ANALYSIS UNIT

CONCEPTUAL FERRY ROUTES

DARE COUNTY

APPENDIX D

Cost Estimates for Conceptual Ferry Route

From Bodie Island To Rodanthe

2 Million Vehicles per Year

NCDOT Ferry Division **Bodie Island/Rodanthe Ferry Route - 2M Cars** **Alternate "B", Rev. 7, Jan. 2, 2013**

Department Breakdown	Initial Cost Summary	Yearly Reoccurring Cost	Cost for 50 Year Period	Remarks
Ferry Vessels (capacity 2,000,000 cars/yr.)	$481,075,250.00	$25,075,250.00	$1,734,837,750.00	36 cars/4 trips per day/365=38 vessels
Ferry Crew Cost	$40,025,400.00	$40,025,400.00	$2,001,270,000.00	(228) Crew for 38 Vessels
Loading Dock/Ramp	$32,492,400.00	$4,148,000.00	$239,892,400.00	(6) & (6) Loading Ramps at each location.
Loading Dock & Maintenance Personnel	$13,315,200.00	$13,315,200.00	$665,760,000.00	(80) Personnel Total
Dormitories & Opps. Building	$8,864,283.00	$258,183.00	$21,773,433.00	No Personnel Required at Dorms
Shipyard/Vessel Maintenance Per Year	$8,602,440.00	$8,602,440.00	$430,122,000.00	19 Vessels Per Year
Facility Maintenance	$1,580,487.88	$1,580,487.88	$79,024,394.00	
Dredging/Environmental	$12,022,920.00	$165,840.00	$20,314,920.00	
New Shipyard at Wanchese, NC	$66,048,788.00	$1,320,975.76	$132,097,576.00	
Vessel Replacement @ 30 Years	$0.00	$0.00	$912,000,000.00	Vessel Cost in 2042 = $24M Ea. x 38
Dredge Replacement @ 30 Years	$0.00	$0.00	$16,000,000.00	Vessel Cost in 2042 = $16M Ea.
Tug Replacement @ 30 Years	$0.00	$0.00	$10,000,000.00	Vessel Cost in 2042 = $10,000,000
				Note:
				Per Google Earth Map attached,
				Miles is 17/10 = 1.7 hrs. x 2 = 3.4 hr. + 1 hr.
				loading of vehicles. Total Round Trip is 4.8 hrs.
				USCG allows 12 hours/day for Crew.
Total Cost for Bonner Ferry Operation	$664,027,168.88	$94,491,776.64	**$6,263,092,473.00**	Cost = $62.63 per person
				Labor Rate = $40.00

Bodie Island/Rodanthe Route

FERRY VESSELS 180'-0" DBL. ENDED

Breakdown	Cost Per Vessel	Cost for 38 Vessels	Reoccurring Cost	Remarks
180' Ferry (Capacity 38 cars @ 10 Knots)				Route - Bodie Island to Rodanthe
Cost for Vessel Construction (38)	12,000,000.00	$456,000,000.00	$0.00	Based on Engineer's Construction Est.
Fuel Cost/50 gals hr./per day/365/3.00	1,800.00	$24,966,000.00	$24,966,000.00	Based on 2 x Cat C18 + 1 Cat C6.6 Eng.
Lube oil and Fuel oil filters (10/yr ea.)	1,000.00	$38,000.00	$38,000.00	Based on 500 hr. oil change
Lube oil (75 x 10 = 750 x 2.50 = 1875)	1,875.00	$71,250.00	$71,250.00	Based on 500 hr. oil change
Totals	**12,004,675.00**	**$481,075,250.00**	**$25,075,250.00**	

Bodie Island/Rodanthe Route

FERRY CREW

Breakdown	Crew Cost/12 hr. Day		Crew Cost / Year	Remarks
Vessel Crew of 6 (12 hr. shift)				
Hrs. (6 persons x 12 hrs. $40.00 =2280.00)	$109,440.00		$39,945,600.00	(228) Crew for Ferries Only
Meals	$0.00		$0.00	
Uniforms (7 x 4 x $75.00)	$79,800.00		$79,800.00	
Totals			**$40,025,400.00**	

Bodie Island/Rodanthe Route

LOADING DOCKS

Department Breakdown	Bodie Island	Rodanthe	Total Cost	Remarks
Loading Dock				Route - Bodie Island to Rodanthe
Cost for one dock and Ramp (1.2M)	$7,200,000.00	$7,200,000.00	$14,400,000.00	Complete w/ ramp, hyd. & lift frame
Total Land for stacking lanes 15/5(150k/acre)	$2,250,000.00	$750,000.00	$3,000,000.00	75 cars/acre x 20 = 1500 vehicles + 6 Dorms
Parking Lot with Asphalt 15/5 Acres x $216,320/Acre	$3,244,800.00	$1,081,600.00	$4,326,400.00	Asphalt finish for parking lot
Bulkhead at Ramps (390/ft.) $1000.00	$390,000.00	$390,000.00	$780,000.00	390 feet of bulkhead (12) ramps
Bulkhead at Tie-up docks (1430ft.x $260.00)	$1,430,000.00	$260,000.00	$1,690,000.00	1430 feet @ BI & 260 ft. @ Rodantie
Repairs to Ramps (cost is for 12 ramps)	$720,000.00	$720,000.00	$1,440,000.00	Cost Incurred by Field Maintenance
Cost per clusters (8 Pilings @ $250 Ea. + $10,000)	$778,000.00	$778,000.00	$1,556,000.00	$27,000.00 per cluster w/ 2 pipes & 15 piles
Cost per cluster (6 Pilings @ $250 Ea.)	$864,000.00	$48,000.00	$912,000.00	$2,800 per Tie-up Cluster 4 Piles/Cluster
Dredging Maintenance at Turning Basins	$120,000.00	$120,000.00	$240,000.00	20,000 Cu. Yds. Per Year x 6/ Cu. Yd.
Reoccurring Year Cost for Maintenance			$4,148,000.00	
Totals			**$32,492,400.00**	

Bodie Island/Rodanthe Route

LOADING DOCK PERSONNEL

Breakdown	Bodie Island	Rodanthe	Totals for 1 yr.	Remarks
Dock Crew of 2 / Ramp (12 hr. shift)	$5,760.00	$5,760.00	$4,204,800.00	6/6 Ramps x 2 = 24 Persons ($40.00/hr)
Parking Crew of 6/6 to park cars	$2,880.00	$2,880.00	$2,102,400.00	6 + 6 = 12
6/6 Ticket Booths Crew 2 / Ticket Booth	$5,760.00	$5,760.00	$4,204,800.00	12 x 2 = 24
2 Manager & 2 Assistant Managers	$960.00	$960.00	$700,800.00	2 + 2 = 4
Maintenance Crew	$2,880.00	$2,880.00	$2,102,400.00	8 Mechanics & 4 Elect. = 12
				76 Total Docking/Parking Personnel
Totals			**$13,315,200.00**	

Bodie Island/Rodanthe Route

OP BUILDING DORMATORIES

Department Breakdown	Bodie Island	Rodanthe	Total Cost	Remarks
Dormitories for Crew and Personnel (152)				Route -Bodie Island to Rodanthe
(5) Dorm Buildings 4000 sq. ft. x $220.00/sq. ft.	$5,280,000.00	$1,320,000.00	$6,600,000.00	30 Personnel Per Dorm x 5 = 150
Dormitory Parking Lot	$0.00	$0.00	$0.00	See Loading Dock for Parking
Sewage System for Dorm/Operations Bldg.	$2,400.00	$600.00	$3,000.00	System Design for 10,000 Gals./Day/Bldg.
Operations Bldg. 100 ft. x 60 ft. = 6,000 sq. ft.	$1,320,000.00		$1,320,000.00	Cost per Sq. Ft. = $220.00
Opps. Building Parking Lot	$0.00	$0.00	$0.00	See Loading Dock for Parking
Emergency Genset/Bldg. & Accessories	$560,500.00	$122,600.00	$683,100.00	See Breakdown Below
	$7,162,900.00	$1,443,200.00	$8,606,100.00	
Reoccurring Year Maintenance Cost	214,887.00	$43,296.00	258,183.00	Estimated 3% Yearly Maintenance Cost
Electrical Monthy	1,500.00	$300.00		Cost Est. $300.00/Dorm or Opps. Bldg.
County Water Monthy	1,000.00	$200.00		Cost Est. $200.00/Dorm or Opps. Bldg.
Telephone Billing Monthy	500.00	$100.00		Cost Est. $100.00/Dorm or Opps. Bldg.
Generator Bldg. Area (50 sq. ft./100 kW)+100	60,000.00	22,500.00		Cost per Sq. Ft. = $150.00 Commercial Std.
500/100 kW Diesel Genset (100 kW/Bldg.)	150,000.00	30,000.00		Cost of Genset $300.00 / kW
1200/240 Diesel Tank ($50.00/gal)	60,000.00	12,000.00		Fuel Consp. is 0.1 gals./kW/hr. x 24 hrs.
Electrical Switchboard	100,000.00	20,000.00		Cost of Switchboard $200.00/kW
Electrical Wiring from Genset Bldg.	187,500.00	37,500.00		Main Supply Cable Run (250 ft. x $1.50 x kW)
Total	560,500.00	$122,600.00		
				228
				76
				152
Totals			**$8,864,283.00**	

Bodie Island/Rodanthe Route

SHIPYARD VESSEL MAINTENANCE @ WANCHESE, NC

Department Breakdown	Bodie Island	Rodanthe	Total Cost	Remarks
Maintenance Cost Per Ferry for One Year				Manns Harbor Shipyard and Field Maint.
				Based on current history.
Fuel Cost to shipyard and back	$1,200.00			Based on 4 to 6 hr. travel time
Cost for Crew to transport vessel.	$1,280.00			Based on 4 to 6 hr. travel time
Yearly Elect. Bill ($40,000 x 12 = $480,000.00)	$16,000.00			Cost per vessel
Emergency Repairs	$40,000.00			
Subtotal	**$58,480.00**			
Shipyard Maintenance Cost Breakdown:	**Labor Cost @ 40.00/hr.**	**Material Cost**	**Totals**	
Gas free and Docking	2,200.00	$1,500.00		
Hull & Superstructure Repairs	28,000.00	$10,000.00		
Mechanical	24,000.00	$8,000.00		
Piping Repairs	4,800.00	$3,000.00		
Electrical Repairs	4,800.00	$4,000.00		
Machine Shop	6,000.00	$3,000.00		
Life Raft Cert.. ($1100.00/yr. x 5 = $5500.00)	1,280.00	$5,500.00		
Blasting and Painting	88,000.00	$30,000.00		
Technical Support (Supervision and Others)	32,000.00			
Subtotal	191,080.00	$65,000.00		
Warehouse	5,600.00			
Cost from above	58,480.00			
Subtotal of Cost	**$387,760.00**	**$65,000.00**	**$452,760.00**	
Total Cost of Vessel in Shipyard Period				
Totals			**$8,602,440.00**	**Cost is for 19 Vessels / Year**

Bodie Island/Rodanthe Route

FACILITY MAINTENANCE

Department Breakdown	Bodie Island	Rodanthe	Total Cost	Remarks
Maintenance Cost Per Ferry for One Year				Manns Harbor Shipyard and Field Maint.
Maintenance Cost at Ramps & Buildings	$360,000.00	$360,000.00	$720,000.00	Based on 12 Ramps @ 5 % of 1.2M Ea.
Maintenance Cost at New Shipyard	$660,487.88		$660,487.88	Based on 1% of Build Cost $66M
	$0.00	$0.00	$0.00	
	$0.00	$0.00	$0.00	
	$0.00	$0.00	$0.00	
	$0.00	$0.00	$0.00	
Emergency Maintenance on Equipment	$100,000.00	$100,000.00	$200,000.00	Hurricane, Nor'easter Storms & Other
Total			$1,580,487.88	
Note: Maintenance is Low Due to New Facilities				
Totals			**$1,580,487.88**	

Bodie Island/Rodanthe Route

DREDGING AND ENVIRONMENTAL

Department Breakdown	BI & Rodanthe	Reoccurring Cost		Remarks
Dredging Cost for One Year for Both Sites				
Dredging Cost 2,000,000 Cu. Yds. X $6.00	$12,000,000.00	$120,000.00		Dredging Cost $6.00/cu. yd. (200 ft. Channel)
New 12" Dredge to Maintain Channels	$10,000.00	$10,000.00		Dredge Cost for 10 days
12" Pipeline x 5250 ft. x $15.00/ft.	$7,920.00	$7,920.00		Pipeline Cost for 10 days
Pipeline and Anchor Handling Tug	$5,000.00	$5,000.00		Tug Cost for 10 days
Total Initial Cost First Year	12,022,920.00			
Reoccurring Cost Each Year for Maintenance		$22,920.00		
Totals	**12,022,920.00**	**$165,840.00**		

Bodie Island/Rodanthe Route

SHIPYARD COST BREAKDOWN 33 Acre Site

BUILDINGS AND EQUIPMENT	COST	TOTAL COST	Reoccuring Cost	REMARKS
Property (20 Acres)	$5,000,000.00	$5,000,000.00		Allowance of $250,000.00/Acre
Haul-Out Slip (300 x 80 x 12)	$2,400,000.00	$2,400,000.00		$100.00 x sq. ft.
Outfit Slip (500 x 120 x 12)	$3,000,000.00	$3,000,000.00		$50.00 x sq. ft.
Paint Building ($160.00/Sq. Ft.) x 2	$6,000,000.00	$12,000,000.00	$60,000.00	150 ft. x 250 ft. x 80 ft. w/ Vented & Hanger Door
Paint Storage Building ($100.00/Sq. Ft.)	$960,000.00	$960,000.00	$9,600.00	120 ft. x 80 ft. x 25 ft. - Vented & Forklift Accessible
Gen. & Cmpr. Building ($100.00/Sq. Ft.)	$1,040,000.00	$1,040,000.00	$10,400.00	160 ft. x 60 ft. x 25 ft.-Vented w/(2) 5 Ton Ovhd. Cranes
Warehouse ($100.00/Sq. Ft.)	$6,150,000.00	$6,150,000.00	$61,500.00	200 ft. x 300 ft. x 25 ft. - Vented & Forklift Accessible
Main Office Building ($250.00/Sq. Ft.)	$5,350,000.00	$5,350,000.00	$53,500.00	100 ft. x 200 ft. x 25 ft. - 40 Offices & Restrooms
Steel Fabrication Bldg. ($150.00/Sq. Ft.)	$2,490,000.00	$2,490,000.00	$24,900.00	60 ft. x 250 ft. x 25 ft. - w/ (6) 10 Ton Overhead Cranes
Engine Rebuild and Mechanical Building	$1,440,000.00	$1,440,000.00	$14,400.00	40 ft. x 200 ft. x 25 ft. - w/ (2) 5 Ton Overhead Cranes
Electric Shop	$1,200,000.00	$1,200,000.00	$12,000.00	40 ft. x 200 ft. x 25 ft. - Ventilated & Forklift Accessible
Sign Shop	$720,000.00	$720,000.00	$7,200.00	40 ft. x 120 ft. x 25 ft. - Ventilated
Travel Lift 800 Ton Capacity	$1,500,000.00	$1,500,000.00	$15,000.00	800 Ton Capacity Travel Lift (Ferry Wt. = 500 Long Tons)
Fuel Tanks 10,000 Gallon Double Wall	$25,000.00	$50,000.00	$60,000.00	Reoccuring Cost is Fuel Consumption @ Shipyard
Propane Tank 5,000 Gallon	$40,000.00	$40,000.00	$100,000.00	Reoccuring Cost is Propane Consumption @ Shipyard
Oxygen Tank 5000 Gallon	$40,000.00	$40,000.00	$200,000.00	Reoccuring Cost is Oxygen Consumption @ Shipyard
Parking Lot (4 Acres) w/ painted slots	$865,280.00	$865,280.00	$0.00	Paved Parking for 350 Cars (Paving Cost = $5.00/Sq. Ft.)
Air Compressors (4 x 750 Cu. Ft. Capacity)	$300,000.00	$300,000.00	$3,000.00	$75,000.00 Ea Electric Motor Driven Screw Type
Generators (2 x 2000 kVA)	$1,200,000.00	$1,200,000.00	$12,000.00	$600,000.00 Ea. CAT 3512B Diesel Driven Skid Mounted
Forklift (12 x 3 ton capacity) $40,000.00 Ea	$320,000.00	$320,000.00	$3,200.00	Propane/Diesel Engine Powered 16' Reach
All Terrain 50 Ton Capacity Crane (6)	$2,100,000.00	$2,100,000.00	$21,000.00	$375,000.00 Ea. Telescopic Hydraulic All Terrain
Pickup Truck (8)	$240,000.00	$240,000.00	$2,400.00	3/4 Ton Crew Cab w/ 6 1/2 Ft. Bed ($30,000.00 Ea.)
Suburban (8)	$320,000.00	$320,000.00	$3,200.00	1/2 Ton 3 Seat Suburban ($40,000.00 Ea.)
(2)18 Wheel Truck w/ two Trailers (2)	$350,000.00	$350,000.00	$3,500.00	Truck and (2) Trailers - One Float & One Low-Boy
Electrical Wiring and Power Stations	$1,950,000.00	$1,950,000.00	$19,500.00	(Wiring $1,500,000.00) (15-Places x $30,000.00)
Electrical Switchboard for Generators	$350,000.00	$350,000.00	$3,500.00	2000 kVA Switchboard for Shipyard Service
Plumbing for Water & Air	$612,500.00	$612,500.00	$6,125.00	35 Manifolds or Outlets in Yard and Buildings
Allowance for Concrete and Roads	$1,500,000.00	$1,500,000.00	0	Inside of Shipyard Depending on Final Layout
Shipyard Personnel (350 Craftsman)	$6,988,800.00	$6,988,800.00		
Sewage (System, Piping and Drain Field)	$115,500.00	$115,500.00	11,550.00	Sewage Sys. 385 Persons x 30 gals./day = 11,550 Gals.
Engineering and Oversight of Project	$5,456,708.00	$5,456,708.00	0	Allowance of 10% for Engineering
Estimated Total Cost		**$66,048,788.00**	**$717,475.00**	**Yearly Consumables and Maintenance**

APPENDIX E

Cost Estimates for Conceptual Ferry Route

From Bodie Island To Rodanthe

1 Million Vehicles per Year

NCDOT Ferry Division **Bodie Island/Rodanthe Ferry Route - 1M Cars** **Alternate "A", Rev. 7, Jan. 2, 2013**

Department Breakdown	Initial Cost Summary	Yearly Reoccurring Cost	Cost for 50 Year Period	Remarks
Ferry Vessels (capacity 1,000,000 cars/yr.)	$240,652,955.00	$12,658,955.00	$873,600,705.00	36 cars/4 trips per day/365=19 vessels
Ferry Crew Cost	$19,998,450.00	$19,998,450.00	$999,922,500.00	(114) Personnel for Ferries Only
Loading Dock/Ramp	$16,922,200.00	$2,352,000.00	$134,522,200.00	(3) & (3) Loading Ramps per Location
Loading Dock & Maintenance Personnel	$6,657,600.00	$6,657,600.00	$332,880,000.00	(40)Personnel
Opps. Building & Dormitories	$6,581,096.00	$292,296.00	$21,195,896.00	
Shipyard/Vessel Maintenance Per Year	$4,527,600.00	$4,527,600.00	$226,380,000.00	10 Vessels Per Year
Facility Maintenance	$810,789.80	$810,789.80	$40,539,490.00	
Dredging/Environmental	$6,022,920.00	$82,920.00	$10,168,920.00	
Maintenance Shipyard at Wanchese, NC	$35,136,880.00	$406,015.00	$55,437,630.00	
Vessel Replacement @ 30 Years	$0.00	$0.00	$456,000,000.00	Vessel Cost in 2042 = $24M Ea. x 19
Dredge Replacement @ 30 Years	$0.00	$0.00	$16,000,000.00	Vessel Cost in 2042 = $16M Ea.
Tug Replacement @ 30 Years	$0.00	$0.00	$10,000,000.00	Vessel Cost in 2042 = $10,000,000
				Note:
				Per Google Earth Map attached,
				Miles is 17/10 = 1.7 hr. x 2= 3.4 hrs. + 1 hr.
				loading of vehicles. Total Round Trip is 4.8 hrs.
				USCG allows 12 hours/day for Crew.
Total Cost for Bonner Ferry Operation	$337,310,490.80	$47,786,625.80	**$3,176,647,341.00**	Cost = $63.53 per vehicle
				Labor Rate = $40.00

Bodie Island/Rodanthe Route

FERRY VESSELS 180'-0" DBL. ENDED

Breakdown	Initial Cost Per Vessel	Total Cost for 19 Vessels	Reoccurring Cost	Remarks
180' Ferry (Capacity 38 cars @ 10 Knots)				Route - Bodie Island to Rodanthe
Cost for Vessel Construction	12,000,000.00	$228,000,000.00	$0.00	Based on Engineer's Construction Est.
Fuel Cost/50 gals hr./per day/3.03	1,818.00	$12,607,830.00	$12,607,830.00	Based on 2 x Cat C18 + 1 Cat C6.6 Eng.
LO & FO filters (10/yr /Vessel)	500.00	$9,500.00	$9,500.00	Based on 500 hr. oil change
Lube oil (75 x 10 = 750 x 2.50 = 1875)	1,875.00	$35,625.00	$35,625.00	Based on 500 hr. oil change
Engine Overhaul @ 25,000 hrs.			$6,000.00	Rebuild every (5) years
Totals	12,004,193.00	$240,652,955.00	$12,658,955.00	

Bodie Island/Rodanthe Route

FERRY CREW

Breakdown	Crew Cost /12 hr. Day		Crew Cost / Year	Remarks
Vessel Crew of 6 (12 hr. shift) Under 150 pass.				Route - Bodie Island to Rodanthe
Manhours (6 persons x 12 hrs. $40.00 =2,880.00)	$54,720.00		$19,972,800.00	(114) Vessel Crew
Meals (Not Provided)	$0.00		$0.00	Crews & Workers Pay for Meals
Uniforms (6 x 114 x $75.00)/2 =$26,650.00	$25,650.00		$25,650.00	Uniforms are not Cleaned
7 days x 150 crew x 75.00 each/ 2 year life span				
Totals			**$19,998,450.00**	Salaries shown are at 2012 figures.

Bodie Island/Rodanthe Route

LOADING DOCKS

Department Breakdown	Bodie Island Dock	Rodanthe Dock	Total Cost	Remarks
Loading Dock				Route - Bodie Island to Rodanthe
Cost for one dock and Ramp (1.2M) x 6 =	$3,600,000.00	$3,600,000.00	$7,200,000.00	Complete w/ ramp, hyd. & lift frame
Land for parking (7/3) acres (150k/acre) =	$1,050,000.00	$450,000.00	$1,500,000.00	75 cars/acre x 10 = 750 vehicles + 3 Dorms
Parking Lot 7/3 Acres with Asphalt) =	$1,514,240.00	$648,960.00	$2,163,200.00	Asphalt finish for parking lot
Bulkhead at Ramps (195/ft.) $1000.00 =	$195,000.00	$195,000.00	$390,000.00	195 feet of bulkhead (6) at ramps
Bulkhead at Tie-up docks ($1000/ft.) =	$715,000.00	$130,000.00	$845,000.00	715 ft at BI & 130 ft @ Rodanthe
Repairs to Ramps (cost is for 3/3 ramps Ea. Side)	$360,000.00	$360,000.00	$720,000.00	Cost Incurred by Field Maintenance
Docking Cluster Cost (8/vessel x 3 vessels)	$648,000.00	$648,000.00	$1,296,000.00	$27,000 - Cluster w/2 pipes & 15 Pilings
Tie-up Cluster Cost (8/vessel x 104 or 16)	$291,200.00	$44,800.00	$336,000.00	$2,800 - Cluster (4 piles)
Dredging Maintenance at Turning Basins	$60,000.00	$60,000.00	$120,000.00	10,000 Cu. Yds. Per Year x 6/ Cu. Yd.
Reoccurring Year Cost for Maintenance			$2,352,000.00	For Repairs and Maintenance Only
Totals			**$16,922,200.00**	

Bodie Island/Rodanthe Route

LOADING DOCK PERSONNEL

Breakdown	Bodie Island (1 day)	Rodanthe (1 day)	Totals for 1 yr.	Remarks
Dock Crew of 2 / Ramp (12 hr. shift)	$2,880.00	$2,880.00	$2,102,400.00	3/3 Ramps x 2 = 12 Persons ($40.00/hr)
Parking Crew of 3/3 to park cars	$1,440.00	$1,440.00	$1,051,200.00	3 +3 = 6
3/2 Ticket Booths Crew 2 / Ticket Booth	$2,880.00	$2,880.00	$2,102,400.00	(6 + 6) = 12
Manager & Assistant Manager	$480.00	$480.00	$350,400.00	1 x 1 = 2
Maintenance Crew	$1,440.00	$1,440.00	$1,051,200.00	4 Mechanics & 2 Electricians = 6
				38 Total Personnel
Totals	**9,120.00**	**$9,120.00**	**$6,657,600.00**	

Bodie Island/Rodanthe Route

OP BUILDING DORMATORIES

Department Breakdown	Bodie Island Dock	Rodanthe	Total Cost	Remarks
Dormitories for Crew and Personnel (77)	2 Dorms - 60 Crew	1 Dorm - 30 Crew	20% of Crew live locally	Route - Bodie Island to Rodanthe
(3) Dorm Building 4000 sq. ft. x $220/sq. ft.	$3,960,000.00	$1,320,000.00	$5,280,000.00	30 Personnel Per Dorm x 3 = 90 People
Dormatory Parking Lot	$0.00	$0.00	$0.00	See Loading Docks for Parking Lot
Sewage System for Dorm/Operations Bldg.	$1,800.00	$600.00	$28,800.00	System Design for 10,000 Gals./Day/Bldg.
Operations Bldg. 100 ft. x 30 ft. = 3000 sq. ft.	$660,000.00		$660,000.00	Cost per Sq. Ft. = $220.00
Parking Lot for OPS Building	$0.00	$0.00	$0.00	See Loading Docks for Parking Lot
Emergency Genset/Bldg. & Accessories	$249,800.00	$96,600.00	$346,400.00	See Breakdown Below
Subtotal of Cost	$4,871,600.00	$1,417,200.00	$6,288,800.00	
Reoccurring Year Maintenance Cost	146,148.00	$146,148.00	292,296.00	Estimated 3% Yearly Maintenance Cost
Electric Cost Monthly	900.00	$300.00		Cost Est. $300.00/Dorm or Opps. Bldg.
County Water Billing Monthly	600.00	$200.00		Cost Est. $200.00/Dorm or Opps. Bldg.
Telephone Billing Monthly	300.00	$100.00		Cost Est. $100.00/Dorm or Opps. Bldg.
Generator Bldg. Area (50 sq. ft./100kW)+100	37,500.00	$22,500.00		Cost per Sq. Ft. = $150.00 Commercial Std.
300/100 kW Diesel Genset (100 kW/Bldg.)	90,000.00	$30,000.00		Cost of Genset $300.00 / kW
750/240 Diesel Tanks ($50.00/gal)	37,500.00	$12,000.00		Fuel Consp. is 0.1 gals./kW/hr. x 24 hrs.
Electrical Switchboard	60,000.00	$20,000.00		Cost of Switchboard $200.00/kW
Electrical Wiring from Genset Bldg.	23,000.00	$11,500.00		Main Supply Cable Run (250 ft. x $1.50 x kW)
Total	249,800.00	$96,600.00		
				114
				40
				77
Note: Operation Bldg. also houses maintenance shop and kitchen/dinning area.				
Totals			**$6,581,096.00**	

Bodie Island/Rodanthe Route

SHIPYARD COST PER VESSEL @ WANCHESE, NC

Breakdown	Bodie Island	Rodanthe	Total	Remarks
				Based on current history.
Fuel Cost to transport vessel to shipyard and back	$1,200.00			Based on 4 hr. travel time Round Trip
Cost for Crew to transport vessel.	$640.00			Based on 4 hr. travel time Round Trip
Yearly Electrical Bill ($20,000 x 12 = $240,000.00)	$16,000.00			Based on May, 2012 billing statement
	$0.00			
Salaries for Field Maintenace	$0.00			See Loading Dock Personnel
Emerg. Repairs (HVAC, Steering, Pumps, Engs)	$40,000.00			
Subtotal	$57,840.00			
Shipyard Maintenance Cost Breakdown:	**Labor Cost @ 40.00/hr**	**Material Cost**	**Totals**	
Gas free and Docking	2,200.00	$1,500.00		
Hull & Superstructure Repairs	28,000.00	$10,000.00		
Mechanical	24,000.00	$8,000.00		
Piping Repairs	4,800.00	$3,000.00		
Electrical Repairs	4,800.00	$4,000.00		
Machine Shop	6,000.00	$3,000.00		
Life Raft Cert.. ($1100.00/yr. x 5 = $5500.00)	1,280.00	$5,500.00		
Blasting and Painting	88,000.00	$30,000.00		
Technical Support (Supervision and Others)	32,000.00			
Subtotal	191,080.00	$65,000.00		
Warehouse	5,600.00			
Cost from above	57,840.00			
Subtotal of Cost	387,760.00	$65,000.00	452,760.00	
Total Cost of Vessel in Shipyard Period				
Totals			**$4,527,600.00**	**Cost is for 10 Vessels / Year**

Bodie Island/Rodanthe Route

FACILITY MAINTENANCE

Department Breakdown	Bodie Island	Rodanthe	Total Cost	Remarks
Maintenance Cost Per Ferry for One Year				Manns Harbor Shipyard and Field Maint.
Maintenance Cost at Ramps & Buildings	$180,000.00	$180,000.00	$360,000.00	Based on 6 Ramps @ 5% of $1.2M Ea.
Maintenance Cost at New Shipyard	$350,789.80		$350,789.80	Based on 1% of Build Cost $35M
	$0.00	$0.00	$0.00	
	$0.00	$0.00	$0.00	
	$0.00	$0.00	$0.00	
	$0.00	$0.00	$0.00	
Emergency Maintenance on Equipment	$50,000.00	$50,000.00	$100,000.00	Hurricane, Nor'easter Storms & Other
Totals			**$810,789.80**	

Bodie Island/Rodanthe Route

DREDGING AND ENVIRONMENTAL

Department Breakdown	BI & Rodanthe	Reoccurring Cost		Remarks
Dredging Cost for One Year for Both Sites				
Dredging Cost 1,000,000 Cu. Yds. X 6.00	$6,000,000.00	$60,000.00		Yearly cost is maintenance only - 10% of Cost
New 12" Dredge to Maintain Channels	$10,000.00	$10,000.00		Dredge Cost for 5 days
12" Pipeline x 5250 ft. x $15.00/ft.	$7,920.00	$7,920.00		Pipeline Cost for 5 days
Pipeline and Anchor Handling Tug	$5,000.00	$5,000.00		Tug Cost for 5 days (Day Rate $2,000.00/Day)
		$0.00		Day Rate Includes: 4-Crew, Fuel & Maintenance
		$0.00		
Totals	**$6,022,920.00**	**$82,920.00**	**$0.00**	

Bodie Island/Rodanthe Route

SHIPYARD COST BREAKDOWN 16 Acre Site @ Wanchese, NC

BUILDINGS AND EQUIPMENT	COST	TOTAL COST	Reoccuring Cost	REMARKS
Property (10 Acres)	$2,500,000.00	$2,500,000.00		Allowance of $250,000.00/Acre
Haul-Out Slip (300 x 80 x 12)	$2,400,000.00	$2,400,000.00		$100.00 x sq. ft.
Outfit Slip (500 x 120 x 12)	$3,000,000.00	$3,000,000.00		$50.00 x sq. ft.
Paint Building ($160.00/Sq. Ft.)	$6,000,000.00	$6,000,000.00	$60,000.00	150 ft. x 250 ft. x 80 ft. w/ Vented & Hanger Door
Paint Storage Building ($100.00/Sq. Ft.)	$480,000.00	$480,000.00	$4,800.00	80 ft. x 60 ft. x 25 ft. - Vented & Forklift Accessible
Gen. & Cmpr. Building ($100.00/Sq. Ft.)	$680,000.00	$680,000.00	$6,800.00	100 ft. x 60 ft. x 25 ft. - Vented w/ (2) 5 Ton Ovhd. Cranes
Warehouse ($100.00/Sq. Ft.)	$3,150,000.00	$3,150,000.00	$31,500.00	200 ft. x 150 ft. x 25 ft. - Vented & Forklift Accessible
Main Office Building ($250.00/Sq. Ft.)	$2,750,000.00	$2,750,000.00	$27,500.00	50 ft. x 200 ft. x 25 ft. - 26 Offices & Restrooms
Steel Fabrication Bldg. ($150.00/Sq. Ft.)	$1,320,000.00	$1,320,000.00	$13,200.00	40 ft. x 200 ft. x 25 ft. - w/ (3) 10 Ton Overhead Cranes
Engine Rebuild and Mechanical Building	$680,000.00	$680,000.00	$6,800.00	40 ft. x 100 ft. x 25 ft. - w/ (1) 5 Ton Overhead Cranes
Electric Shop	$600,000.00	$600,000.00	$6,000.00	40 ft. x 100 ft. x 25 ft. - Ventilated & Forklift Accessible
Sign Shop	$360,000.00	$360,000.00	$3,600.00	40 ft. x 60 ft. x 25 ft. - Ventilated
Travel Lift 800 Ton Capacity	$1,500,000.00	$1,500,000.00	$15,000.00	800 Ton Capacity Travel Lift - Ferry Wt. = 500 Long Tons
Fuel Tanks 10,000 Gallon Double Wall	$25,000.00	$50,000.00	$30,000.00	Located at Outfit Slip
Propane Tank 5,000 Gallon	$40,000.00	$40,000.00	$50,000.00	Located at Outfit Slip
Oxygen Tank 5000 Gallon	$40,000.00	$40,000.00	$100,000.00	Located Outside of Shipyard Near Parking Lot
Parking Lot (2 Acres)	$432,640.00	$432,640.00		Paved Parking for 175 Cars (Paving Cost = $5.00/Sq. Ft.)
Air Compressors (2 x 750 Cu. Ft. Capacity)	$150,000.00	$150,000.00	$1,500.00	$75,000.00 Ea Electric Motor Driven Screw Type
Generators (2 x 1100 kVA)	$900,000.00	$900,000.00	$9,000.00	$450,000.00 Ea. CAT 3512B Diesel Driven Skid Mounted
Forklift (4 x 3 ton capacity) $40,000.00 Ea.	$160,000.00	$160,000.00	$1,600.00	Propane/Diesel Engine Powered 16' Reach
All Terrain 50 Ton Capacity Crane (3)	$1,050,000.00	$1,050,000.00	$10,500.00	$375,000.00 Ea. Telescopic Hydraulic All Terrain
Pickup Truck (4)	$120,000.00	$120,000.00	$1,200.00	3/4 Ton Crew Cab w/ 6 1/2 Ft. Bed ($30,000.00 Ea.)
Suburban (4)	$160,000.00	$160,000.00	$1,600.00	1/2 Ton 3 Seat Suburban ($40,000.00 Ea.)
18 Wheel Truck w/ two Trailers	$175,000.00	$175,000.00	$1,750.00	Truck and (2) Trailers - One Float & One Low-Boy
Electrical Wiring and Power Stations	$1,240,000.00	$1,240,000.00	$12,400.00	(Wiring $1,000,000.00 Allowed) (8-Stations x $30,000.00)
Electrical Switchboard for Generators	$250,000.00	$250,000.00	$2,500.00	1500 kVA Switchboard for Shipyard Service
Plumbing for Water & Air	$297,500.00	$297,500.00	$2,975.00	17 Manifolds or Outlets in Yard and Buildings
Allowance for Concrete and Roads	$750,000.00	$750,000.00		Inside of Shipyard Depending on Final Layout
Shipyard Personnel (175 Craftsman)	$3,494,400.00	$3,494,400.00		Allowance of 15 persons/vessel + 20% for Management
Sewage (System, Piping and Drain Field)	$57,900.00	$57,900.00	$5,790.00	Sewage Sys. 193 Persons x 30 glas./day = 5790 Gallons.
Engineering and Oversight of Project	$349,440.00	$349,440.00		Allowance of 10% for Engineering
Estimated Total Cost		**$35,136,880.00**	**$406,015.00**	**Yearly Cost of Consumables and Maintenance.**

APPENDIX F

High-Speed Ferry Vessels

TABLE F1. HIGH-SPEED AND OTHER VEHICULAR FERRY INFORMATION

Ferry	Location	Capacity	Speed	Trip Distance	Trip Duration	Loading Time	User Fee (2011)	Ship Cost	Draft Depth
United States Ferry Routes									
Lake Express Ferry	Wisconsin-Michigan	46 cars	40 mph	78 miles	2.5 hours	45 min	Auto: $100.50 one-way $173.00 round trip	$118 million (2004)	8.3 feet
United States/International Routes									
Derecktor Chenega	Prince William Sound and other Alaska routes	36 vehicles- 250 passengers	37 mph	249 miles	18 hours		From Kodiak to Chignik Auto: $151-$248 one way		8.5 feet
International Routes									
CNM Evolution (April to October)	Quebec Canada	30 vehicles 175 passengers	35 mph	25 miles	1 hour	30 min	Auto: $40 one way	$6.2 million (1997)	5 feet
Austal Benchijigua Express	Inter-island service, Canary Islands	341 vehicles- 1291 passengers	48 mph	24 miles	40 mins	30 mins	From Los Cristianos- San Sebastian de la Gomera Auto: $124 one way $240 round trip		13 feet
Incat 046 “T&T Express”	Inter-island service, Trinidad & Tobago	240 vehicles- 720 passengers	49 mph	98 miles	2.5 hours		Auto: $150 one way $250 round trip		12.17 feet
Austal Avemar Dos	Inter-island service, Spain	150 vehicles- 855 passengers	40 mph	18 miles	30 minutes		Auto: $140-162 one way $262 - 296 round trip	$9.2 million (current)	7.83 feet
Incat Condor 10	France- Channel Islands	90 vehicles- 576 passengers	40 mph	39 miles	1.25 hours		From St. Malo, France- Jersey Auto: $181-$247 one way $362-$493 round trip	$16 million	8.58 feet

TABLE F1. HIGH-SPEED AND OTHER VEHICULAR FERRY INFORMATION

Ferry	Location	Capacity	Speed	Trip Distance	Trip Duration	Loading Time	User Fee (2011)	Ship Cost	Draft Depth
U.S. Navy									
Austal Westpac Express	N/A Currently owned by US Navy	251 vehicles- 970 passengers	41 mph				N/A	$20 million (2012)	13.75 feet
Discontinued or Not in Service									
Austal Alakai	Hawaii, Honolulu Harbor- Kahului Harbor	282 vehicles- 866 passengers each	40 mph	117 miles	Alakai –3-3.5 hrs		N/A-Service suspended in 2009	Approximately $88 million each (auctioned to US Maritime Administration for $25 million)	12 feet
"The Cat"	Maine-Nova Scotia	200 cars 700 passengers	55 mph	90 miles	2.75 hours	45 min	Auto: $140 one way	$130 million	14.9 feet
Austal Turgut Reis 1	Not in Service	94 vehicles- 450 passengers	38 mph					2 vessels available $6 million each	10.58 feet
Non-High-Speed Ferries									
Washington State Ferries "Kwa-di Tabil" class	3 vessels, various Washington State Ferry routes	64 vehicles- 750 passengers	18 mph					$57 million each	11 feet
Cape May – Lewes, DE ferry (5 Vessels)	New Jersey-Delaware	100 cars, 1000 passengers	18 mph	17 miles	80 minutes	45 min	Auto: $30-44 one way/ $56-78 round trip	$4 million per vessel (1974) with 54.4 million dollar upgrade for entire fleet between 1994-1998	7.1 feet

TABLE F1. HIGH-SPEED PASSENGER-ONLY FERRY INFORMATION

Ferry	Location	Capacity	Speed	Trip Distance	Trip Duration	Loading Time	User Fee (2011)	Ship Cost	Draft Depth
Seastreak (NYC fleet only)	New York Metro Area	400 passengers	44 mph	varies	varies	varies	$25.00 one-way/ $43.00 round trip	$7.9 million (2001)	5.11 feet
Victoria Clipper IV	Victoria-Seattle	330 passengers	35 mph	72 miles	3 hours	45 min	$78-100 one way/ $130-147 round trip	$79 million (current)	8.2 feet