U.S. Department of Homeland Security

United States Coast Guard

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16611
January 6, 2009

Mr. J. M. Robinson
Director of Gas, Environment, and Engineering (PJ 11)
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426

Dear Mr. Robinson:

This Letter of Recommendation (LOR) is issued pursuant to 33 C.F.R. § 127.009 in response to the Letter of Intent (LOI) that Downeast LNG submitted on December 20, 2005, proposing to transport liquefied natural gas (LNG) by ship to the Downeast LNG facility proposed for operation in Mill Cove, Robbinston, ME. It conveys the Coast Guard's determination as to the suitability of Passamaquoddy Bay, Western Passage, and Head Harbor Passage (hereafter Passamaquoddy Bay Waterway) for LNG marine traffic as it relates to navigational safety and maritime security. In addition to meeting the requirements of 33 C.F.R. § 127.009 and other applicable guidelines, this letter fulfills the Coast Guard's commitment to provide information to your agency under the Interagency Agreement signed in February 2004.

After reviewing the information in the applicant's LOI and completing an independent evaluation of the waterway in consultation with a variety of local port stakeholders, I have determined that the Passamaquoddy Bay Waterway is suitable for the type and frequency of marine traffic associated with this proposed project, provided that all of the recommended risk mitigation measures outlined in Section 4.6 of the attached Waterway Suitability Report (WSR) are fully implemented by the applicant. If and when these measures are put into effect, I conclude that they will sufficiently mitigate the identified risks associated with LNG traffic on the Passamaquoddy Bay Waterway to make it fully suitable for LNG vessels bound to and from the proposed facility. My determination is based on review of the information provided in accordance with 33 C.F.R. § 127.007(d)(3) through (d)(6) and in consideration of the items listed in 33 C.F.R. § 127.009(b) through (d)(6). The reasoning behind my determination is outlined below and in the attached WSR.

The Coast Guard has completed a comprehensive review of the LOI that Downeast LNG submitted and the Waterway Suitability Assessment (WSA) for the Downeast LNG facility that Det Norske Veritas submitted on behalf of Downeast LNG on December 19, 2006. This review was conducted following the guidance provided in the two applicable U.S. Coast Guard Navigation and Vessel Inspection Circulars (NVICs) in effect during this time frame, NVIC 05-05 and NVIC 05-08. The review focused on the navigational safety and maritime security risks posed by LNG marine traffic and the measures needed to responsibly manage those risks. During the review, the Coast Guard consulted a variety of stakeholders, including the Passamaquoddy Bay/Downeast Regional Sub-Committee of the Area Maritime Security Committee, the Maine and New Hampshire Port Safety Forum, and other ad hoc groups identified in Section 1 of the attached WSR.

While this letter has no enforcement status, the determinations, analysis, and ultimate recommendation as to the suitability of this waterway, as contained in this letter, would be referenced in concert with a Captain of the Port Order, should an LNG transit be attempted along the Passamaquoddy Bay Waterway. Such an Order would be issued pursuant to my authority under the Ports and Waterways Safety Act of 1972, as amended by the Port and Tanker Safety Act of 1978, 33 U.S.C. § 1223 *et seq.*, and other applicable authorities.

For further information, please contact my project officer, Mr. Alan Moore, at (207) 767-0338, or email: Alan.H.Moore2@uscg.mil.

Sincerely,

J. B. McPHERSON
Captain, U.S. Coast Guard
Captain of the Port, Sector Northern New England

Enclosures: (1) WSR
(2) WSR (Redacted version with SSI material removed)

Copy: Commander, First Coast Guard District (dl, dp, dpa)
Commander, Coast Guard Atlantic Area (Ap)
Commandant, U.S. Coast Guard (CG-5222, CG-0941)
Coast Guard Civil Engineering Unit Providence
Downeast LNG

REDACTED VERSION

Section 5.0 of this document contains Sensitive Security Information controlled under 49 CFR Part 1520. No part of that Section may be disclosed to persons without a "need to know," as defined in 49 CFR 1520.11, except with the written permission of the Secretary of homeland Security. Section 5.0 has been redacted from this document.

U. S. Coast Guard Captain of the Port
Sector Northern New England
Liquefied Natural Gas Facility
Waterway Suitability Report

for the proposed

Downeast LNG Facility
Robbinston, ME

January 6, 2009
Sector Northern New England

TABLE OF CONTENTS

REDACTED VERSION

DOWNEAST LNG
WATERWAY SUITABILITY REPORT

Executive Summary

The data and information regarding the proposed facility detailed in this Waterway Suitability Report (WSR) was derived from Downeast LNG's Application and supporting Resource Reports filed with the Federal Energy Regulatory Commission (FERC), as well as information provided directly to the COTP Sector Northern New England (COTP) in the Downeast LNG's Letter of Intent (LOI) and Waterway Suitability Assessment (WSA). Downeast LNG is proposing to build a Liquefied Natural Gas (LNG) import, storage, and regasification facility within an 80-acre tract of land on the south side of Mill Cove, Robbinston, Maine, near the confluence of Passamaquoddy Bay and the St. Croix River.

This report was developed using U.S. Coast Guard Navigation and Vessel Inspection Circulars (NVIC or Circular) 05-05, *Guidance on Assessing the Suitability of a Waterway for Liquefied Natural Gas (LNG) Marine Traffic and* NVIC 05-08, *Guidance Related to Waterfront Liquefied Natural Gas (LNG) Facilities* which replaced 05-05. NVIC 05-08 eliminated the term WSR and replaced it with "Letter of Recommendation Analysis". For the purpose of clarity, the WSR is equivalent to the LOR Analysis. As this report was originated under NVIC 05-05, we have elected to keep "Water Suitability Report" as the title of this document.

The project is intended to have the capability to receive, store, and vaporize LNG at a baseload sendout rate of 500 million standard cubic feet per day (mmscfd), with a peaking capacity of approximately 625 mmscfd, and an expansion potential for a total capacity of 1 billion standard cubic feet per day (bscfd). The proposed facility includes a 3,862-foot single-berth pier and vessel mooring system, LNG unloading pipeline, onshore storage tanks, regasification equipment, and ancillary, supporting infrastructure. An approximate 30-mile sendout pipeline will connect the facility to the existing interstate Maritimes and Northeast Pipeline. It is anticipated that an LNG carrier would be arriving from a foreign port and offloading to the terminal once every 5 to 7 days in the winter and once every 8 to10 days during the summer period. The proposed LNG vessel transit route passes through both United States and Canadian waters. This requires that Downeast LNG adequately address and resolve several transboundary safety and security risks, requirements, and impacts.

1.0 Introduction

This document constitutes the U.S. Coast Guard Captain of the Port (COTP) Sector Northern New England's Waterway Suitability Report (WSR) for the proposed Downeast LNG, Inc. (Downeast LNG) Liquefied Natural Gas (LNG) Facility. This Waterway Suitability Report (WSR) meets the intent of paragraph 6.a. of U.S. Coast Guard Navigation and Vessel Inspection Circular (NVIC or Circular) 05-05, entitled *Guidance on Assessing the Suitability of a Waterway for Liquefied Natural Gas (LNG) Marine*

Traffic, and NVIC 05-08 *Guidance Related to Waterfront Liquefied Natural Gas (LNG) Facilities.* NVIC 05-08 and it predecessor 05-05 establishes U.S. Coast Guard (USCG) policy for assessing the suitability of a waterway to support LNG carrier traffic. This Report was compiled from several resources, some of which have been provided by the applicant, including the Application filed with the Federal Energy Regulatory Commission (FERC or Commission) and associated Resource Reports, Waterway Suitability Assessment (WSA), and amplifying information Downeast LNG provided directly to the COTP Sector Northern New England.

1.1 Background

The COTP Sector Northern New England received a Letter of Intent (LOI) in accordance with Title 33, Code of Federal Regulations (CFR), §127.007 from Downeast LNG, dated December 20, 2005. That LOI notified the COTP Sector Northern New England that Downeast LNG, Inc.; a Delaware based corporation, intended to construct a liquefied natural gas (LNG) import terminal and facility at a site located in Washington County on Mill Cove, Robbinston, ME.

The small town of Robbinston (population 525 in the 2000 census) lies at the northeastern edge of Washington County, with the small cities of Eastport (pop. 1640) lying to the south, and Calais (pop. 3447) to the north. The facility is to be sited within an 80-acre tract of land that abuts U.S. Route 1 on one end, and the southern half of Mill Cove, near the confluence of Passamaquoddy Bay and the St. Croix River, on the other. The marine portion of the project will be located entirely within U.S. waters.

The project is intended to have the capability to receive, store, and regasify (vaporize) LNG at a baseload sendout rate of 500 million standard cubic feet per day (mmscfd), with peaking capacity of approximately 625 mmscfd, and an expansion potential capacity of 1 billion standard cubic feet per day (bscfd). The marine terminal and single berth pier is intended to handle LNG vessels ranging from 70,000 to 165,000 m^3 in capacity. It will have the capability to support future vessels of up to 220,000 m^3 and corresponding lengths approximating 1,033 feet and drafts of nearly 40 feet (natural water depth at berth will be 50 feet at mean low, low water). It is anticipated that a carrier would be arriving and offloading once every five to seven days in the winter, and once every eight to ten days during the summer period. Figure 1 is an artist's rendering of the proposed project.

Figure 1

1.1.1 Marine Terminal and Storage Facility General Arrangement

The proposed import facility will consist of five major components: (1) Marine Terminal; (2) Storage Facility; (3) Pipeline Facilities; (4) Utilities, Infrastructure, and Support Systems; and (5) the natural gas pipeline. The following is an overview of these components of the project:

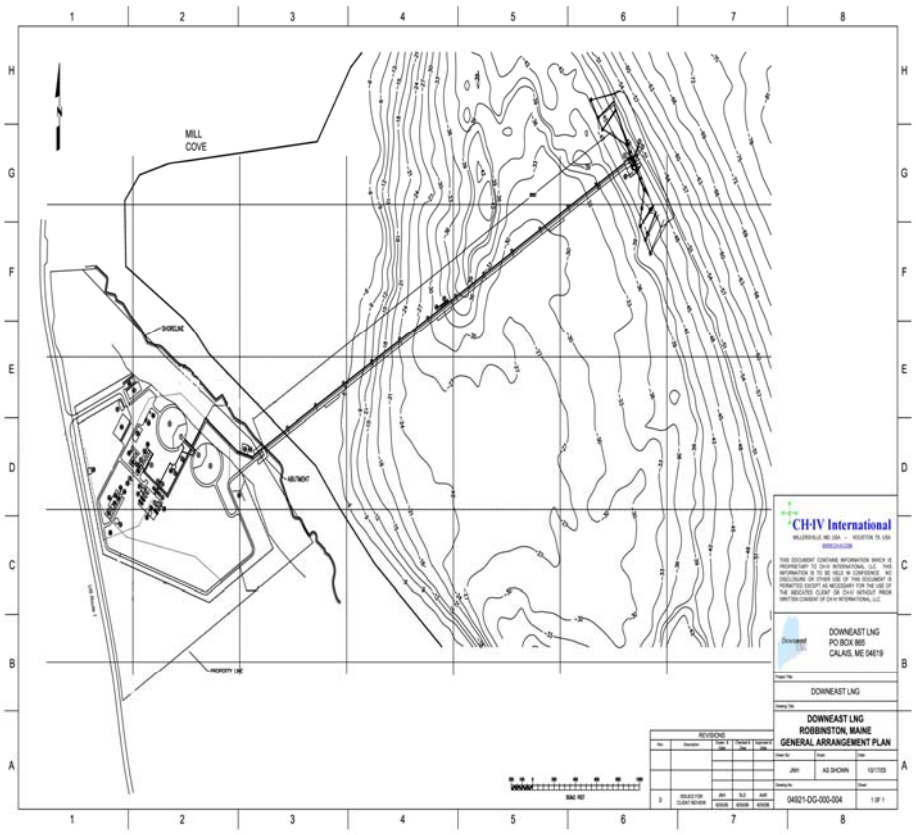
1. The Marine Terminal is comprised of a single berth pier arrangement with the trestle portion approximating 3,862 feet in length. The pier will be affixed with mooring systems to accommodate LNG carriers ranging from 70,000 to 165,000 m^3 in cargo carrying capacity, with future expansion capabilities to handle vessels approaching 220,000 m^3 in cargo carrying capacity. Three 16-inch manifold liquid unloading arms, equipped with emergency quick release couplings, are mounted mid-way along the vessel berth, as well as a 16-inch vapor return line and 36-inch cargo transfer pipeline.

2. The LNG Storage Facility will contain two storage tanks, with each having the capacity to store 160,000 m^3 of LNG. Only one tank will be initially built, with the second dependent on operational, permitting, and marketing conditions. The storage facility will also house two fully submerged, low pressure transfer pumps, boil-off gas recovery system, a submerged combustion vaporizer system, and high pressure natural gas pumps.

3. Pipeline Facility: The LNG will be offloaded from the carriers and pumped to the landside storage tank(s) using shipboard pumps. From the storage tank, the LNG will be regasified (natural gas) and ultimately fed into the M&NP pipeline via an approximate 30-inch diameter, 31-mile sendout pipeline and metering arrangement which serves the downstream States of Maine, New Hampshire, and Massachusetts. The entire capacity of the Downeast LNG facility is intended for the pipeline; no retail distribution is planned.

4. The Utilities, Infrastructure, and Support Systems contain the ancillary control, hazard detection and emergency shutdowns, vent system, fire detection and fire fighting, supply and control pneumatics, electrical control and transmission, and a host of administrative, utility, maintenance, and service facilities that are necessary to operationally support the facility.

Figure 2 – Proposed LNG Facility



1.2 COTP Role

The Federal Energy Regulatory Commission (FERC) conducts environmental, safety, and security reviews of LNG plants and related pipeline facilities, and as the lead federal agency for the process of authorizing the siting, construction, and operation of such facilities, prepares the overall National Environmental Policy Act (NEPA) documentation. In accordance with an Interagency Agreement between FERC and the Coast Guard, the Coast Guard is a cooperating agency with FERC under the NEPA

process, and will be providing input to FERC throughout the siting process. The Coast Guard exercises regulatory authority over LNG facilities which affect the safety and security of port areas and navigable waters under Executive Order 10173, the Magnuson Act, the Ports and Waterways Safety Act of 1972, as amended, and the Maritime Transportation Security Act of 2002. The Coast Guard is responsible for matters related to navigation safety and security, vessel engineering and safety standards, and all matters pertaining to security of facilities or equipment located in or adjacent to navigable waters. The Coast Guard also has authority for LNG facility security plan review, approval, and compliance verification as provided in 33 CFR subchapter H (parts 101-106)

1.3 Public Input and Interaction

The public had significant input into this Report. COTP Sector Northern New England representatives participated in five public meetings (of which two were joint scoping sessions) in concert with FERC: three in Washington County, ME, one on the Passamaquoddy Tribal Reservation at Pleasant Point, ME, and one on Campobello Island, New Brunswick (although premised on the safe and secure transportation of LNG in general, the Pleasant Point and Campobello sessions were conducted in conjunction with a competing project proposal). COTP Sector Northern New England attended a number of public outreach and informational sessions that were hosted by the applicant and/or their contracted consultants; meetings/sessions organized by the State of Maine Office of Energy Independence and Security; and a forum hosted by a tri-nation alliance/concerned citizens' group.

COTP Sector Northern New England has also considered numerous letters and electronic correspondence received from U.S., Canadian, and Tribal members of the public sector; local, county, state, provincial, and federal elected officials; non-profit organizations; environmental groups; and local, county, and state agencies commenting on the proposal. Many comments, both written and verbal, questioned the safe navigation of the intended waterway and expressed serious concerns for the maritime security and security of the vessels and port area.

Several articulated apprehension about LNG vessels being able to safely navigate through the approaches to Passamaquoddy Bay, especially within constrained portions of the channel where extreme currents and divergent eddies exist due to the extraordinary tides in the area. Comments also referenced local meteorological conditions, such as the prolonged periods of heavy fog and extreme winds common to the region. Several questioned the impact of these conditions on the safe movement of deep draft LNG carriers. In addition, numerous comments expressed grave concern regarding the perceived health hazards and property risks associated with the transportation of LNG to the coastal residents in the event of an intentional or unintentional release of LNG consequent to an act of terrorism or major marine casualty. These comments were carefully considered during the USCG's evaluation of this proposal.

Comments were also received that were not specifically relevant to the USCG's evaluation of the actual navigation safety and maritime security aspects of the proposed project. For example, comments included concern and opposition to potential

industrialization of the Passamaquoddy Bay area and the resultant impact it would have on ecotourism. Such comments reflected concern for the many environmentally sensitive areas and regional estuaries that the area is renowned for, some of which are outside of the immediate waterway. Others stressed potential adverse impacts on local aquaculture, marine life and fish, as well as the shellfish and lobster harvesting industries, claiming there would be crippling effects to the commercial fishermen. Some expressed concern about limiting public access to, and on, Passamaquoddy Bay and its tributaries. Several expressed general, overall opposition to the proposal, without further indicating specific areas of concern.

While all comments were not exclusively related to navigational safety and/or maritime security, which is the premise of this report, the USCG felt many of these issues and concerns have an overlapping effect on shipping, whether directly or indirectly, and consequently were taken into consideration where deemed germane. All documentary comments were placed in the public docket, and can be accessed via the FERC website. In addition, COTP Sector Northern New England proactively conducted a number of outreach campaigns to solicit input from, among others, the regional citizenry, local and state agencies, Canadian officials, the Passamaquoddy Tribe, and advocacy groups such as the "Save Passamaquoddy Bay 3-Nation Alliance."

1.4 Safety Working Group

Regional waterway users and stakeholders contributed to the information contained in this Report. As part of its assessment of the safety and security aspects of this project, the COTP Sector Northern New England convened safety and security working groups under the umbrella of the Passamaquoddy Bay/Down East Sub-Committee of the Area Maritime Security Committee (LNG Working Group) and Maine and New Hampshire Port Safety Forum, and participated in ad hoc meetings with the regional U.S. and Canadian response and law enforcement communities. For each of these working groups and sub-committees, a balanced group of representatives were invited to participate to ensure concerns on both sides of the international boundary were considered. None of the participants were asked to 'vote' or otherwise indicate whether the Downeast LNG proposal should be approved. Rather, participants were relied upon to provide valid input based on their expertise and regional familiarity in order to conduct a thorough assessment of potential risks to navigational safety and port security associated with the proposed project, and as well assist in the identification of possible mitigation measures.

The LNG Working Group, as a whole, convened initially in Ellsworth, ME, in March, 2006, and subsequent meetings were held in Ellsworth and Eastport, ME, in April and December, 2006, respectively. The consultation process has included subsequent collaboration with members throughout the WSA review and validation process. Additionally, LNG sub-committee sessions and related issues were regular agenda topics at quarterly Maine and New Hampshire Port Safety meetings held in Portsmouth, NH, Augusta, Bangor, and Eastport, ME. In addition to the Eastport Port Safety Forum venue, a tour through the waters of the intended LNG transit route was conducted for the benefit of the membership. In addition to the USCG sponsored LNG Working Group, COTP Sector Northern New England participated in LNG technical working group

sessions hosted by the State of Maine, which met periodically to collaborate on safety and emergency response aspects of the proposed project.

The LNG Working Group, Port Safety Forum, State assemblage, and project-related ad hoc safety and response meetings included representatives from the following:

- U.S. Coast Guard
- Maine Maritime Academy
- Moran Towing
- Portland Tugboat
- U.S. Army Corps of Engineers
- National Oceanographic and Atmospheric Administration
- National Marine Fisheries
- NI2 Center for Infrastructure
- Maine State Fire Marshall
- Maine Department of Environmental Protection
- Maine Department of Marine Resources
- Eastport City Manager
- Eastport Port Authority
- Maine Emergency Management Agency (MEMA)
- Washington County EMA
- Clean Harbors Response Corp
- Town of Calais, ME
- Maine Port Authority
- Harbor Master, Town of Bar Harbor
- Maine Bureau of Parks and Lands
- U.S. Department of Justice
- Royal Canadian Mounted Police
- Integrated Border Enforcement Team
- U.S. Customs and Border Protection
- Maine Marine Patrol
- Maine Energy and Policy
- Maine State Police
- Save Passamaquoddy Bay
- Roosevelt Campobello International Park Commission
- Passamaquoddy Tribe, Pleasant Point Reservation
- Town of Perry, ME
- Town of Robbinston, ME
- Federal Marine Terminal
- Eastport Pilots
- Quoddy Pilots
- Maine Ferry Service
- Pollution and Safety Advisor/LNG Consultant
- National Response Corp
- Penobscot Bay Pilots

This LNG Working Group was formed to review the safety risks outlined in Downeast LNG's WSA and those identified and compiled by the COTP, and to help evaluate proposed risk mitigation measures and vessel transit operational parameters.

1.5 Security Working Group

The USCG conducted its security assessment in conjunction with Law Enforcement (LE) elements of its LNG Working Group, the Passamaquoddy Bay/Down East Sub-Committee of the Area Maritime Security Committee, and ad hoc sessions involving the regional law enforcement community. Representation included:

- Maine State Fire Marshall
- Maine Department of Marine Resources
- City of Calais, ME
- Maine Pilotage Commission
- U.S. Coast Guard
- Maine State Police
- U.S. Department of Justice
- Royal Canadian Mounted Police
- Interagency Border Enforcement Team
- U.S. Customs and Border Protection
- Maine Marine Patrol
- Maine State Police
- Passamaquoddy Tribe, Pleasant Point Reservation
- Town of Perry, ME
- Town of Robbinston, ME
- City of Eastport, ME

This Report will not identify specific security mitigation measures, nor divulge any other information that could compromise security measures for the proposed facility. Such information is considered Sensitive Security Information (SSI) under 49 U.S.C. § 114(s) and 49 CFR, Part 1520. Because it discusses potential vulnerabilities or operational security measures for the proposed facility; this specific information has been provided to FERC as part of the Supplementary Record to this WSR. Members of the LNG Working Group were considered to have the "need to know" as defined by 49 C.F.R. §1520.11. Accordingly, each signed appropriate Non-Disclosure Statements, which gave them access to SSI material related to the safety and security assessment.

2.0 Port and LNG Route Characterization

The assessment of the projected route included the examination of waterway attributes, weather, port characterization, density and character of marine traffic, zones of concern as defined in the Sandia Study, sensitive environmental areas, and population density. Applicable navigation charts are NOAA 13394 (approach) and NOAA 13396 (inward passage).

2.1 General Features

The natural features in the area along the transit route are rolling hills meeting the waters of the passages. The channel is naturally deep and is not required to be maintained by dredging. Currents in the area run up to 5-6 knots due to the extreme tides in the area. The mean range of tide in the region is 18 feet, with a tidal range from 11-26 feet being common, and 28 feet under extraordinary circumstances. The shoreline quickly disappears into deep water very close to the shore at high tide. At low tide there is a considerable expanse of exposed sand and mud intermixed with a substantially rocky shoreline containing shoals and land points that jut out into the waterway. The waterway is dotted with large and small islands. The largest islands are located in Canadian waters and inhabited with year-round residents. The intended LNG carrier route skirts the shoreline of the three Fundy Isles - Deer Island, Campobello Island, and Grand Manan Island.

There are no known physical hazards, such as shipwrecks, reefs, shoals, etc., in this area. In addition, there are no man-made obstructions such as bridges, dams, or locks along the intended waterway. The only major chokepoint measures approximately 1,000 yards wide and is located between Dog Island and Deer Island Point. This area is subject to whirlpools on the ebb and flood tides where currents from Western Passage and Passamaquoddy Bay converge. Of interest, the so-named “Old Sow” whirlpool has garnered significant interest as a tourist attraction and has been blamed for small recreational vessels losing control when unknowingly caught in its vortex. Due to the extreme and divergent currents in this area, pilots favor the Maine coast off Dog Island when making this bend and primarily move ships only during periods of slack tide. Transit times are planned to ensure vessels pass through this area as close to slack water as possible. The second narrowest point between land masses occurs in Canadian waters, within Head Harbor Passage between Casco Bay Island and Head Harbor, and measures approximately 1,200 yards in width.

2.2 Transit Route Overview

The proposed Downeast LNG facility is to be constructed on the down slope of Mill Cove on the west side of the mouth of the St. Croix River. An LNG carrier’s transit from sea to the Downeast LNG terminal would follow a circuitous route through Canadian waters. This is virtually the same route as currently used by all deep-draft vessels servicing the Passamaquoddy Bay port area. Deep-draft vessels bound for the ports of Bayside, New Brunswick, or Eastport, ME, either enter the area via the Gulf of Maine and into Grand Manan Channel, or by transiting Grand Manan Basin into the Bay of Fundy.

A major issue of concern and routing factor for mariners is the protection of the North Atlantic Right Whale, which is known to aggregate in large numbers to the east of Grand Manan Island near the Roseway Basin off the coast of Nova Scotia. The North Atlantic right whale has been listed as “endangered” under the Endangered Species Act since 1973. Consequently, the right whale has been the subject of major concern throughout

the WSA-review process. The potential increase in vessel traffic, especially if other regional LNG facility proposals come to fruition, could result in increases in vessel strikes of whales. Additionally, potential vessel traffic increases could also raise the risk for a significant pollution incident that could result in habitat degradation. The plight of the right whale is obviously a trans-boundary issue. The topic is of significant research interest by both nations in that the Bay of Fundy and Gulf of Maine are both critical habitat for the right whale and represent the whale's primary foraging ground. In addition, the east-west ship traffic to port(s) bisects the north-south movements of reproducing female whales that congregate in this area. Therefore, protecting whales against ship strikes and other interference is a critical environmental management issue.

In July of 2003, the routing scheme through the Bay of Fundy was modified to reduce the likelihood of mortality or serious injury to these marine mammals as a result of ship collisions. Specifically, the northern segment of the shipping lanes was moved eastward approximately four miles at the maximum point and a designated turn-out lane for ships turning west towards Eastport, ME, was established. It was determined that this approach would be at least 80% effective in reducing strikes and yet afford safe and economical commercial marine operations.

While no mandatory deep draft vessel routing is currently prescribed for the proposed transit area, Downeast LNG proposes that LNG carriers en route to their Mill Cove terminal enter the area via the Grand Manan Channel only, thereby:

(1) avoiding the designated right whale conservation zones altogether, and

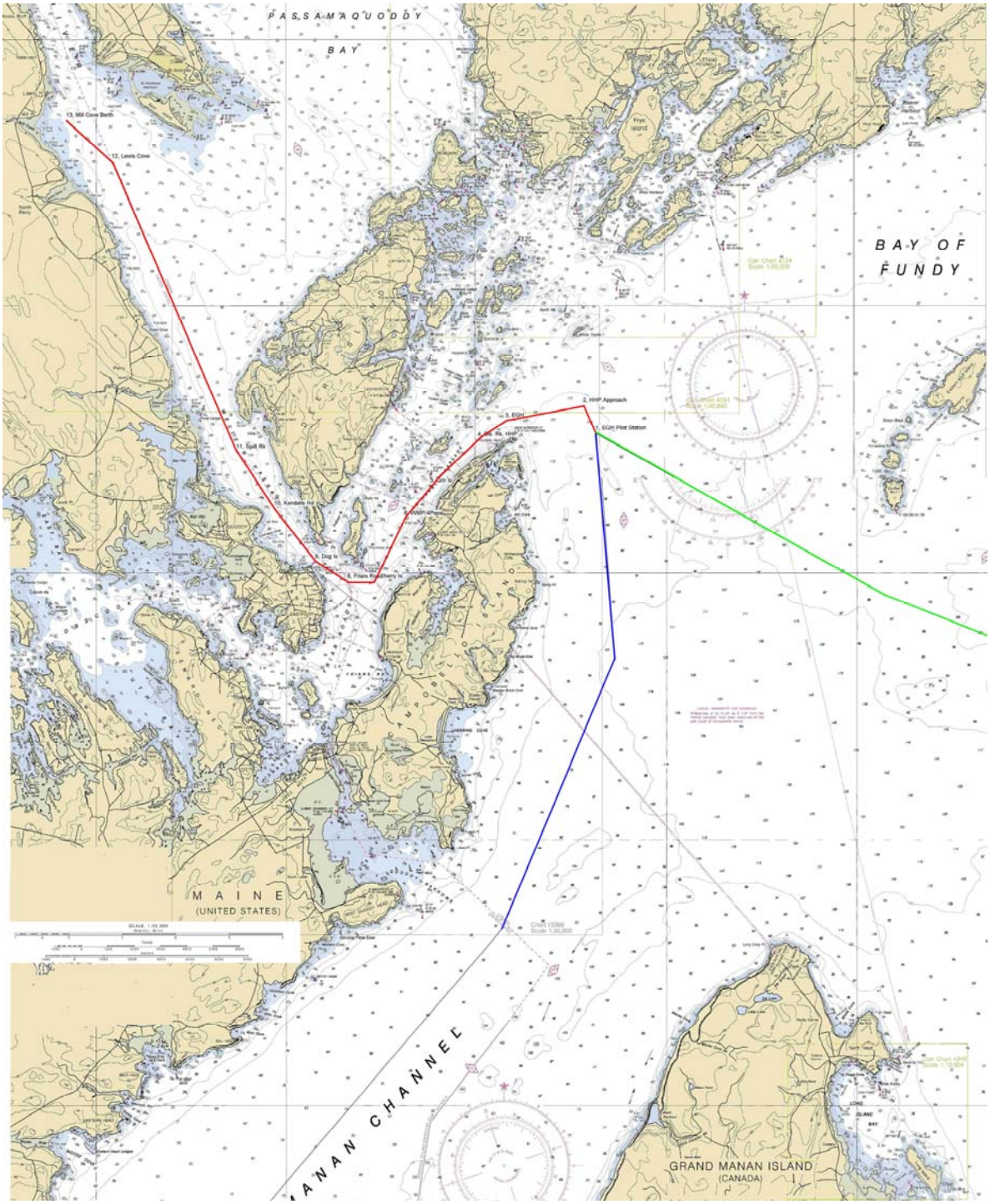
(2) providing a potential site for a USCG boarding in U.S. waters south of Quoddy Narrows in the vicinity of West Quoddy Head.

Figure 3 depicts the proposed route. Specifically, LNG vessels would approach the U.S. coast from the Atlantic Ocean to a point about five miles southeast of Cutler, ME, and ten miles northwest of the southern end of Grand Manan Island. From this point the ship would turn northeast and roughly parallel the coast of Maine between Cutler, ME, and Quoddy Head State Park at a distance of about two to three miles. Along this same segment, the ship's route would also parallel the northwest coast of Grand Manan Island at a distance of five to nine miles. The ship would continue on its northeasterly course into Canadian waters, roughly paralleling the east and northeast coasts of Campobello Island, New Brunswick, to the entrance of Head Harbor Passage.

The ship's transit would then enter Head Harbor Passage where it would pass Campobello Island along the island's north shore, to Friar Roads south of Indian Island and Cherry Isle, into U.S. waters as it neared Eastport, ME. It would pass along that city's eastern shore, up Western Passage, passing Quoddy, ME, to the west and Deer Island, New Brunswick to the east. The ship's transit would continue north through Western Passage along the international boundary between Canada and the United States, keeping Deer Island to the right and the Maine coast on the left until turning northwesterly back into U.S. waters opposite Lewis Cove to reach the intended project site near the mouth of the St. Croix River. A typical transit, from the time an LNG

carrier would enter Head Harbor Passage to the time it reaches the proposed Downeast LNG Terminal, would take approximately two and one half to three and one half hours.

Figure 3 - Proposed Route



2.3 Transit Route Alternatives

As discussed above, vessels bound for the Passamaquoddy Bay port area can take one of two routes; effectively transit Grand Manan Channel to the west of Grand Manan Island, or enter the traffic lanes in the Grand Manan basin and follow the traffic scheme on the easterly side of Grand Manan Island towards the port of St. John, New Brunswick, turning west at the established turn-out sector discussed above. Both routes converge offshore in the general vicinity of the entrance to Head Harbor Passage, north-northeast of Campobello Island. For the purposes of the Waterway Suitability Assessment (WSA) process, the transit starting point for the westerly route was deemed West Quoddy Head and for the north-easterly route the center of the designated Eastport turn-out lane in the St. John Fairway, at 66 degrees 12 minutes North latitude, by 44 degrees 47.5 minutes West longitude.

The only other entrance to the Passamaquoddy Bay port area, aside from Head Harbor Passage, is the Quoddy Narrows located between Lubec, ME, and the southern tip of Campobello Island. This passage, which is bisected by the international boundary along its course, has very strong currents and a relatively shallow depth (28 feet mid channel) making it impassable by deep-draft vessels. Moreover, in 1962 the Franklin D. Roosevelt Memorial Highway Bridge, an essential link connecting Campobello Island to the mainland and having a documented vertical fixed span of 47 feet, was built over the Lubec Narrows (10 feet at mid channel), further restricting the size of ship traffic.

As discussed previously, Downeast LNG has proposed that all prospective LNG carriers serving its facility enter the system via the Grand Manan Channel, which is relatively free of shoals and would be the most direct passage for those bound for the Bay of Fundy from the Gulf of Maine. The Company states that this would serve to avoid the right-whale-conservation area altogether and better situate the vessel for USCG safety and security boardings while still in U.S. waters.

2.4 Port Area Characterization

2.4.1 Maritime Commerce

The major commercial ports in the area are Eastport, ME, on the U.S. side, and Bayside, New Brunswick, on the Canadian side of the waterway.

The port of Eastport is operated by the Eastport Port Authority. The Eastport Breakwater Terminal has berthing for a vessel up to 700 feet in length with approach depths being over 100 feet and the mean low water depth averaging 42 feet. The downtown Fish Pier berths two tug boats on the north side, and has slips for transient boats on the south side. The Breakwater Terminal is also used by the aquaculture industry, commercial fishermen, and recreational boaters. Also located in Eastport is the Estes Head Cargo Terminal, which can accommodate a ship of 900 feet in length in Berth A and one up to

550 feet in Berth B. The 43 acre terminal contains several large warehouses and open storage areas. Office space for the Federal Marine Terminals is located just above the Estes Head Pier.

The Bayside Port Corporation in New Brunswick, Canada, is located south of the St. Croix River across from Calais, Maine. The facility has three berths with lengths of 330, 264, and 462 feet, and corresponding depths of 26.7, 21.5, and 32 feet, respectively. The approach channel has a depth of 70 feet, and the terminal is affixed with a ship loader used for quarried aggregate material. The terminal's main source of traffic consists of gypsum, potatoes, and sensitive cold food storage. A review of waterborne commodities being delivered to, and/or shipped from, the regional Passamaquoddy Bay ports was conducted. It was determined that:

- No bulk petroleum products are actually transported by vessel or barge through the Passamaquoddy Bay area; however, crude oil traffic traverses the Bay of Fundy itself in order to reach the port of St. John, New Brunswick.

- Ammonium nitrate, shipped in bags as low-grade agriculture fertilizer in support of potato farming in Maine and New Brunswick, has been transported by vessel to Bayside, New Brunswick, on the average of 1-3 times in any given year. The non-regular commodity is offloaded from vessels and transferred directly into awaiting trucks for immediate over-the-road delivery.

- No bulk chemical carriers call on either Eastport or Bayside.

There was some conjecture that dynamite was being routinely shipped by vessel to the port of Bayside in support of regional construction, mining, and quarry/aggregate operations. No documentary evidence was discovered that sustained this speculation, and the Bayside Port Corporation reported that there had been no dynamite shipped through, or to, their port since it has been in operation.

2.4.2 Port Level Impacts

Commerce in the area consists almost entirely of aquaculture, farming, ecotourism, and commercial fishing. Some of those who commented during this review process described commercial fishing and fisheries, occurring on both sides of the international border, as the "economic engine" of the region. Aquaculture and fishing related industries reportedly employ over 6,000 persons in Charlotte County, New Brunswick, and Washington County, ME.

The area also supports a good deal of lobster fishing, fish weirs, and aquaculture. Due to the strong currents, commercial fishing within the channel is relatively light. Most of the lobster fishing is conducted in the Grand Manan Channel and along the coast south of Lubec Narrows. Aquaculture has been a mainstay industry in the area, with salmon being the principal fish grown and harvested. Research is ongoing regarding the potential of cod farming as well. The state-controlled leases for these facilities are generally along the waterway in shallower water than that transited by deep-draft vessels. Reportedly, on

any given day there are approximately twenty small commercial draggers and lobster boats working in the inlets and coves. The regional pilots have estimated that about twenty fishing vessels operate out of the U.S. side, and fifteen to twenty from the Canadian side seasonally, but not necessarily all at the same time.

Primarily, the fish catch is lobster and herring, with limited amounts of scallops and other species. There are some shellfish (soft-shell clam) nurseries along the transit route; however, these areas are well inshore where manual harvesting of the clams is accomplished using hand rakes. The shorelines along most of Head Harbor Passage, Friar Roads, and Western Passage are steep and rocky, offering little habitat for the soft-shelled clam. The majority of the remaining area that would provide the necessary habitat is adversely affected by the "red tide," a "bloom" of damaging marine microorganisms; only a few of the coves/mud flats are actually open to shellfish harvesting. Scallops are harvested commercially by draggers, primarily in Cobscook Bay and South Bay, which are south and west of the transit route and proposed facility site. Due in large part to the strong tidal currents, the bulk of lobsters landed is caught along, and offshore, the outer Maine coast. Few traps are actually set inside Cobscook Bay, Western Passage, or Passamaquoddy Bay; the extreme currents make it difficult for fishermen to set and haul them. Although not formally documented, local fishermen contend that Mill Cove (the proposed Downeast LNG site) is a rich breeding, hatching, and nursery ground for lobsters, and that any major disturbance to the underwater bottom in connection with the proposed project trestle construction could significantly impact future lobster catches.

Members of the Fundy North Fishermen's Association, Cobscook Bay Fishermen's Association, Grand Manan Fishermen's Association, and others expressed anxiety about increased deep-draft vessel traffic, and more specifically LNG carriers, adversely affecting their industry. There was considerable apprehension that USCG established safety and/or security zones would adversely hamper their ability to freely fish and move about during LNG carrier transits, with the assumption being that the entire waterway would be closed to boaters. As denoted in Section 3, the USCG anticipates setting and enforcing safety/security zones in U.S. waters during carrier transits to ensure the safety of the surrounding communities, the boating public, and the carrier itself. However, there are specific boundary parameters applied to any such zones, and in most cases there will be ample room for boaters to still freely navigate the waterway along the outer periphery of the channel and ahead and astern of any LNG carrier present. As well, the zones will move with the vessel, with the average time for the zone to pass any given point corresponding to approximately eighteen minutes. While the zones could cause slight delays and/or interferences, proper voyage planning and attention to advance Broadcasts to Mariners should help alleviate potential impositions and conflicts.

The land and islands along the transit route and in the vicinity of the proposed facility site are relatively remote, rural, and sparsely-populated, especially during the wintertime. During the late spring, summer, and early fall seasons, however, the population density swells. Tourism along the entire Maine coast also increases significantly at that time, and contributes greatly to the regional economy. The tourism industry in the area is estimated at $300-400 million, with much of the attraction to the area centered on its natural beauty,

fish, whales, and other wildlife. Although the "down east corridor" does not presently experience the same tourist "pull" in comparison to communities further south in Maine, the region, nonetheless, depends on eco-tourism dollars to supplement its fishing, lobstering, agricultural, and wood harvesting industries. In addition, the City of Eastport and other municipalities along the regional shoreline are exploring a number of tourist-related ventures to increase local employment opportunities in the future.

St. Andrews, New Brunswick, a Canadian resort community located on the western shore of the St. Croix River geographically opposite of the proposed Downeast LNG site, relies almost exclusively on eco-tourism for its economic well-being. Other attractions and sources of eco-tourism related income include kayaking, recreational fishing, canoeing, and sightseeing by boat, including whale-watching.

As identified by USCG records and confirmed during a Ports and Waterways Safety Assessment (PAWSA), the number of maritime-related events that could potentially impact or impede deep draft vessel traffic flow for the region is relatively small. Historically, Fourth of July festivities in Eastport involve recreational boating events and usually include a U.S. Navy vessel port visit. A "Sailabration Parade," sponsored by the Save the Bay organization, also transits Head Harbor Passage during that festival. There are other annual events and festivals held in the immediate port area which attract a number of visitors, but do not significantly affect boating traffic. These include the Memorial Day weekend Down East Spring Bird Watching Festival, Fourth of July Old Home Week, Maine Salmon Festival in September, and the Eastport Festival of Lights held in December.

The entire Passamaquoddy Bay area is characterized by its pristine environment, many natural attractions, and abundant wildlife. The waters of the Bay of Fundy leading up the existing facilities and proposed Downeast terminal are known habitats for whales and other marine mammals, including, as discussed above, the North Atlantic right whale. Whale-watching is a major tourist attraction in the area, particularly for tours out of St. Andrews, New Brunswick. Consequently, significant efforts have been undertaken, including the shifting of the traffic scheme in the vicinity of Grand Manan Island, to protect this endangered species' breeding and feeding grounds. Other whales, such as minke, finback, and humpback, are also common. In addition, porpoises, seals, bald eagles, osprey, ducks, and many types of sea birds make their home in the waters of Head Harbor Passage and Friar Roads.

Obviously, a major concern to the regional boaters and residents in the area is the heightened risk of a maritime accident due to the potentially three-fold (pending multiple LNG proposals) increase in deep-draft vessel traffic along the transit route. Although a significant number of whale-watching and sight seeing tour boats operate out of the St. Andrew vicinity, they normally transit Letite Passage in order to get to the Bay of Fundy whale viewing and wildlife habitat areas. This effectively reduces the vessel traffic in Western Passage and Head Harbor Passage and would minimize any conflicts.

2.4.3 Iconic Value

The Roosevelt Campobello International Park is located on the southern end of Campobello Island, which directly abuts Head Harbor Passage and Friar Roads. The Park and its Commission were established in 1964 by a treaty between the U.S. and Canada as a symbol of friendship. As a result, the Park holds iconic value for both U.S. and Canadian citizens alike. One of the Park's main attractions is the historic summer home of President Franklin D. Roosevelt, which receives approximately 150,000 visitors annually. The Park is well known for its unspoiled natural beauty and offers spectacular, unbroken views of rugged coastline, estuarine bays, and the open ocean. Tourism dollars have a significant and positive ripple-effect on the economic health of the area.

The Roosevelt Campobello International Park Commissioners have voiced grave concern regarding the proposed development of the Downeast LNG terminal and resultant tanker traffic, citing safety and security concerns due to its extreme closeness to the transit route. They fear that a large-scale movement of LNG cargo in an area unsuited to such traffic poses an unacceptable risk. A release of fuel oil, lube oil, or LNG product as a result of an accidental grounding or intentional act of terrorism would result in unacceptable ecological harm to the unique environment and present an even greater health hazard to the surrounding population.

Some persons who commented on this proposal opined that an accidental or intentional release of LNG would not only be catastrophic to the Park and Island, but would be devastatingly compounded by the absence of trained personnel and proper response equipment needed to effectively combat a fire of such magnitude and proportion due to the remoteness of the area. In general, the law enforcement, public safety, and emergency response assets and capabilities in the U.S. and Canada are in keeping with the rural nature of the area – minimally staffed, minimally equipped and trained, and limited in their ability to expand due to their small tax base.

2.5 Areas of Environmental Significance

The Passamaquoddy Bay port area is characterized by its pristine environment, natural attractions and abundant wildlife. The Bay of Fundy, Passamaquoddy Bay, and Cobscook Bay (and all approaches) are areas of unusual biodiversity and are home to a number of species listed as endangered, threatened, or of special concern. A number of marine research and biological studies have been conducted by such institutions as Canada's Department of Fisheries and Oceans (DFO) and the New England Aquarium, with focus on protecting and preserving endangered aquatic life, and integrated marine management strategies within and for the Bay of Fundy, Passamaquoddy Bay, and Cobscook Bay, including adjacent estuaries. Subjects of study included the aquaculture industry, commercial fisheries and hatcheries, protection of seabirds, marine mammals and exploited species, among others. Collectively, the area has been reported as being the most diverse aquatic ecosystem on the eastern seaboard of North America.

The National Environmental Policy Act (NEPA) review process is designed to evaluate each project independently and ensure any and all potential impacts to the environment

have been carefully considered. The assessment includes an analysis of potential pollutants and the ability to reduce or eliminate such pollution.

Part and parcel to the NEPA assessment is the individual state permitting/application review process. Project applicants must demonstrate compliance with applicable federal and state laws and regulations regarding environmental protection to receive the necessary approvals needed to construct their respective project. Detailed information and data concerning environmentally sensitive areas, endangered species, wildlife refuges, estuaries, aquaculture, and general areas of environmental significance, which could be impacted in one way or another by the Downeast LNG project, are contained in Resource Report 3, filed with FERC.

The following is a sampling of some of the area's ecological and environmental concerns, followed by a "snapshot" of regional resource centers, sensitive sites, estuaries and refuges. It should be noted that not all identified environmentally-significant areas would be directly impacted by the Downeast LNG proposal due to their geographical location and/or distance; however, these sites are considered "common" to the region and often referred to collectively.

The waters of the Bay of Fundy leading up to the existing regional facilities and proposed LNG terminals are known habitats for whales, including the North Atlantic right whale, which is a federally endangered species. Along the entire Eastern seaboard, significant efforts are being taken to protect this marine mammal. Canada, through its Fisheries and Oceans Department, created two Right Whale Conservation Zones in the area. Zone 1, where right whales have been most frequently observed, includes Grand Manan Basin within the Bay of Fundy, and Zone 2 includes the Roseway Basin, located between Browns and Baccaro Banks on the southern Scotia shelf. Ships are asked to avoid this area, if possible. If they do transit the area, they are required to decrease speed without sacrificing maneuverability, post lookouts, avoid maneuvering around marine mammal activity, and report any marine mammal sightings or collisions with same.

Other whales such as minke, finback, and humpback are common to the waters of Head Harbor Passage and Friar Roads, as well as porpoises and seals. Bald eagles, Peregrine Falcons, Osprey, ducks, and a variety of sea birds, such as the Atlantic Puffin and Common Tern, make their home along the bay and waterway as well.

According to the referenced research studies, open ocean aquaculture must avoid areas of known deep draft vessel traffic and anchorages in order to be successful. For that reason, the safety of other craft, and the protection of the right whale, designated traffic lanes now exist for large ships traveling between the southeastern entrance to the Bay of Fundy and the port of St. John, New Brunswick. These sea lanes are used by approximately 840 vessels annually, most of them petroleum tankers bound for, or departing, St. John.

Environmentally sensitive areas include:

- The U.S. St. Croix Island is a designated heritage site. Access to the island is by boat only, from either the U.S. or Canadian shores of the St. Croix River.

- The Huntsman Marine Science Center is located adjacent to the DFO Biological Station in Brandy Cove, St. Andrews, New Brunswick. The Center houses an aquarium and is in the process of expanding to the shorefront to further encourage tourism and public access to the waterfront.

- Within Canadian boundaries, other environmentally sensitive areas include the coasts of Grand Manan Island and Deer Island (Clark Gregory Preserve and the Robert Stewart Preserve), and the West Isles area. As well, Campobello Island, with its coastline along the Bay of Fundy, houses numerous environmentally sensitive areas including the Roosevelt International Park.

- Other significant areas include the St. Croix Estuary, located along the coastal region of Charlotte and neighboring areas surrounding St. Andrews, and the Cobscook Bay region – a unique ecosystem and estuary of significance renowned for its eagle habitat.

- The Moosehorn National Wildlife Refuge, located immediately south of Calais, ME, consists of two divisions: the Baring Division, which covers 20,016 acres and is located southeast of Calais; and the Edmunds Division, which is comprised of 8,735 acres and borders the tidal waters of Cobscook Bay. The Refuge was established in 1937 and is first in the chain of migratory refuges extending from Maine to Florida.

3.0 Safety and Security Assessment

Downeast LNG contracted Det Norske Veritas, (USA), Inc. (DNV), to conduct the Follow-On Waterway Suitability Assessment, in accordance with the guidance contained in NVIC 05-05 on its behalf. A *Preliminary WSA*, providing the outline of the proposed project and projected impacts to the port community, had been prepared by TRC Security LP (TRC). The safety assessment evaluated the risks of an *accidental* release of LNG consequent to such incidents as collisions, allisions, and groundings. Potential problems that could lead to an accidental release were considered and the likelihood and consequences of those events evaluated. The consequence analysis evaluation was based on accidental release scenarios as outlined in the Sandia National Laboratories Report SAND2004-6258 (Sandia Report), a study commissioned by the Department of Energy (DOE), entitled *Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water*, dated December 2004. The corresponding Zones of Concern parameters related to an accidental release of LNG, as determined by DNV in conjunction with the Sandia Report, are depicted in Figures 6 through 10. The security assessment evaluated the risks of *intentional* releases of LNG and explored threat, vulnerability, and consequence. The probability of an incident was evaluated in terms of threat and vulnerability, where threat was considered as the likelihood of an attack and vulnerability being the likelihood that such an attack could succeed. As was done with the safety risk assessment, potential consequences relating to an intentional release of LNG were considered based on release scenarios outlined in the Sandia Report. The corresponding Zones of Concern for an intentional release are shown in Figures 11

through 15. This Report also contains a discussion of strategies aimed at managing the potential risks associated with the proposed project.

3.1 Ports and Waterways Safety Assessment

A Ports and Waterways Safety Assessment (PAWSA), conducted in October 2006, provided a baseline for analyses of navigational safety concerns for the Passamaquoddy Bay port area. The PAWSA is a systematic assessment process designed to identify major waterway safety hazards, estimate risk levels, and evaluate potential measures to reduce risk.

Participation in the PAWSA was through invitation and was designed to include a broad cross-section of waterway users, port stakeholders, and maritime professionals. Participants included representatives of the marine industry, pilots, tug operators, passenger/ferry operators, commercial fishing and aquaculture industry, environmental groups, state and local officials, local and regional law enforcement, and federal and provincial governments. Canadian government officials, members of the LNG industry, and concerned citizens' groups were on hand to observe the process.

The PAWSA covered existing navigation concerns for the Passamaquoddy Bay port area; including those anticipated should the proposed Downeast LNG terminal be approved. In consideration of an alternate LNG proposal, the potential for cumulative impacts relative to other LNG terminals that may be operating simultaneously was factored into the assessment process as well. As a baseline, the participants informally defined the geographic bounds of the waterway area under consideration as the contiguous waters of Passamaquoddy Bay and its tributaries, from the International Bridge at Calais, ME, seaward to the eastern shore of Campobello Island and West Quoddy Head, encompassing both the U.S. and Canadian waters, and including Head Harbor Passage.

The participants examined all risk factors along the waterway, including those presumptive risks associated with the proposed LNG traffic. Participants then cross-checked the identified risks against mitigation measures and practices that are currently in place. Further discussion of identified risk areas and potential mitigation factors for the port area are contained in the PAWSA. The PAWSA results are being used as part of the USCG's continued assessment of related waterway safety issues associated with this LNG proposal. A copy of the PAWSA Report is contained in Appendix B.

3.2 Thermal Radiation Analysis

An important consideration in assessing the suitability of the proposed transit route and its approaches to support LNG traffic along the intended transit route, as well as the suitability of the proposed terminal site, is establishing the size of the hazard zones, or Zones of Concern associated with a large release of LNG. The criteria used by Sandia National Labs to define the outer limits of the three hazard zones discussed in their report, (SAND2004-6285), "*Guidance on Risk Analysis and Safety Implications of a*

Large Liquefied Natural Gas (LNG) Spill Over Water", were used/applied in assessing potential risks associated with the proposed Downeast LNG project.

The criterion used to define the outer limits of Zone 1 and Zone 2 is incident heat flux, i.e., thermal radiation that would be expected from an intense LNG vapor fire over a specified time. Within Zone 1, the thermal radiation can cause serious injuries and/or significant damage to structures. Within Zone 2, thermal radiation can cause injuries or some damage to structures. The outer limit of Zone 3 is defined based on the lower flammability limit of LNG vapor, i.e., the lowest concentration of fuel by volume mixed with air that is flammable. Within all three zones, the level of risk of injury or property damage is reduced as the distance from the source increases and the thermal radiation decreases, as indicated in Figure 4.

Figure 4 - Hazard Zone Criterion

Zone	Distance from Release (in meters)	Criteria (10 minute exposure time)	Consequence
Zone 1	0-500	37.5 kW/m^{2*}	High potential for major injuries or significant structural damage consequent a pool fire and/or vapor cloud
Zone 2	500-1600	5 kW/m^2	Potential for injuries and limited property damage consequent a pool fire and/or vapor cloud
Zone 3	1600-3500	Lower flammability limit (5%)	Reduced potential for injury or damage if appropriately clothed or protected consequent a vapor cloud only

Source: Extrapolated data from Sandia Report and NVIC 05-05
Notes: (1) Zone distance from spill based on an intentional release; the zone criteria for accidental spill scenarios is significantly less.
*(2) kW/m^2 = Kilowatts per square meter

Therefore, the most significant impacts to public safety and property exist within approximately 500 meters of an LNG spill/release, due to the thermal radiation hazards from fire, with lower public health and safety impacts at distances approaching 1600 meters and beyond.

3.2.1 Hazard Zone Characteristics and Considerations

The intensity and linear size of the three hazard zones calculated in the Sandia Report for accidental and intentional spills/releases of LNG were determined only after extensive modeling and testing. However, the potential for an LNG cargo tank breach, the dynamics and dispersion rates, and the resultant hazards of such a spill are only generally understood and, as such, are only postulated estimates at best. The combination of LNG vessel double hull design and current safety management practices throughout the marine transportation industry have reduced LNG accidents to a point where there is little historical or empirical information from which to arrive at finite conclusions. This lack of information forces assumptions to be made when the size, dispersion rate, and thermal

hazards of a spill are calculated. Therefore, it should be understood that a level of variability exists with the many current models and techniques being used to provide adequate guidance on the hazards of an LNG spill. Some of the variables that affect the modeling techniques, assumptions, and simplifications include: the size, mass, speed, and loaded condition of the carrier; size, mass, collision velocities, and angle of impact if collided with another vessel; amount of penetration and whether or not the inner hull and primary tank boundary was compromised; size and number of breaches; whether or not there were multiple, cascading tank failures; climatic conditions (wind velocity and sea state); and reference of the breach to the waterline.

The Sandia Report, published in December 2004 (SAND2004-6258), based its findings on the capacities of LNG carriers in operation at the time. The vessels studied had an average upper cargo carrying capacity of 148,000 cubic meters (m^3), with individual tank capacities of approximately 25,000 m^3 of LNG, depending on number and type of design. The emerging generation of LNG carriers has cargo carrying capacities of as much as 265,000 m^3. In May of 2008, Sandia National Labs published an additional report (SAND2008-3153), *"Breach and Safety Analysis of Spills Over Water from Large Liquefied Natural Gas Carriers"* which analyzed impact of LNG spills associated with breaches from the emerging larger class of LNG tankers. Overall, the results obtained from the more detailed analyses conducted and presented by Sandia were found to be similar to the previous conclusions, recommendations, and guidance presented in the 2004 Sandia LNG report concerning the general scale of hazards to the public and property from a large LNG spill over water and approaches to reduce those risks and consequences.

For the purposes of this Report, the hazard zones used to assess the possible impacts of potential LNG releases resulting from either navigation safety accidents or terrorist attacks against the proposed LNG carriers transiting the waters of the Passamaquoddy Bay port area and its approaches are based on the computations conducted by Sandia National Laboratories in their December 2004 Report. Based on the conclusions presented in the Sandia Report of May 2008, the sizes of the hazard zones applied in association with the Downeast LNG site are considered applicable to vessels up to a maximum of 265,000 m^3 cargo capacity.

Figure 5 - Downeast LNG Project Hazard Zones

	Zone 1 (37.5 kW/m^2)		**Zone 2 (5 kW/m^2)**		**Zone 3 (Lower Flammability Limit)**	
Intentional Breaches	500 m	546 yds	1600 m	1750 yds	3500 m	2.2 miles
Accidental Breaches	250 m	273 yds	700 m	765 yds	1700 m	1.06 miles

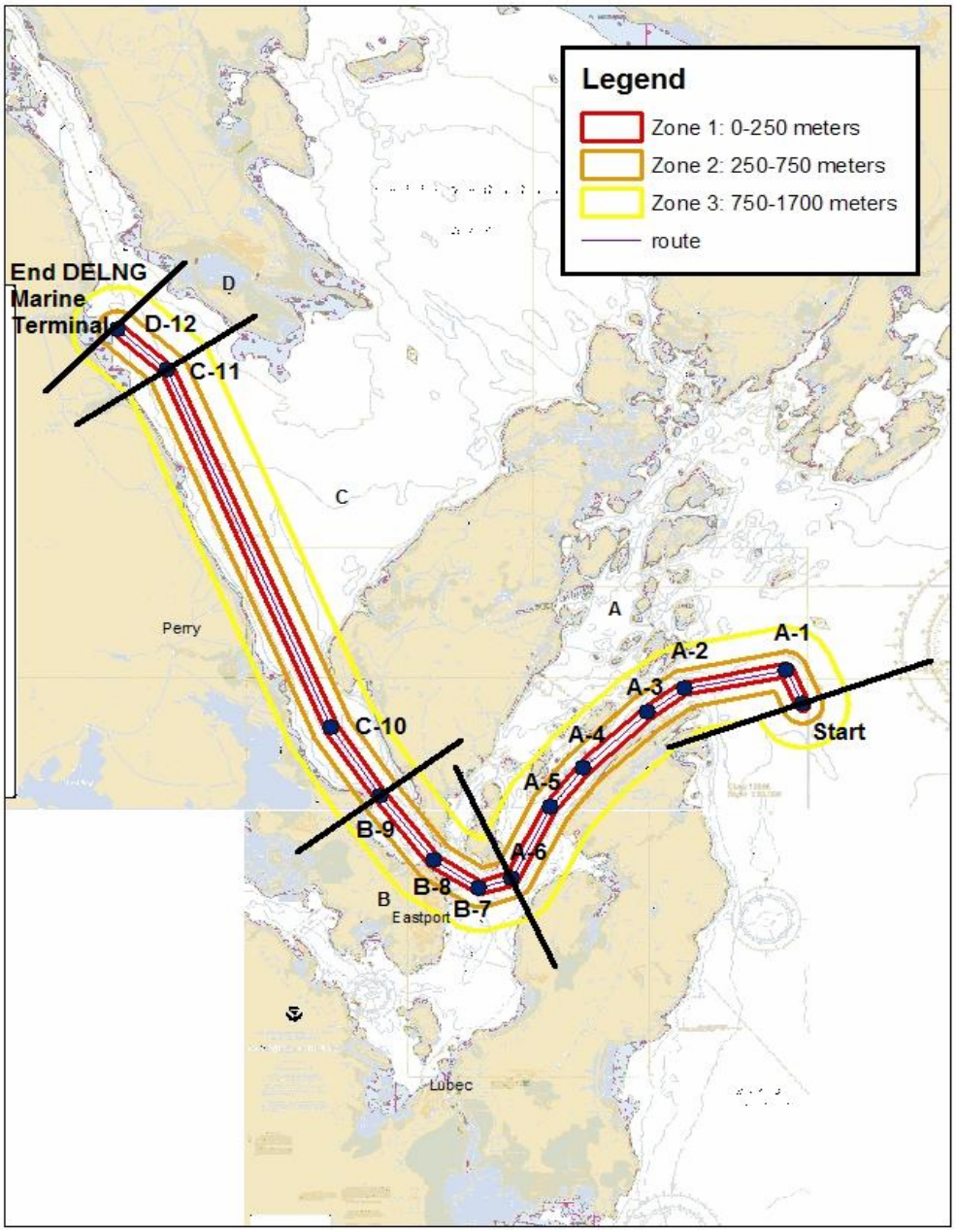
Ref: Sandia Report

As discussed in the December 2004 Sandia Report, Hazard Zone 3 is based on the simultaneous release of LNG from three tanks without being ignited. The size of the zone is established by calculating the distance the vapor cloud could travel before the lower flammability limit (LFL) is reached. Based on the modeling conducted, Sandia

National Laboratories established the size of Zone 3 to be 3,500 m from the source of the LNG release.

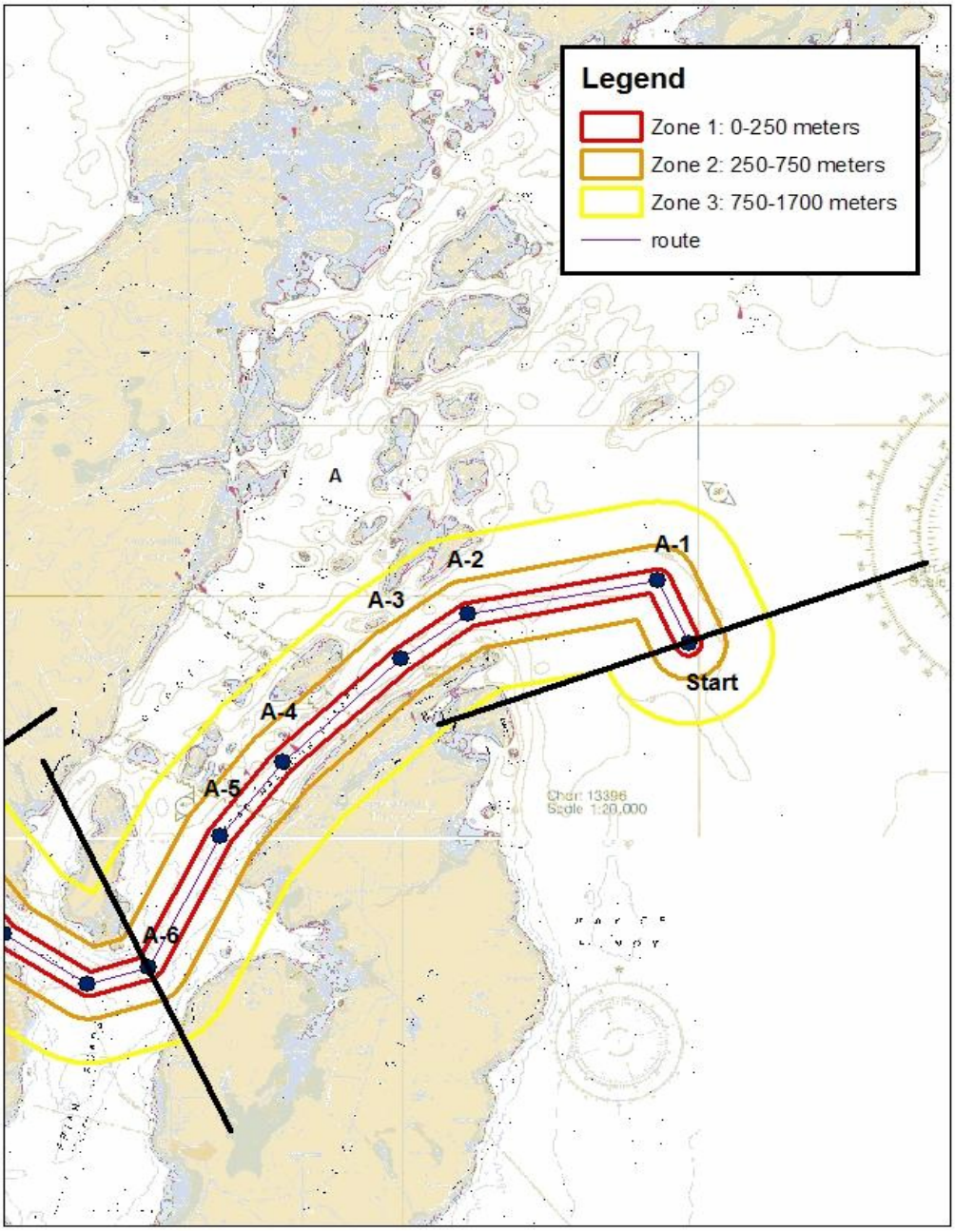
Figures 6-15 feature the projected zones of concern for LNG vessel traffic transiting from sea to the proposed Downeast facility site. Specifically, Figures 6-10 highlight the zones of concern through the proposed transit route based on an accidental cargo release. Figures 11-15 highlight the zones of concern through the proposed transit route based on an intentional cargo release.

Figure 6



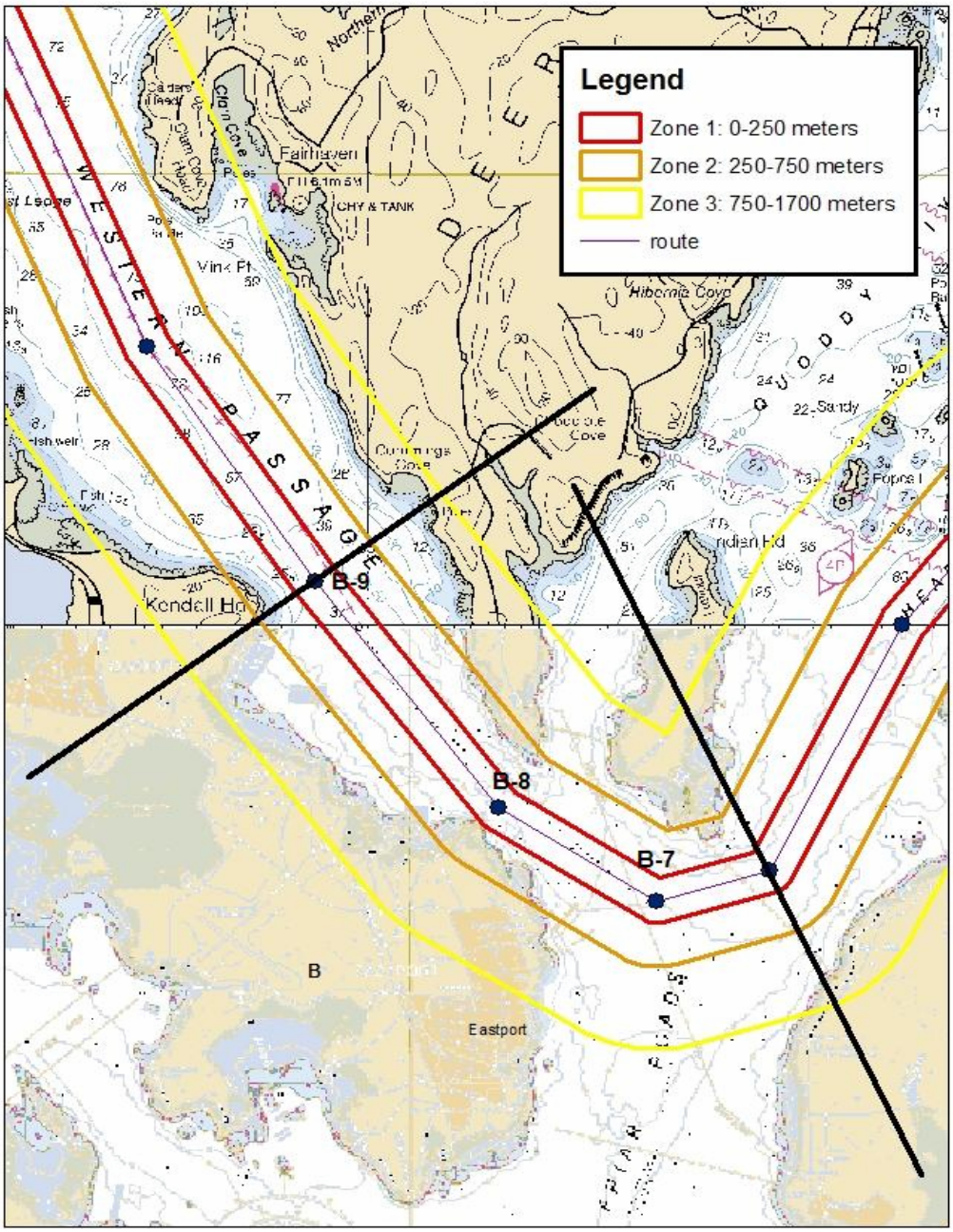
(Accidental Release)

Figure 7



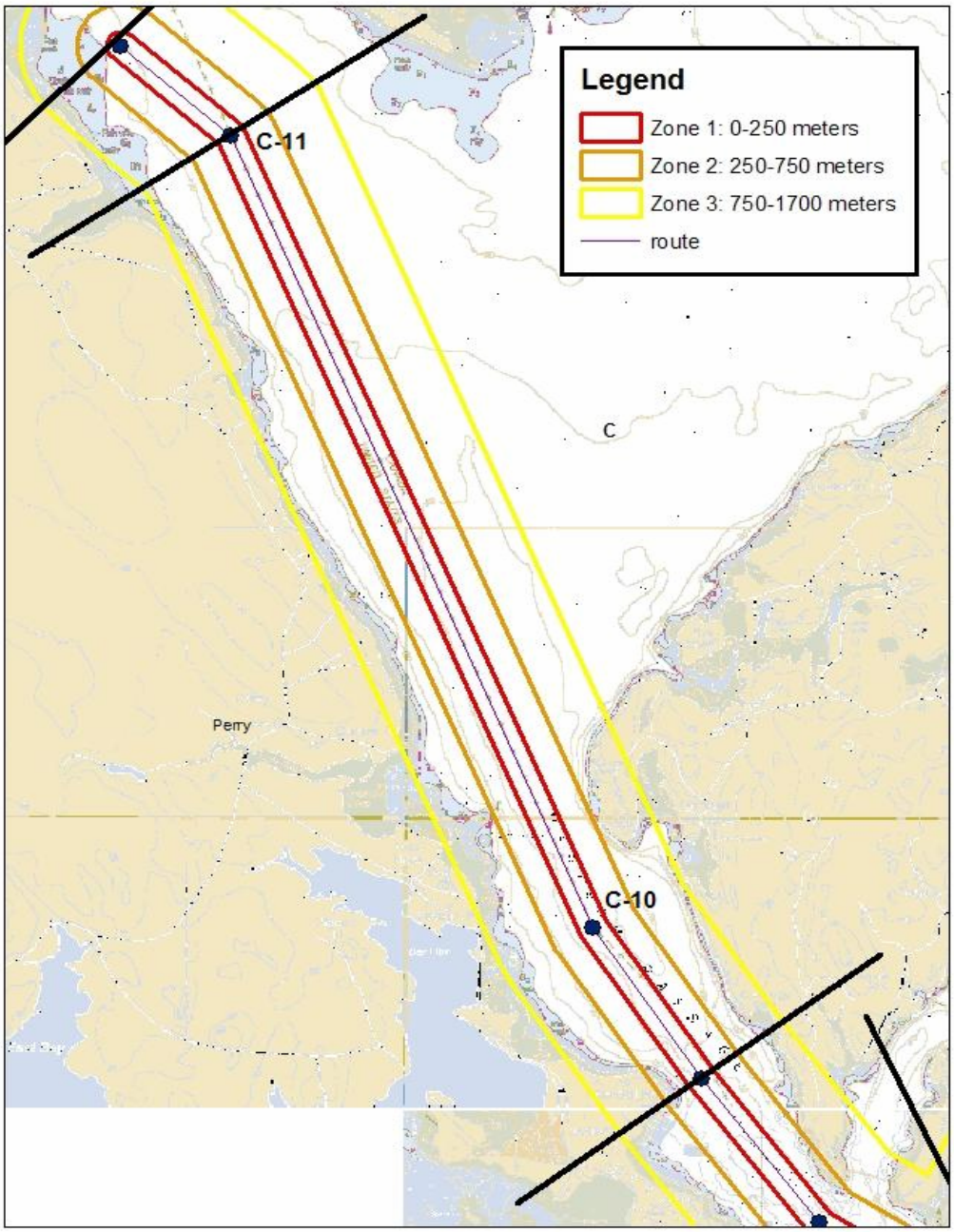
(Accidental Release)

Figure 8



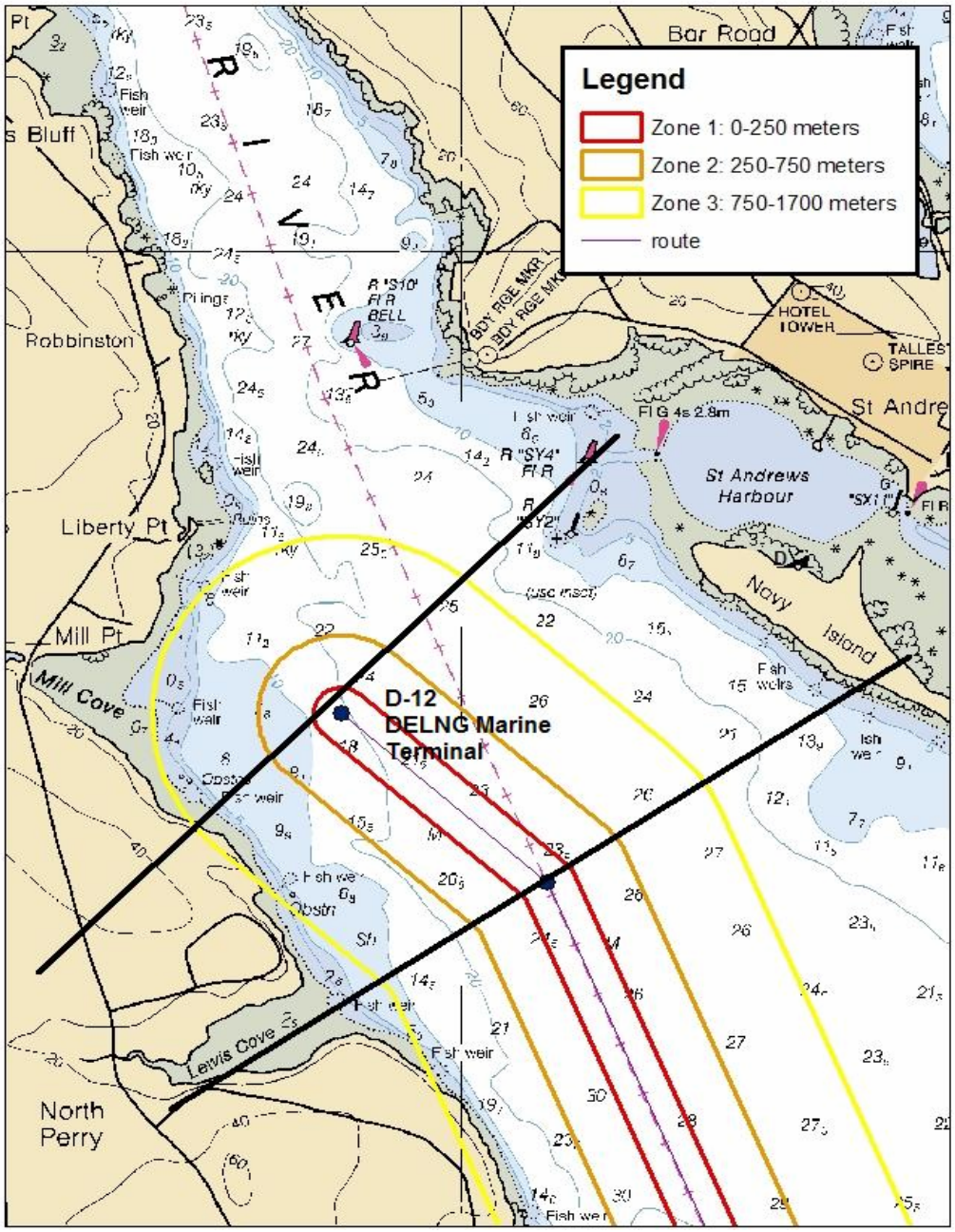
(Accidental Release)

Figure 9



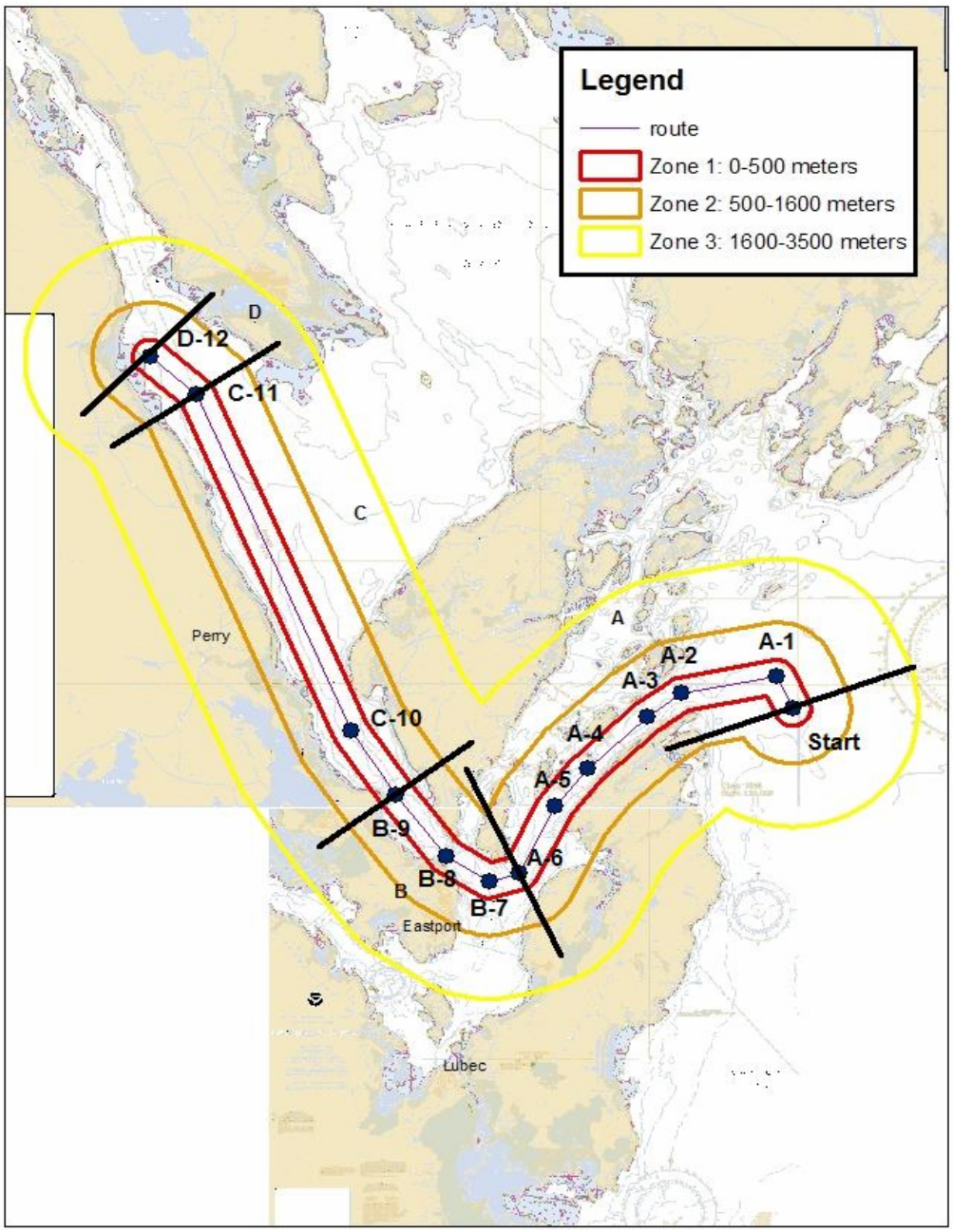
(Accidental Release)

Figure 10



(Accidental Release)

Figure 11



(Intentional Release)

Figure 12

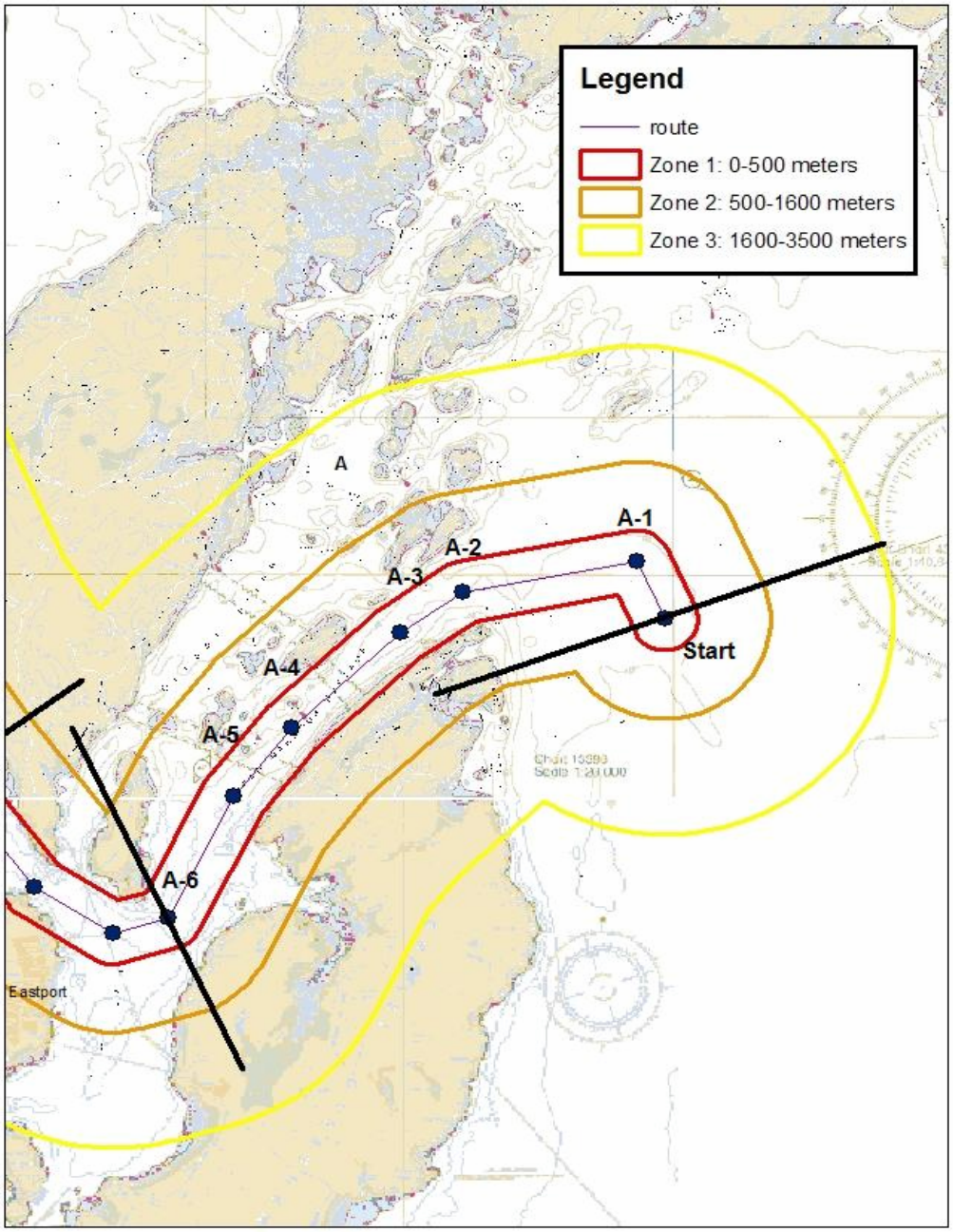


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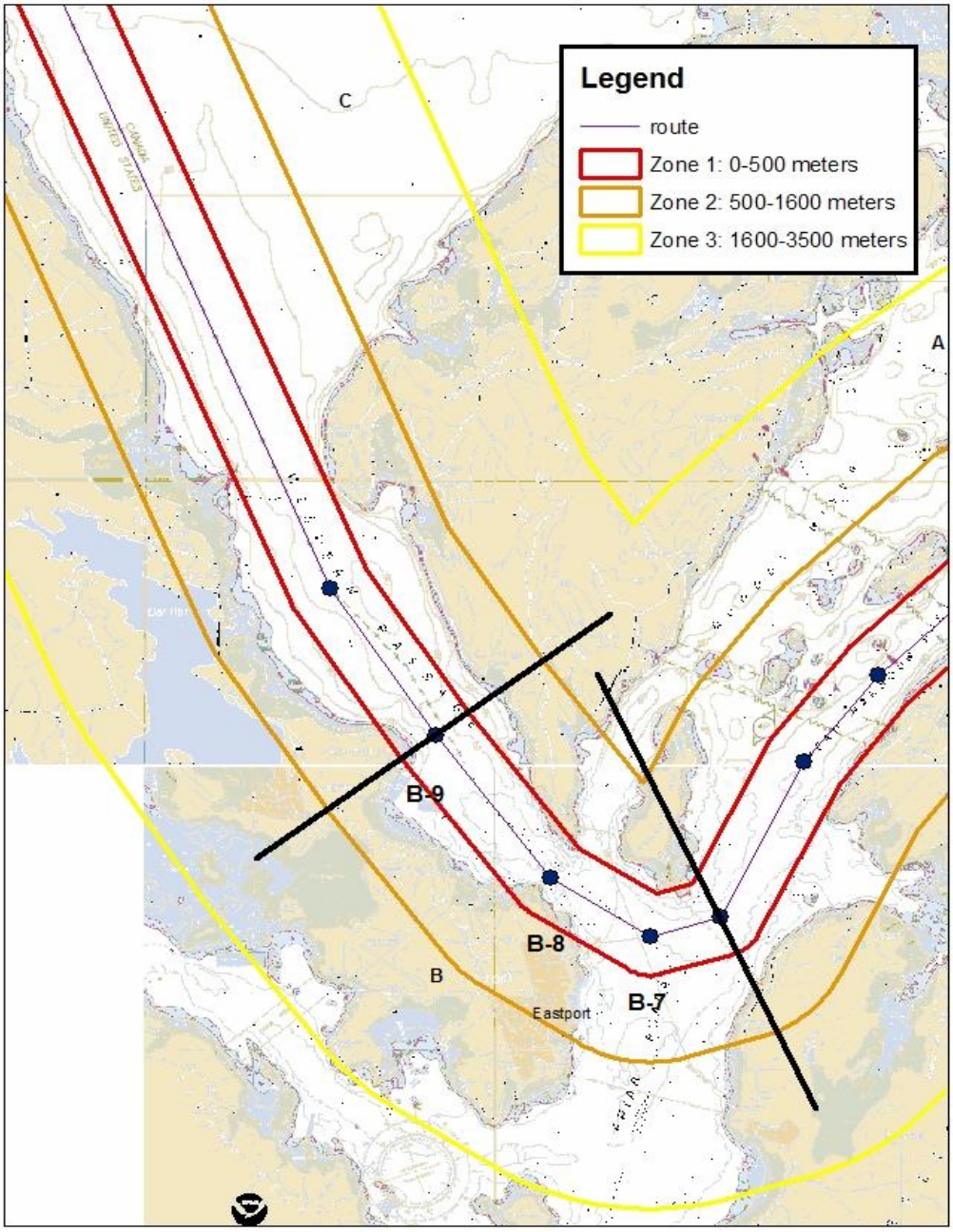
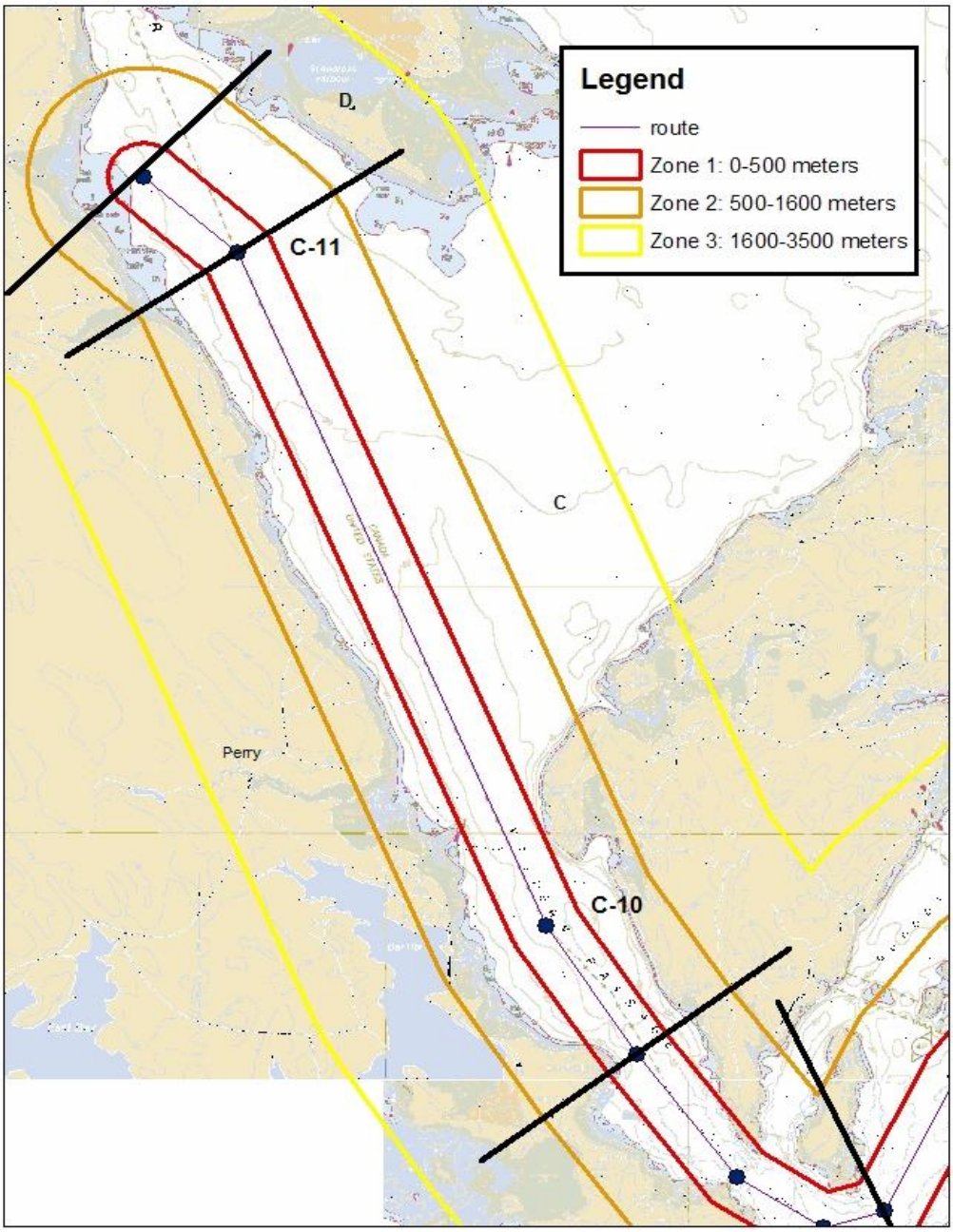
Figure 13



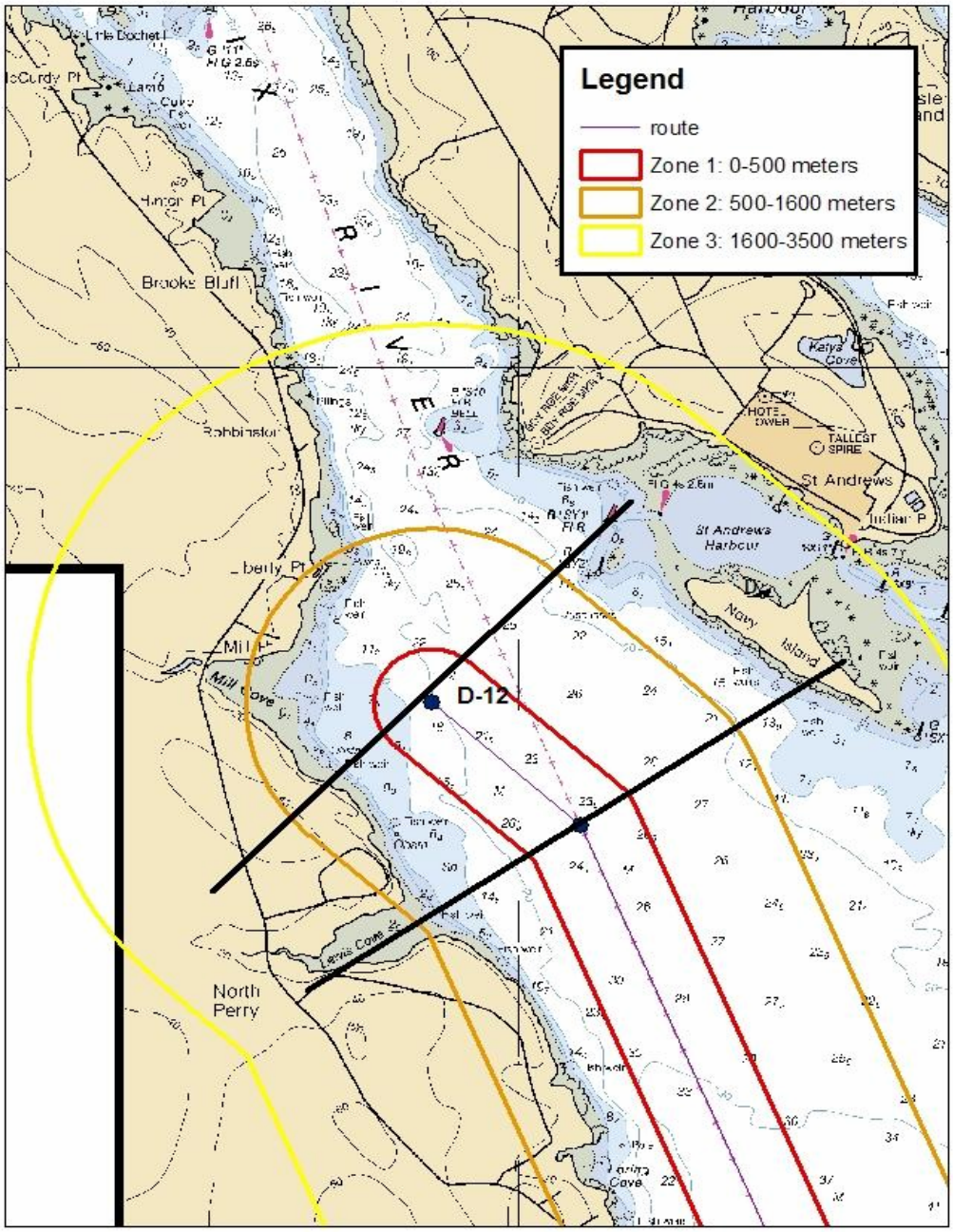
(Intentional Release)

Figure 14



(Intentional Release)

Figure 15



(Intentional Release)

3.2.2 Consequence-Zone Analysis

Consistent with the guidance contained in NVICs 05-05 and 05-08, the WSA submitted by Downeast LNG used the Sandia Report to describe the expected consequences of a large release of LNG from a carrier onto the water and into the surrounding atmosphere. The hazard zones, as discussed earlier, were applied along the intended carrier route to geographically depict where the zones may intersect with the population areas and major infrastructure elements in and adjacent to the transit waterway. As well, two different risk assessments, commensurate with the zones of concern, were conducted and incorporated into the Downeast WSA; one for accidental releases and one for intentional breaches.

3.2.3 Hazard-Zone Impacts

Preceding Figures 6-10 provide a graphic view of the hazard zones (accidental release) applied along the inland portion of the prospective LNG carrier's transit route. Preceding Figures 11-15 detail the same graphic depictions for an intentional release. [1]

Complementing the inland portion of the transit route, Figures 16 through 25 are provided to graphically depict the zones of concern for an intentional release along the LNG carrier approach route from sea. Of note, vessels may proceed up the Grand Manan Channel or take an alternate route via the port of St. John, New Brunswick. traffic separation zone, turning westerly at the turnout to Head Harbor Passage. Figure 16 shows a broad view of both possible routes from the sea. Figure 17 shows the zones applied to the traffic separation scheme. Figures 18 through 25 show the transit route and corresponding zones along the northeast coastline of Maine and Grand Manan Channel leading to the proposed facility site. Because these two offshore routes are relatively distant from land masses, intentional zones of concern were depicted, as they represent the worst-case scenario and corresponding zone size.[2]

[1] Figures reprinted courtesy of DNV (USA), Inc. with permission by Downeast LNG.
[2] Reprinted courtesy of WOODLOT ALTERNATIVES, Inc. with permission of Downeast LNG.

Figure 16

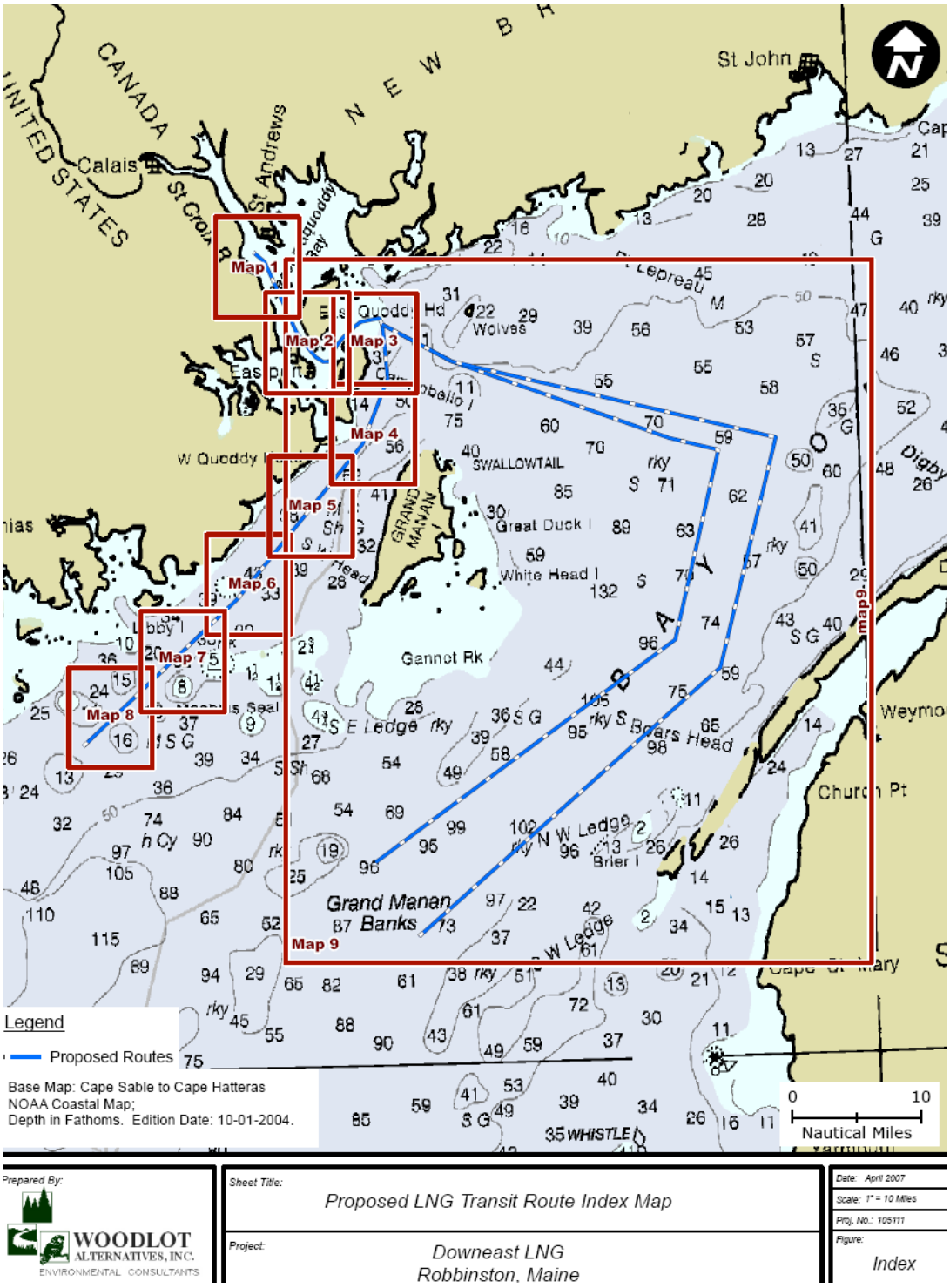

CANADA
UNITED STATES
Calais
St Andrews
St John
Map 1
Map 2
Map 3
Map 4
Map 5
Map 6
Map 7
Map 8
Map 9
map9
Grand Manan
Banks
Gannet Rk
White Head I
Great Duck I
SWALLOWTAIL
Bears Head
Brier I
WHISTLE
Weymo
Legend
Proposed Routes
Base Map: Cape Sable to Cape Hatteras
NOAA Coastal Map;
Depth in Fathoms. Edition Date: 10-01-2004.
0
10
Nautical Miles
Prepared By:
WOODLOT
ALTERNATIVES, INC.
ENVIRONMENTAL CONSULTANTS
Sheet Title:
Proposed LNG Transit Route Index Map
Project:
Downeast LNG
Robbinston, Maine
Date: April 2007
Scale: 1" = 10 Miles
Proj. No.: 105111
Figure:
Index

Figure 17

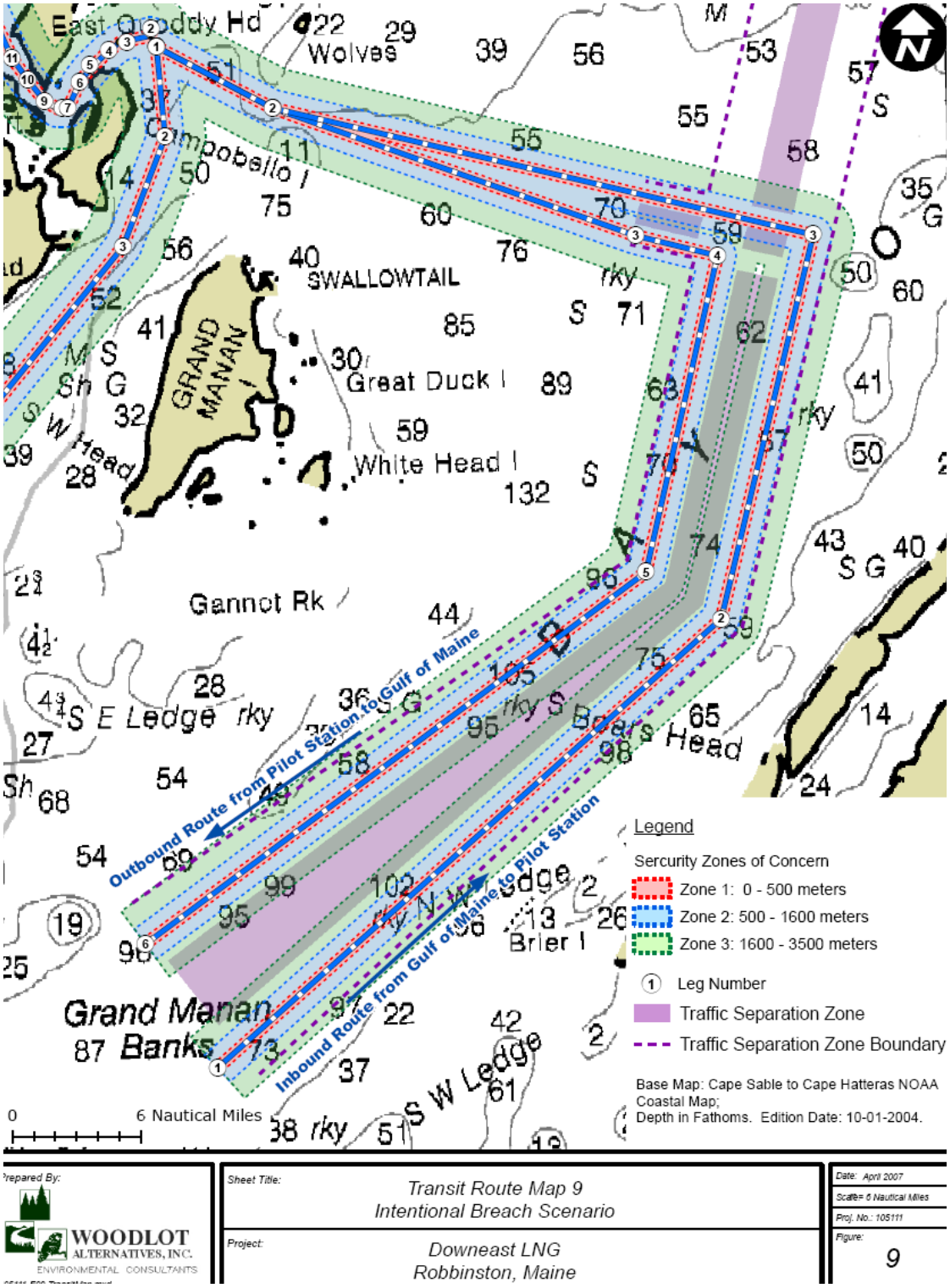

Outbound Route from Pilot Station to Gulf of Maine
Inbound Route from Gulf of Maine to Pilot Station
SWALLOWTAIL
GRAND MANAN
Great Duck I
White Head I
Gannet Rk
Bears Head
Brier I
Grand Manan Banks
S W Ledge
S E Ledge
Legend
Sercurity Zones of Concern
Zone 1: 0 - 500 meters
Zone 2: 500 - 1600 meters
Zone 3: 1600 - 3500 meters
Leg Number
Traffic Separation Zone
Traffic Separation Zone Boundary
Base Map: Cape Sable to Cape Hatteras NOAA Coastal Map;
Depth in Fathoms. Edition Date: 10-01-2004.
0
6 Nautical Miles
Prepared By:
WOODLOT ALTERNATIVES, INC.
ENVIRONMENTAL CONSULTANTS
Sheet Title:
Transit Route Map 9
Intentional Breach Scenario
Project:
Downeast LNG
Robbinston, Maine
Date: April 2007
Scale= 6 Nautical Miles
Proj. No.: 105111
Figure:
9

Figure 18

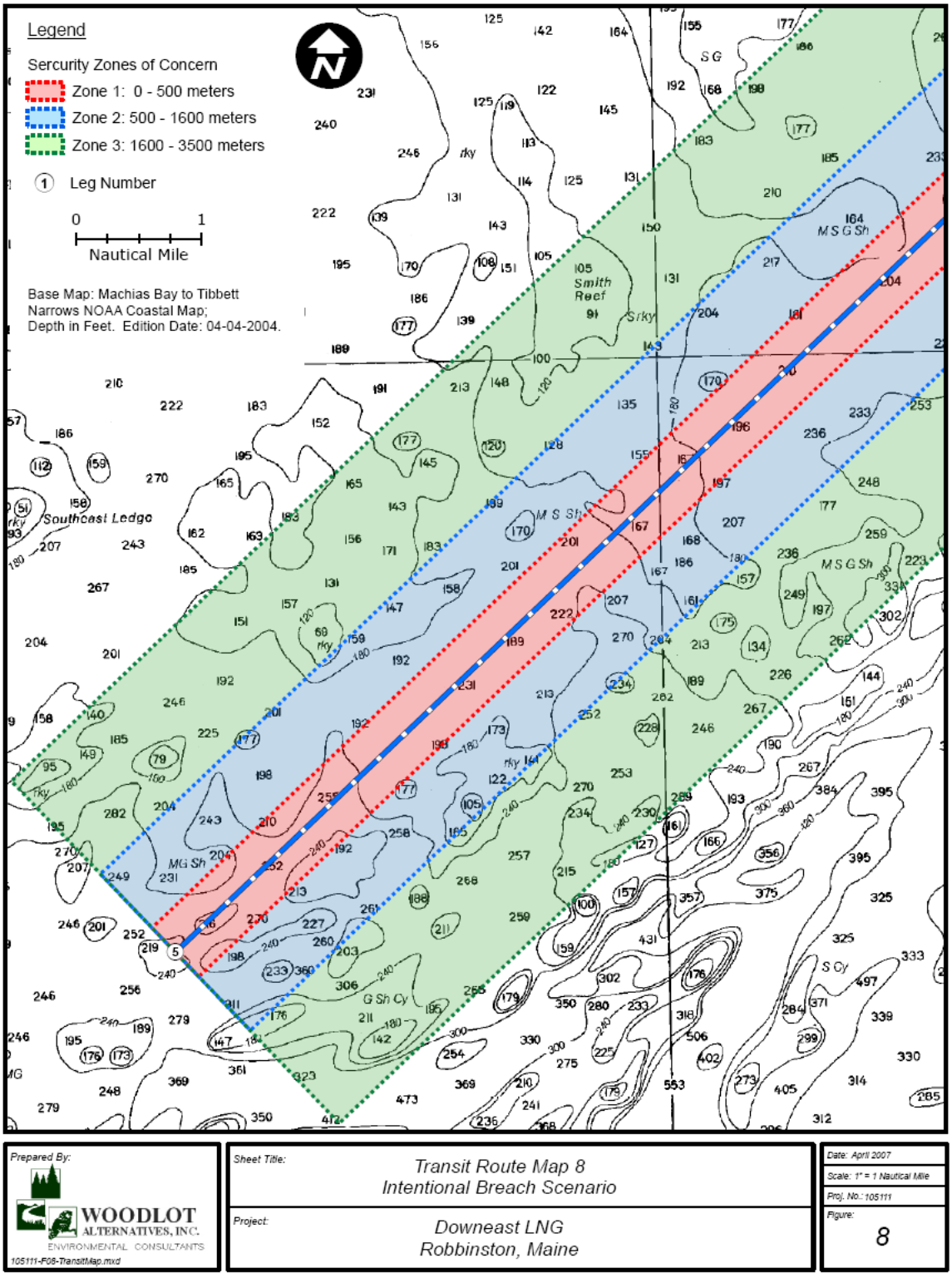

Legend
Sercurity Zones of Concern
Zone 1: 0 - 500 meters
Zone 2: 500 - 1600 meters
Zone 3: 1600 - 3500 meters
1 Leg Number
0 1
Nautical Mile
Base Map: Machias Bay to Tibbett Narrows NOAA Coastal Map; Depth in Feet. Edition Date: 04-04-2004.
Smith Reef
Southeast Ledge
Prepared By:
WOODLOT ALTERNATIVES, INC.
ENVIRONMENTAL CONSULTANTS
105111-F08-TransitMap.mxd
Sheet Title:
Transit Route Map 8
Intentional Breach Scenario
Project:
Downeast LNG
Robbinston, Maine
Date: April 2007
Scale: 1" = 1 Nautical Mile
Proj. No.: 105111
Figure:
8

Figure 19

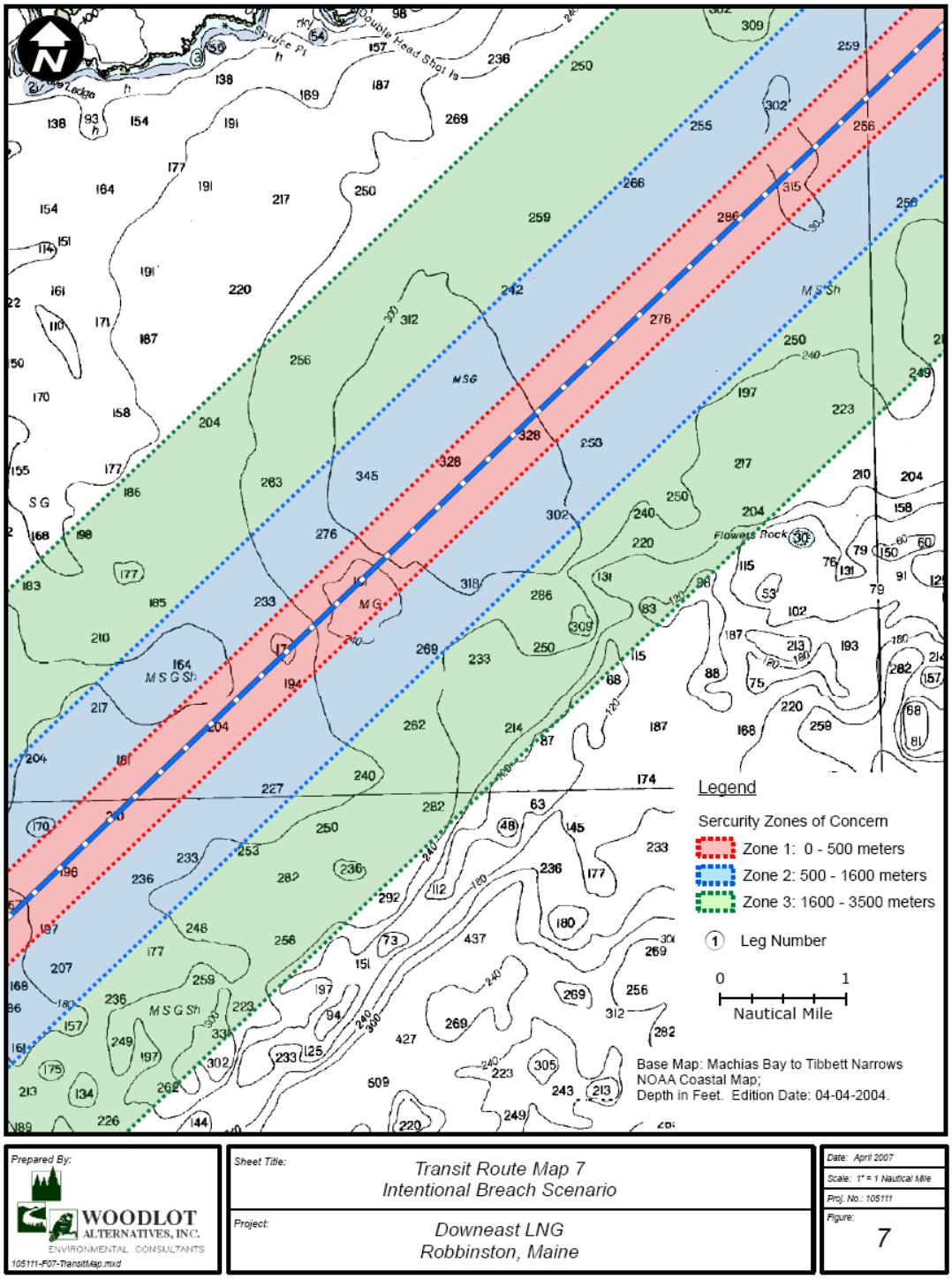

Legend
Sercurity Zones of Concern
Zone 1: 0 - 500 meters
Zone 2: 500 - 1600 meters
Zone 3: 1600 - 3500 meters
1 Leg Number
0
1
Nautical Mile
Base Map: Machias Bay to Tibbett Narrows
NOAA Coastal Map;
Depth in Feet. Edition Date: 04-04-2004.
Prepared By:
WOODLOT ALTERNATIVES, INC.
ENVIRONMENTAL CONSULTANTS
105111-F07-TransitMap.mxd
Sheet Title:
Transit Route Map 7
Intentional Breach Scenario
Project:
Downeast LNG
Robbinston, Maine
Date: April 2007
Scale: 1" = 1 Nautical Mile
Proj. No.: 105111
Figure:
7

Figure 20

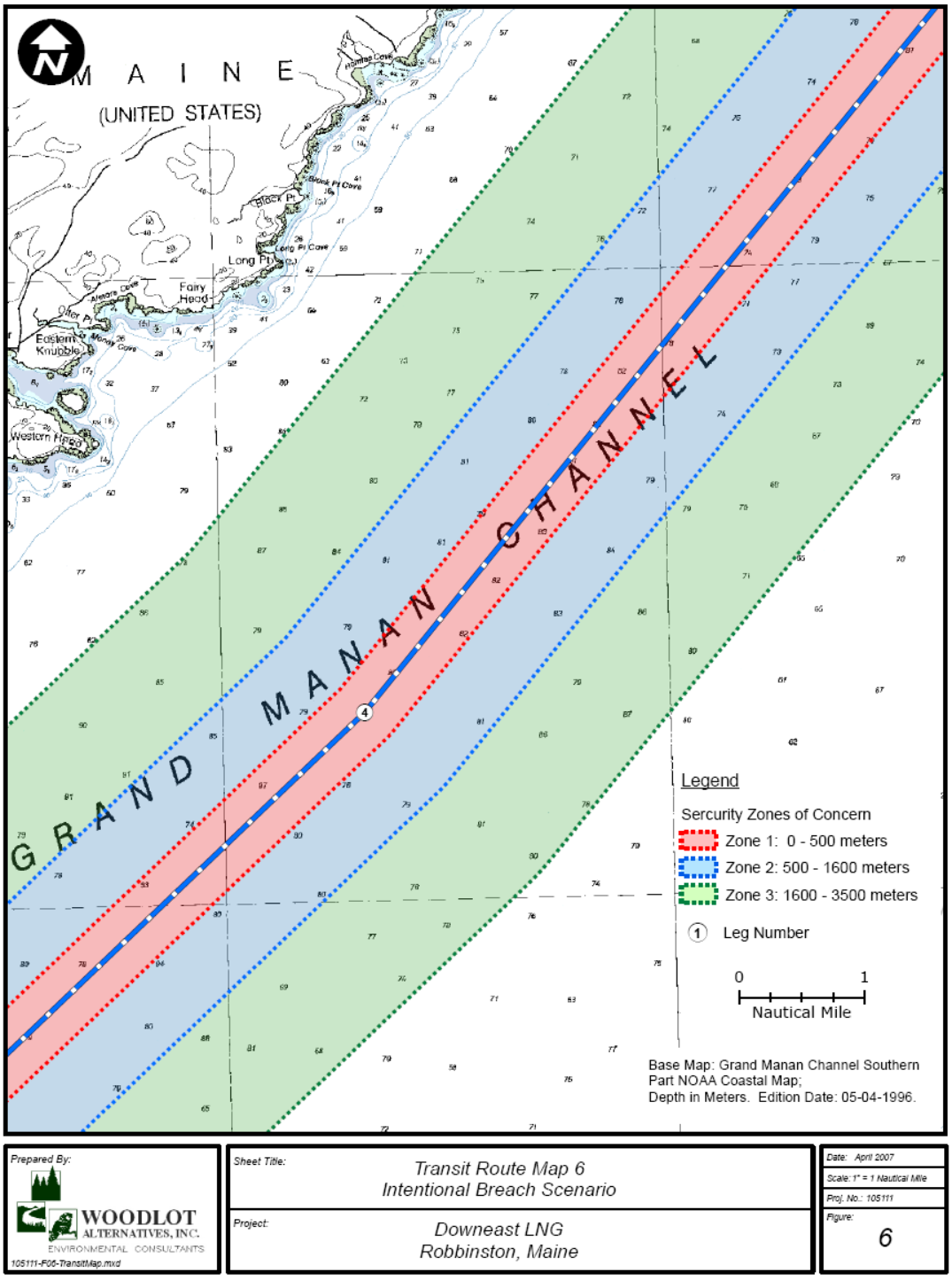

M A I N E
(UNITED STATES)
GRAND MANAN CHANNEL
Black Pt
Long Pt
Fairy Head
Eastern Knubble
Western Head
Legend
Sercurity Zones of Concern
Zone 1: 0 - 500 meters
Zone 2: 500 - 1600 meters
Zone 3: 1600 - 3500 meters
1 Leg Number
0
1
Nautical Mile
Base Map: Grand Manan Channel Southern Part NOAA Coastal Map;
Depth in Meters. Edition Date: 05-04-1996.
Prepared By:
WOODLOT ALTERNATIVES, INC.
ENVIRONMENTAL CONSULTANTS
105111-F06-TransitMap.mxd
Sheet Title:
Transit Route Map 6
Intentional Breach Scenario
Project:
Downeast LNG
Robbinston, Maine
Date: April 2007
Scale: 1" = 1 Nautical Mile
Proj. No.: 105111
Figure:
6

Figure 21

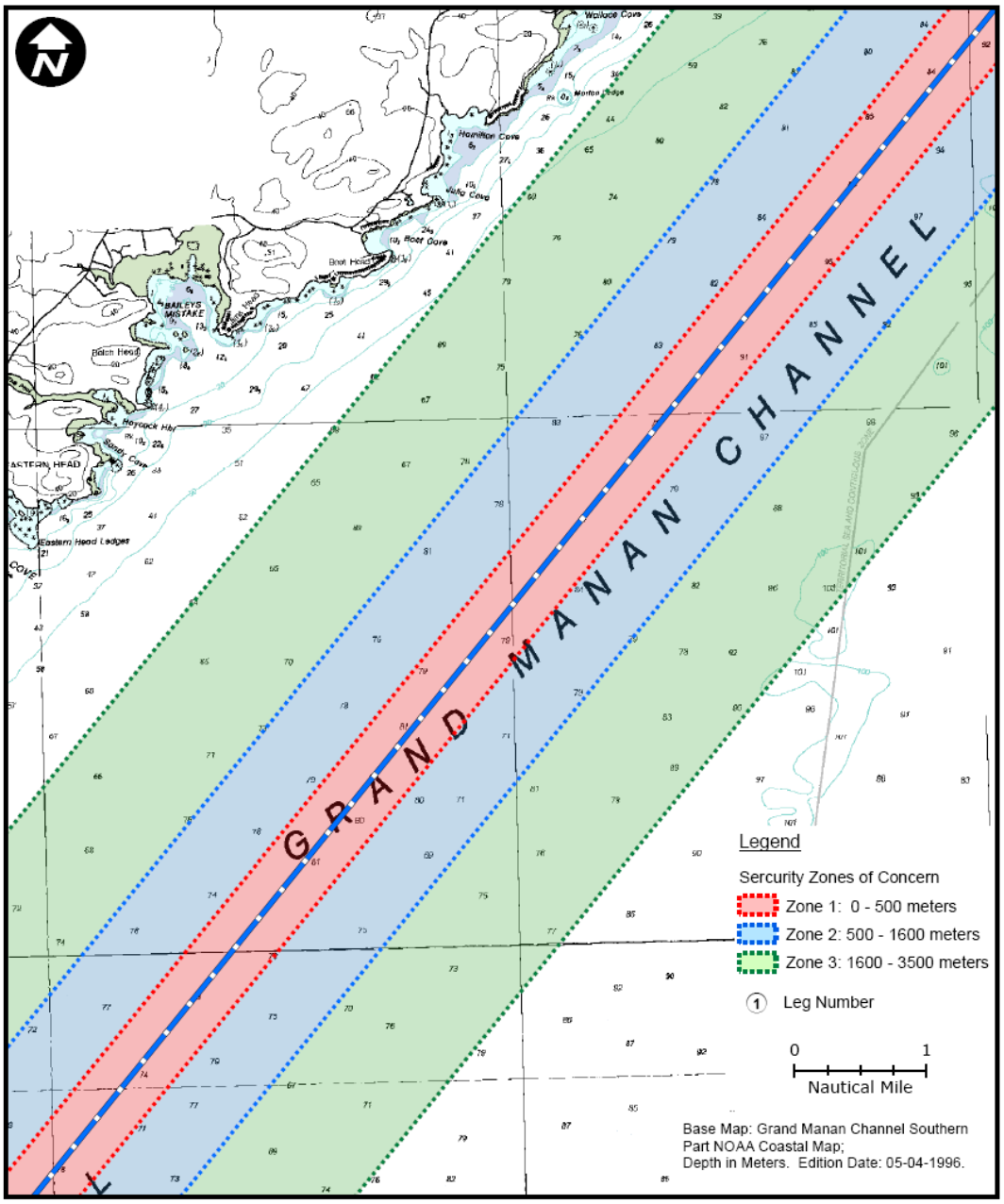

GRAND MANAN CHANNEL
Legend
Sercurity Zones of Concern
Zone 1: 0 - 500 meters
Zone 2: 500 - 1600 meters
Zone 3: 1600 - 3500 meters
1 Leg Number
0
1
Nautical Mile
Base Map: Grand Manan Channel Southern Part NOAA Coastal Map;
Depth in Meters. Edition Date: 05-04-1996.
Prepared By:
WOODLOT ALTERNATIVES, INC.
ENVIRONMENTAL CONSULTANTS
105111-F05-TransitMap.mxd
Sheet Title:
Transit Route Map 5
Intentional Breach Scenario
Project:
Downeast LNG
Robbinston, Maine
Date: April 2007
Scale = 1 Nautical Mile
Proj. No.: 105111
Figure:
5

Figure 22

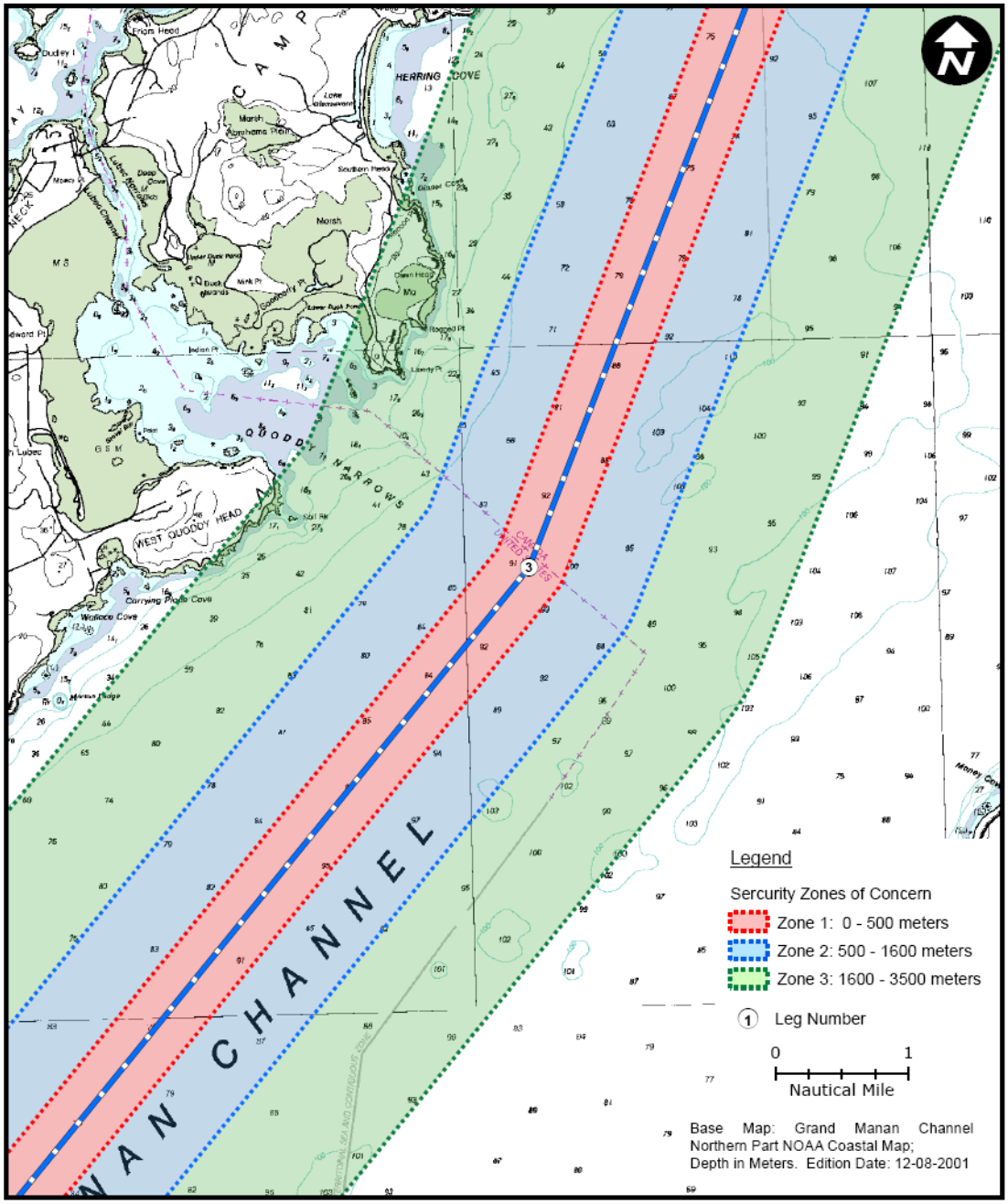

HERRING COVE
QUODDY NARROWS
WEST QUODDY HEAD
GRAND MANAN CHANNEL
3
Legend
Sercurity Zones of Concern
Zone 1: 0 - 500 meters
Zone 2: 500 - 1600 meters
Zone 3: 1600 - 3500 meters
1 Leg Number
0
1
Nautical Mile
Base Map: Grand Manan Channel Northern Part NOAA Coastal Map; Depth in Meters. Edition Date: 12-08-2001
Prepared By:
WOODLOT ALTERNATIVES, INC.
ENVIRONMENTAL CONSULTANTS
105111-F04-TransitMap.mxd
Sheet Title:
Transit Route Map 4
Intentional Breach Scenario
Project:
Downeast LNG
Robbinston, Maine
Date: April 2007
Scale: 1" = 1 Nautical Mile
Proj. No.: 105111
Figure:
4

Figure 23

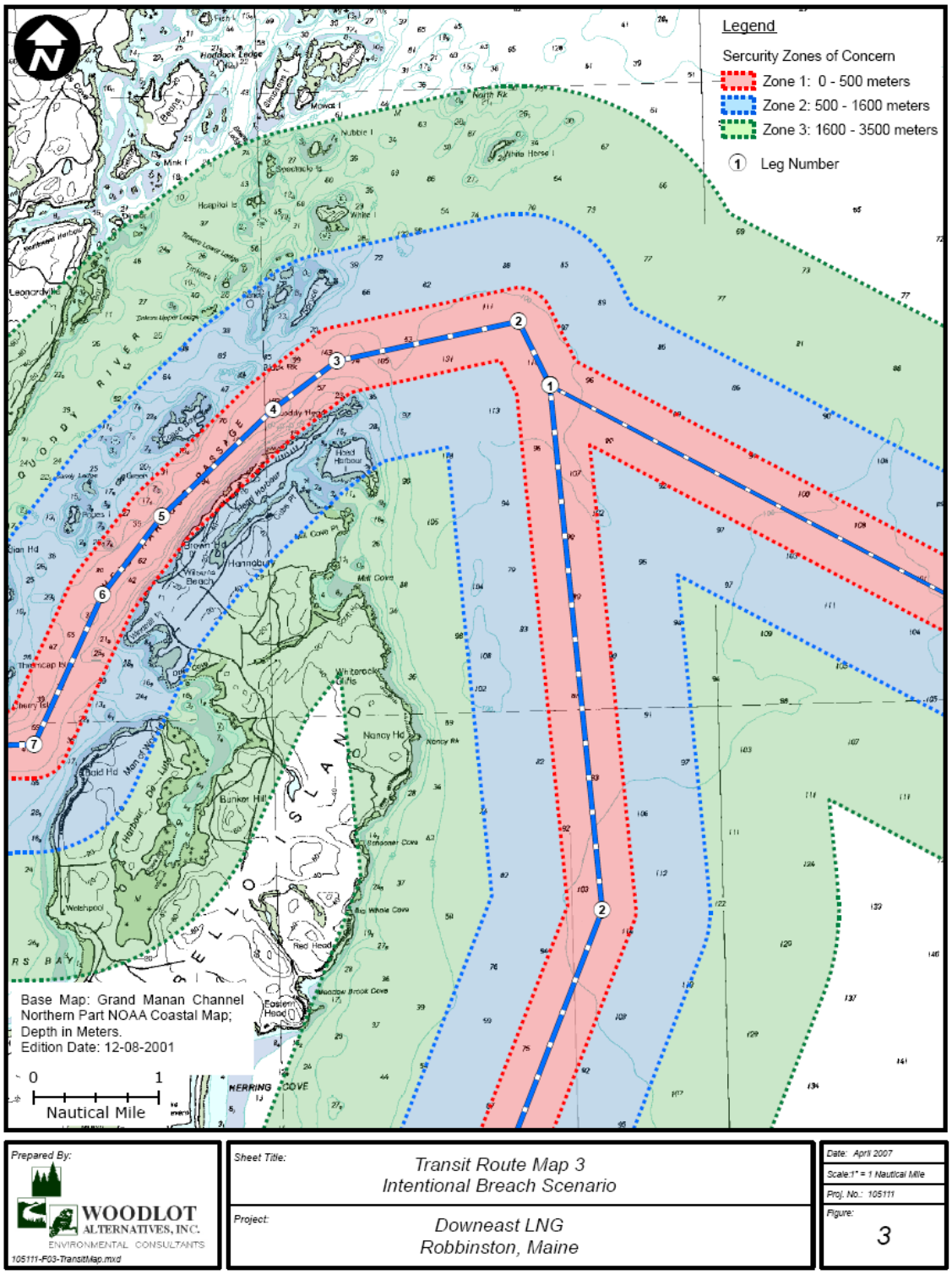

Legend
Sercurity Zones of Concern
Zone 1: 0 - 500 meters
Zone 2: 500 - 1600 meters
Zone 3: 1600 - 3500 meters
1 Leg Number
Base Map: Grand Manan Channel
Northern Part NOAA Coastal Map;
Depth in Meters.
Edition Date: 12-08-2001
0
1
Nautical Mile
Prepared By:
WOODLOT
ALTERNATIVES, INC.
ENVIRONMENTAL CONSULTANTS
105111-F03-TransitMap.mxd
Sheet Title:
Transit Route Map 3
Intentional Breach Scenario
Project:
Downeast LNG
Robbinston, Maine
Date: April 2007
Scale:1" = 1 Nautical Mile
Proj. No.: 105111
Figure:
3

Figure 24

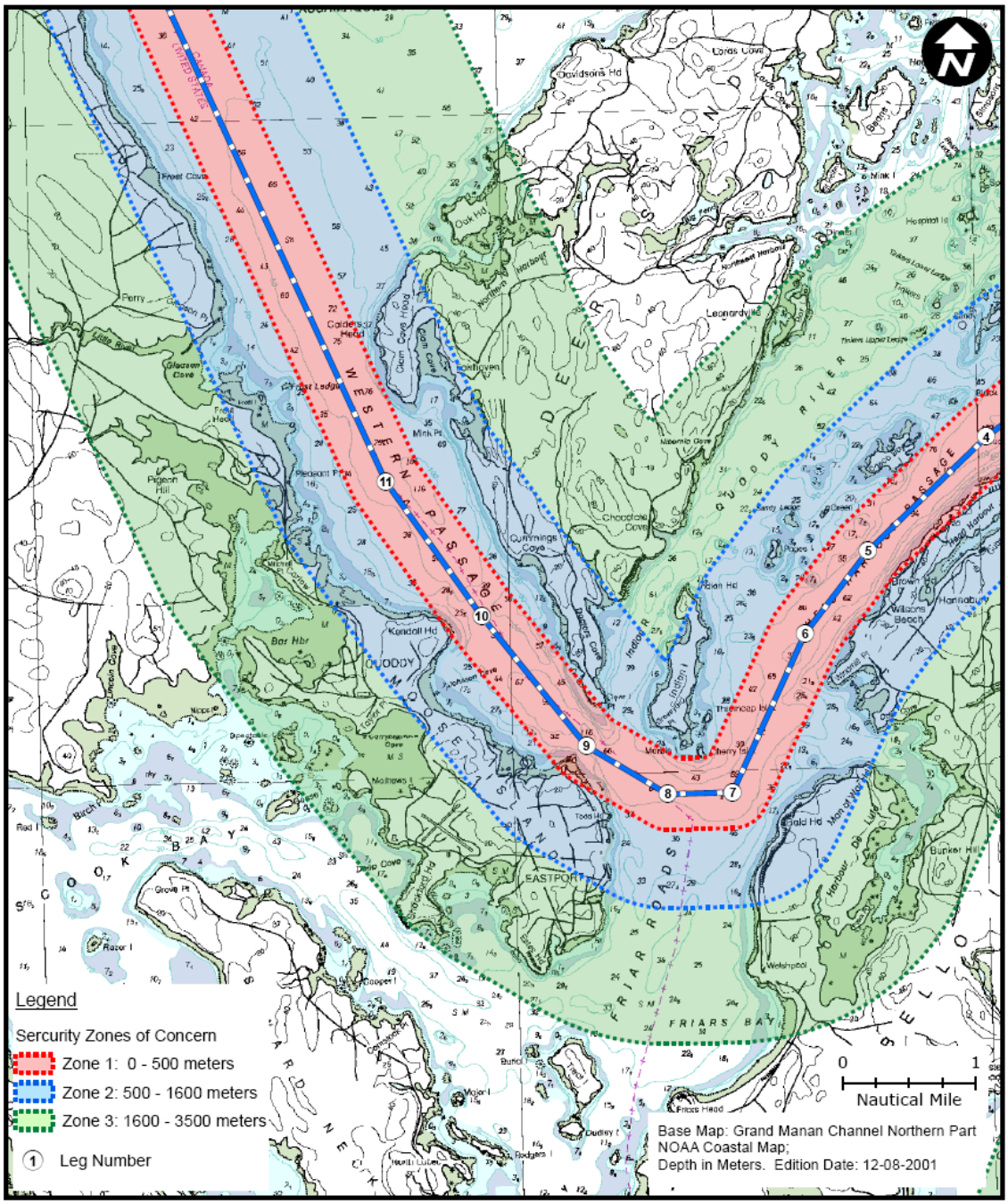
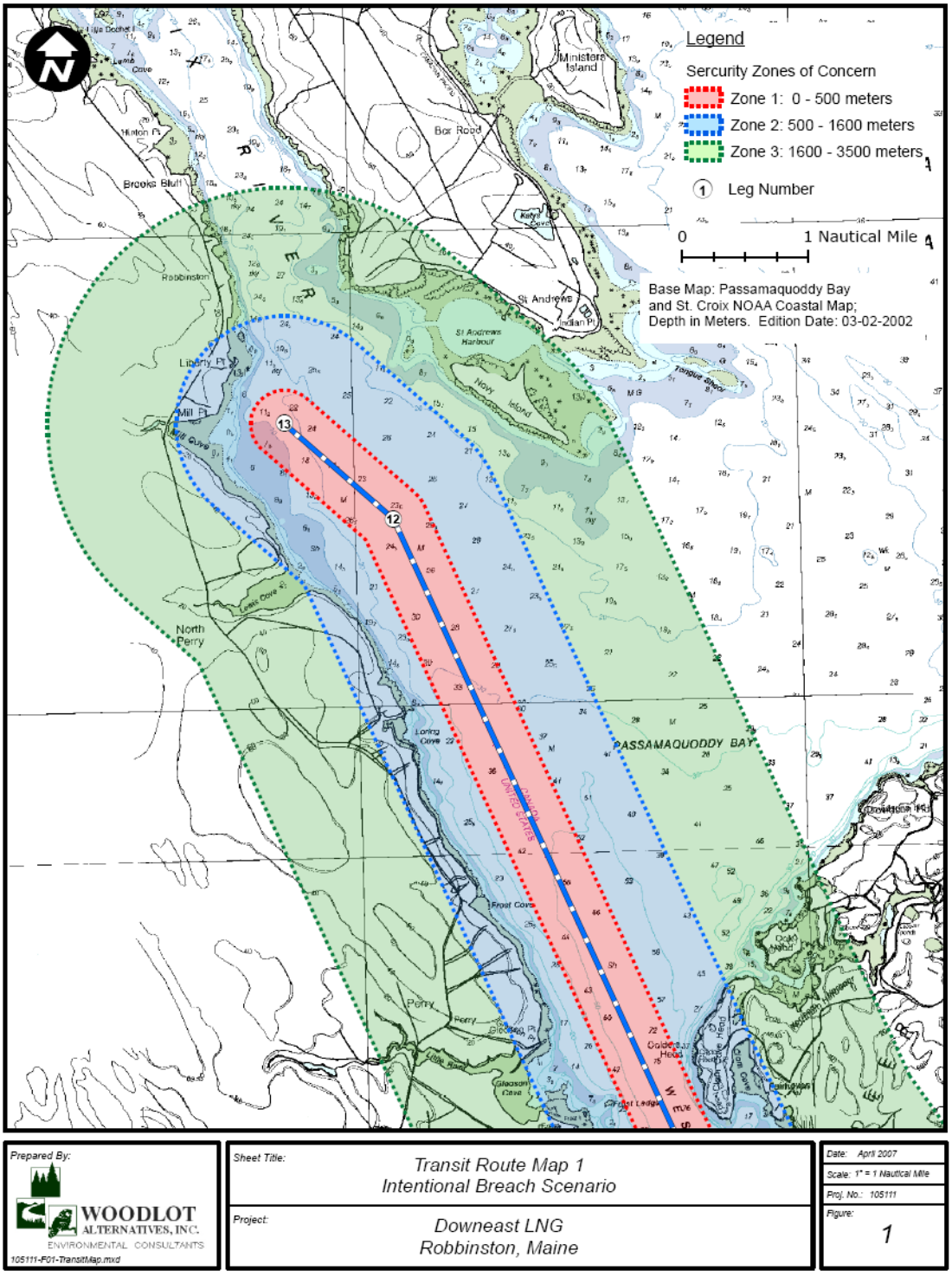

Legend
Sercurity Zones of Concern
Zone 1: 0 - 500 meters
Zone 2: 500 - 1600 meters
Zone 3: 1600 - 3500 meters
1 Leg Number
0
1
Nautical Mile
Base Map: Grand Manan Channel Northern Part
NOAA Coastal Map;
Depth in Meters. Edition Date: 12-08-2001
WESTERN PASSAGE
EASTPORT
FRIARS BAY
Prepared By:
WOODLOT ALTERNATIVES, INC.
ENVIRONMENTAL CONSULTANTS
105111-F02-TransitMap.mxd
Sheet Title:
Transit Route Map 2
Intentional Breach Scenario
Project:
Downeast LNG
Robbinston, Maine
Date: April 2007
Scale: 1" = 1 Nautical Mile
Proj. No.: 105111
Figure:
2

Figure 25



LNG burns at extremely high temperatures. Once started, a natural gas fire is quite difficult to extinguish. As indicated in the Sandia Report, scientists determined that should a large LNG spill on water be ignited, it could burn at 3,000 degrees F for 30 minutes to an hour, throwing off extreme, potentially damaging radiant heat for the first four-tenths of a mile from the vessel. Beyond that range, the degree of heat flux

decreases appreciably depending on surrounding climatic conditions (wave height, wind speed, ambient temperature, etc.) and geographical impediments such as man-made buildings or structures, and natural obstructions such as tree lines and hills. The affected distances and hazard parameters related to Sandia zones of concern for an intentional (i.e., terrorism related) release are:

- Zone 1 - 500 meter radius with resultant fire and severe thermal radiation hazards. By definition these are areas in which LNG shipments occur in relatively narrow harbors or channels, or ships pass under major bridges or over tunnels, or come in within 500 meters of major infrastructure such as military installations, commercial/business centers, or national icons.
- Zone 2 - from 500 to 1600 meters with less severe thermal radiation hazards to public safety and property. These are areas of broader channel widths, larger open harbors, or over 500 meters from major critical infrastructure elements.
- Zone 3 – from 1600 to 3500 meters with potential pockets of flammable vapor. These are areas where LNG traffic and deliveries occur approximately 1.6 kilometers from major infrastructure or in large bays or open water. The thermal radiation risks to public safety and property are significantly reduced.

As shown in the Figures on pages 25-34, zones of varying significance impinge on communities along both sides of the shared waterway. It should be noted, however, that the centerline from which the Zones of Concern are calculated follow the LNG carrier's anticipated course or track line. An LNG carrier "drifting" from the plotted route within the channel would, therefore, carry the zones of concern proportionately, where greater public safety and environmental effects could be experienced, if a worst case accidental or intentional release scenario were realized.

The other factor used to judge the potential impact of an LNG release is the concentration of populace threatened. The three levels of population density, as defined by NVICs 05-05 and 05-08, are:

- High population areas – residential areas with a population density of 9,000 persons or more per square mile;
- Medium population areas – residential areas with 1,000 to 9,000 persons per square mile; and
- Low population areas – residential areas with less than 1,000 persons per square mile.

Using the above criteria, Downeast LNG concluded in their WSA that the transit route passes through relatively low population areas, i.e., predominantly fewer than 1,000 persons per square mile. By definition, the Pleasant Point Passamaquoddy Tribal Reservation, having a population density of 1,376 persons per square mile and located about 7 nautical miles downstream of the proposed terminal site and approximately ¾ nautical miles from the centerline of the transit route, is considered a borderline medium population area (other sources report the population density as being 984 persons per square mile). By contrast, the popular tourist area of St. Andrews, New Brunswick, is located geographically opposite from the proposed Downeast LNG site, and is home to

approximately 2500 residents with a population density of 88 persons per square mile. The next highest population area affected by a transiting LNG carrier is the City of Eastport, ME, with a population density of 448 persons per square mile. Comparatively, Campobello Island, New Brunswick, Deer Island, and Robbinston, ME, have population densities of 78, 58, and 19 persons per square mile, respectively. Obviously, the demographics of the Passamaquoddy Bay port area do not meet the NVIC criterion for high population density, both with regard to the vessel's transit route or surrounding the proposed facility site. This statement is not meant to minimize the significance and/or importance of the surrounding communities, environment, and population living, working or using the waterway. Rather, it simply concludes that the risk of LNG movement through the waterway has been evaluated against pre-determined criteria in order to measure and prioritize those areas that would be most severely impacted.

Due to the relative remoteness of the shared waterway and comparatively low concentration of defined critical infrastructure and population densities, the following generalities, by zone consequence, are provided regarding an intentional release of LNG vice a detailed breakdown of the entire transit route by segments:

Zone 1

- Zone 1, the measure with the most severe impact, does not affect any high population area, public or government centers such as schools, hospitals or transportation infrastructure as LNG carriers proceed along the intended track line. However, any commercial vessel intended for the port of Bayside may well fall into Zone 1 as it passes docked LNG carriers (cumulative consideration if other proposed LNG facilities are also built), and similarly, recreational and fishing vessels may fall within the zone depending on their course. As well, the seasonal ferry crossings connecting Deer Island, New Brunswick and Eastport, Maine and Campobello Island, New Brunswick could possibly be within Zone 1 as an LNG carrier passes. Transit of such vessels through a Zone 1 area of concern can be avoided by timing and course changes, if conditions permit.

- During the LNG carrier's transit, a Zone 2 impact may very well occur at Dog Island Light, affecting portions of Moose Island on the Maine side and Deer Island on the New Brunswick side. This area presents the narrowest point in the entire transit route and the pilots tend to hug the U.S. side of the dogleg, rather than stay in the middle of the channel, in order to avoid the divergent currents common to this portion of the waterway.

- Although no major military post or camp is situated along the waterway, USCG Station Eastport, a Search and Rescue (SAR) and Law Enforcement (LE) installation, is located on the shore of Eastport and would fall within Zone 1 and/or 2, depending on the actual course taken by the pilots when navigating the bend off Dog Island.

- When the carriers transit Head Harbor Passage, the northern most edge of Head Harbor and shore side neighboring areas on Campobello Island would fall within

Zone 1. When the carriers transit Friar Roads and Western Passage, the western edge of Deer Island Point, New Brunswick, would also fall into this zone.

Zone 2

- Elements within the U.S. which would fall within Zone 2 while vessels transited Friar Roads and Western Passage include most of Eastport, Kendall Head, and Pleasant Point, ME. While not necessarily classified as "critical infrastructure", i.e. bridges, tunnels, etc., Route 190 provides the only vehicle access to and from the City of Eastport. A portion of Route 190 is within the zone of concern.

- During LNG vessel transits of Head Harbor Passage all Canadian areas and communities along the northern and westerly edges of Campobello Island such as Brown Head, Wilson's Beach, Windmill Point, and Bald Head would fall within Zone 2. Also within this zone would be the islands off the coast of New Brunswick to include Spruce Island, Sandy Island, Casco Bay Island, Green Island, Pope Island and Indian Island. Zone 2 would also impact land masses along Friar Roads and Western Passage such as West Deer Isle, New Brunswick communities west of Highway 772, Doctors Cove, Cummings Cove, and Mink Point.

Zone 3

- In addition to the localities identified in the above zones, areas impacted by Zone 3 in the U.S. include all of Moose Island, Pleasant Point, Perry, and Robbinston.

- On the Canadian side, in addition to all locales previously identified along Head Harbor Passage impacted by Zones 1 and 2, Welshpool and all of Northern Campobello Island would fall into Zone 3, as would the communities on the alternate side of Head Harbor Passage which would encompass areas such as Leonardville, Bar Island, and a portion of Southern Deer Island. And, when carriers navigate Friar Roads and Western Passage, a major portion of western Deer Island falls within this zone as well.

Within the context of the defined criteria contained in the Sandia Report and the guidance contained in the NVICs, Downeast LNG identified the following as not being contained within the Zones of Concern, as plotted from the centerline of their intended transit route:

- any wild and scenic rivers;

- any shellfish nurseries;

- any coral reefs; or

- any marine protected areas (assuming vessels used the Grand Manan Channel, which may be their preferred transit route as the North Atlantic right whale and Bay of Fundy conservation areas are located to the east of Grand Manan Island).

A number of comments were received regarding the site selection and proposed LNG operations in contrast to the guidelines and recommended industry best practices outlined in *The Society of International Gas Tanker and Terminal Operators Ltd.* (SIGTO) publications. As emphasized by SIGTO, each port environment presents a unique set of risk exposures for LNG operations and, as such, each requires a specific, detailed study of the operating environment in every case. The waterway suitability assessment process and the FERC site analysis closely parallels SIGTO's Quantitative Risk Assessment (QRA) methodology and, in fact, utilized many similar decision-making tools.

Of specific comment and concern was SIGTO's pronouncement that an LNG site location should be suitably distant from centers of population; and the associated mooring piers should not be situated in heavily trafficked areas or within constricting channels where other ships pose collision risks. There was expressed concern that Downeast LNG's proposed site did not follow SIGTO's site selection criteria in these regards. It must be understood that SIGTO's publications are meant as general *guidance* only. While based on industry "best practices," the recommended procedures and precautionary measures provided in their Information Papers are not regulatory standards. Rather, they are intended as transit/site-specific measures to reduce risk and to be applied where practical and within realistic limits. The USCG recognizes the significance of SIGTO and referred to their documents throughout the WSA process as a risk management measure.

As described above, Zones of Concern were applied along the carrier transit route to graphically identify and depict areas where an accidental release of LNG may cause the most severe consequences. Unique to the Passamaquoddy Bay port area, three separate and distinct LNG proposals are being evaluated for FERC approval. Although each proposal is being assessed on its own merits, there are cumulative impacts that should be taken into account on the event that each ultimately receives approval. There is one case of particular note: A competing LNG project proposal involves the construction and operation of a facility about 6.8 nautical miles downstream of the Downeast LNG site. The alternate proposal includes a marine terminal designed with two staggered berths near to affiliated regasification facilities. As part of that proposed operation, two LNG carriers will most likely be at the facility simultaneously; one will be actively offloading product into the sendout line via the regasification system, while the other stands by, ready to offload. According to the developer's stated plans, this event will be typical during its first phase of operation while storage tanks are being constructed in the neighboring town of Perry, but are expected to be rare thereafter. Although only one carrier will actually be transferring cargo at any given time, the gross amount of LNG attributable to two berthed carriers having a midpoint separation distance of about 575 yards, becomes an accumulative factor affecting the overall dimensional range of overlapping zones of concern – compounded by the likelihood of an LNG carrier passing relatively close aboard (approximately 1,100 yards to the centerline of the established vessel track line) when en route the Downeast LNG proposed site. (Note: Effective October 17, 2008, the FERC formally dismissed the application of this alternate proposal without prejudice. The applicant has stated intentions to re-apply in the future once the facility design plans are finalized.) Also of significance, a third prospective developer

has entered the pre-filing process with the FERC and filed a LOI with the Coast Guard to build and operate an LNG facility near the City of Calais on the St Croix River, also necessitating the need for cumulative impact assessments.

The above scenario is presented only to highlight the fact that there may be a need to re-calculate the hazard zone parameters in order to qualify the cumulative effects of double cargo loads being present at the opposing terminal site for the safety of the surrounding populous and infrastructure. Apart from any mitigating strategies and measures that may become apparent as a result of an impending analysis, the USCG will require, at a minimum, a tractor tug of minimum 60 ton bollard pull and equipped with American Bureau of Shipping (ABS) Class 1 (Fi Fi 1) equivalent firefighting capabilities to be moored outboard of all berthed LNG carriers at all times to assist with emergency departure maneuvers and/or assist in the fending off of uncontrollable craft.

3.3 International and Sovereignty Considerations

As denoted in the Transit Route Overview, LNG carriers bound for the proposed LNG facility site must travel through Canadian territorial waters, specifically Head Harbor Passage, before entering U.S. waters at the confluence of Friar Road. The vessels then straddle the international boundary before turning into exclusive U.S. waters to reach the intended terminal site, to be located on the Maine side of Passamaquoddy Bay near its confluence with the St. Croix River. Based on the sovereignty over their portions of these waters, the Canadian and provincial governments have publicly expressed strong opposition to any and LNG carriers traversing their waters, citing potential security, environmental, navigational, and safety risks. Also of expressed concern are the public health of its local residents, economic viability of the fishing and tourism industries, and the pristine environment of the region. Jurisdictional issues have been at the forefront as well. The Canadian government has indicated that it considers all of Head Harbor Passage to be the internal waters of Canada and that the international right of "innocent passage" does not apply. This has been a matter of extensive discussions and legal review ever since the Downeast LNG proposal was first announced. In contrast to Canada's assertion, it is the formal position of the United States that vessels departing to and from U.S. ports on the waters of the Passamaquoddy Bay port area enjoy the non-suspendable right of innocent passage under customary international law as reflected in the United Nations Convention on the Law of the Sea (UNCLOS).[3] Canada became a party to UNCLOS in December 2003; the United States is not party to the Convention in that the U.S. Senate has not yet provided the necessary approval.[4] One important consequence of the U.S.'s current non-party status is that the United States is not subject to, nor can the U.S. make use of, the compulsory dispute settlement provisions of

[3] United States, Message of President Clinton transmitting the United Nations Convention on the Law of the Sea to the U.S. Senate for Ratification in 1994, "Commentary -The 1982 united Nations Convention on the Law of the Sea and the Agreement on Implementation of Part XI," 103rd Congress, 2nd Session, Treaty Document 103-39, at p.19.

[4] Marjorie Ann Brown, "The U.N. Law of the Sea Convention and the United States: Development Since October 2003," (Congressional Research Service Report for Congress, Order Code RS21890, updated 27 January 2006).

UNCLOS, since this is clearly a right/obligation that arises from being a party and is not a right/obligation that arises from customary international law.[5]

The Province of New Brunswick has filed a *Motion for Leave to Intervene and Comment* with FERC, in addition to, a *Motion to Suspend Proceedings*. These documents, along with other official correspondence relating to the subject emanating from the offices of the Canadian Ambassador, Premier of New Brunswick, Chairman of FERC, U.S. State Department, and U.S. Senate, are maintained in the public docket by FERC and accessible on their website.

There has been ongoing correspondence and a continued dialogue between COTP Sector Northern New England and its counterpart Canadian agencies. Early on, the COTP initiated meetings with colleagues in Transport Canada, the Departments of Foreign Affairs, Fisheries and Oceans, Environment, and Public Safety and Security during trips to Halifax/Dartmouth, Moncton, and Fredericton, New Brunswick, to build on the existing professional rapport and discuss issues of the mutual concern regarding the project proposal and need for joint cooperation and a unified response capability. Additionally, the COTP met with the Mayor of St. Andrews and members of his council to discuss local safety, economic, and environmental concerns in relation to the proposed operation.

During the initial assessment proceedings, pertinent branches within the Canadian government, such as Transport Canada, were granted permission by the Ministry of Foreign Affairs to engage in "technical" discussions with COTP Sector Northern New England in an effort to identify mutual issues of concern, potential risks, and address possible mitigating factors surrounding the proposed LNG ventures. However, consequent to the official stance taken by the government in regards to "innocent passage" and the formal filing of the documents discussed above, Canadian officials curtailed further participation in the review process and subsequent joint interrogatories have since stalled. This action caused the assessment process to slow and ostensibly inhibited Downeast LNG's ability to assimilate resource information and fully assess environmental impacts to Canadian waters and property; requisites that were communicated via follow-on agency data requests. Developing bilateral arrangements and protocols is necessary on a number of fronts to ensure that adequate safety, security, and environmental response mechanisms are in place to ensure safe and efficient transits and for the protection and welfare of the surrounding marine communities. The eventual involvement and cooperation of Canada's maritime, environmental, and public safety authorities are paramount to ensure the safety and security of the waterway.

In addition to examining Canadian sovereignty issues, the inherent rights and concerns of the Passamaquoddy Tribal Nation, whose Sipayik members reside in the vicinity of the proposed project site, have been issues of significant concern and consideration by COTP Sector Northern New England. The Pleasant Point Reservation, which is located at the edge of the transit route on the banks of Western Passage, is approximately eight nautical miles downstream from the planned Downeast LNG site. The Indian Township

[5] Ted L. McDorman, "The International Legal Status of Head Harbor Passage," Research Memorandum, January 2007, p. 8.

Reservation, situated further upstream on the edge of the St. Croix River near Calais, ME, is beyond the transit route. However, that Reservation could be directly or indirectly impacted by an LNG terminal or vessel mishap. Additionally, some Passamaquoddy Tribal members live in Canada just across the St. Croix River.

Sovereignty, a critical feature of federal Indian law, has been an exceedingly complex and sensitive issue for the Wabanaki People (Coalition of Abenaki, Penobscot, Maliseet, Passamaquoddy and Mi'kaq Tribes) within the State of Maine for hundreds of years. In order to appreciate the complexity surrounding Passamaquoddy Tribal sovereignty issues the following historical overview is provided.

In 1790, the First Congress of the United States enacted the Nonintercourse Act, declaring that any transfer of land from Indians to non-Indians had to be approved by Congress. The law was designed to protect Indians from unscrupulous and unfair property transactions. However, during the 19th Century and much of the 20th Century, the Wabanaki People of Maine were considered "state" Indians, because they had never signed any treaties with the federal government. Thus, Indians in Maine were considered to have no inherent sovereignty, no right to self-government, and were excluded from land trust relationships; i.e., they were not protected under the Non-intercourse Act. Purportedly, the Maine State Legislature assumed the authority to make whatever decisions it thought necessary at any given time, and it was during this time period that most of the land of the Passamaquoddy and Penobscot People was transferred, through a variety of transactions, to the State of Maine. These land transfers were never approved by Congress.

In 1972, the Passamaquoddy Tribe filed suit in federal court seeking to force the federal government to return their lands; an area encompassing 60% of the State of Maine. The suit also sought to establish that the Passamaquoddy tribe and Penobscot Indian Nation were entitled to the special services that the federal government makes available to Indians in other parts of the country, that they still possess their inherent sovereignty, and that the State of Maine had no power to interfere with their self-government. The Passamaquoddy Tribe won this suit in U.S. District Court in 1975, and the U.S. Court of Appeals affirmed that decision. Neither the federal government nor the State of Maine sought to appeal that decision to the U.S. Supreme Court. Within months of this landmark decision, the U.S. Department of Justice announced that it would sue the State of Maine and its largest land holders on behalf of the Tribes for the return of the land if an out-of-court settlement could not be reached. At the same time, the federal government also announced that from then on the tribes would be eligible for the special services that the federal government provides to other tribes.

In a memorandum the Justice Department described the case as "potentially the most complex litigation ever brought before the federal courts with social costs and economic impacts without precedent …." This conclusion was based on the size of the claim (12.5 million acres, or 60% of the State of Maine, with an assessed value of $25 billion), and the fact that 350,000 people lived, worked, and often owned property within the disputed area. In 1979, the Maine Supreme Court determined and ruled that the inherent

sovereignty of the Passamaquoddy People survives and that the State of Maine had no power to interfere in their self-government.

Over the next few years negotiations were intense. The Governor of Maine persuaded the congressional delegation from Maine to ask Congress to pass legislation that would bar the Passamaquoddy Tribe and Penobscot Indian Nation from continuing in court by retroactively approving the treaties that their claims were based on. The tribes maintained that such a move would be illegal and unjust.

The situation was extremely tense until President Carter called for a resolution. Through the actions of an appointed work group, an agreement was ultimately reached. The Maine Indian Claims Settlement Act (MICSA), signed by President Carter in 1980, is the Federal codification for this agreement. In the end, the Passamaquoddy Tribe and Penobscot Nation received a total of $81.5 million, and 150,000 acres for each tribe.

The State of Maine enacted companion legislation to MICSA, known as the Maine Implementation Act (MIA). It attempted to define the relationship between the three Tribes and the State of Maine. Its interpretation has proven controversial, and many issues are still in dispute, including concerns of aboriginal rights. One unresolved issue is that the Passamaquoddy Tribe claims the waters from the head of the St. Croix River to Pemaquid Point as their own. There continues to be spirited debates about state versus tribal jurisdiction in many areas, including land-use regulation, tribal courts, and fish and wildlife enforcement.[6]

COTP Sector Northern New England is sensitive to the issues pertaining to Passamaquoddy Nation sovereignty and has reached out to the Pleasant Point Sipayik Tribal Council to seek clarification on the Tribe's perception of its authority with regard to the territorial waters of the Passamaquoddy Bay area. Additionally, Pleasant Point law enforcement, fire and emergency response, and environmental management personnel have been active participants in the LNG Working Group proceedings to assist in the evaluation of the Downeast LNG WSA process. In response to the COTP's focused outreach efforts, the Sipayik's, in consultation with the Joint Tribal Council, have retained legal council to address his concerns. While no formal response has yet been received, the COTP anticipates receiving helpful input and ongoing cooperation.

In response to a USCG-initiated FERC data request regarding the sovereignty issues discussed above, Downeast LNG submitted a legal précis rebuffing the Passamaquoddy Tribe's claims. Based on legal research the company stated: "The Passamaquoddy tribal fishermen lack sovereignty or any other special fishing or sustenance rights over the waters through which LNG carriers will transit to and from the Downeast LNG facility. Accordingly, Downeast LNG does not anticipate material legal issues regarding this matter." The legal argument included the following points:

- The rights of the Passamaquoddy Tribe in Maine are collectively governed by the MICSA MIA, and, accordingly, the Passamaquoddy Tribe does not maintain an

[6] Diana Scully, Executive Director Maine Indian Tribal-State Commission; summary/excerpts from *Maine Indian Claims Settlement: Concepts, Context, and Perspectives*, February 14, 1995.

interest as a sovereign in the waters in and surrounding Passamaquoddy Bay, though it does have some level of sovereignty in Passamaquoddy Indian Territory, which is limited to the Passamaquoddy Indian Reservation and certain lands acquired by he U.S. government in trust for the Tribe.[7]

- The Tribe does not have sovereign authority in any other lands or waters, and aboriginal title in other lands has been extinguished.[8]
- The Tribes retained "sovereignty in Passamaquoddy Indian territory exempts the Tribe from the laws of the State of Maine with respect to "internal tribal matters."[9] The scope of the internal tribal matters exception to State sovereignty, however, is narrow and "does not displace general Maine law on most substantive subjects, including environmental regulation."[10]

The intricacy of, and overall sensitivity to the sovereignty issues within the region have complicated the WSA process. Of significant concern is the COTP's jurisdictional authority to enforce risk reduction measures, such as safety/security zone enforcement, and/or how to quantify environmental risks and related potential impacts to hallowed hunting and fishing grounds and sacred ceremonial sites, if in fact Passamaquoddy sovereign rights prevail.

3.4 Marine Traffic Control

As previously indicated, all deep-draft vessel traffic entering the Passamaquoddy Bay port area initially traverses Canadian waters, and then straddle the international boundary throughout their respective transits. The existing scheme for ensuring traffic control involves the full cooperation of the U.S. and Canada, with vessel movements reported to and controlled by "Fundy Traffic," a Canadian Vessel Traffic System (VTS) in St. John, New Brunswick. Canadian authorities require vessels destined for Canadian waters to provide a 96-hour notice of arrival. In addition, 24-hour advance notification to Fundy Traffic is required for all vessels transiting this area. Similarly, the National Vessel Movement Center in the U.S. requires a 96-hour advance notice of arrival for those deep draft vessels calling on U.S. ports. Once inside the VTS Fundy Zone, all vessels are required to both maintain voice contact with controllers and check in on designated frequencies at established way points. Fundy Traffic has radar coverage of the entire Bay of Fundy, but does not have visual or radar coverage inside Head Harbor Passage. Voice communication (VHF-FM), however, is maintained with vessels transiting to Eastport and/or the port of Bayside, New Brunswick. Insufficient radar coverage for this port area was an issue of major concern and debate during the PAWSA workshop and the recommendation was made that a radar repeater be installed on either Campobello Island, Deer Island, or in Eastport, ME, in order to provide full coverage.

Both Transport Canada and the U.S. Coast Guard administer Port State Control procedures. If a U.S. Port State Control boarding is required prior to a vessel entering a

[7] Maine Revised Statutes Annotated (M.R.S.A.) § 6205(1).
[8] *See* 25 U.S.C. §§ 1723(b), 1725(a), 1725(h).
[9] 30 M.R.S.A. § 6206(1).
[10] *See* Maine v. Johnson, 498F.3d 37, 45 (1st Cir., 2007).

U.S. port, the boarding would need to take place in U.S. waters, most likely at a point south of West Quoddy Head.

Deep-draft vessels bound for ports within the Passamaquoddy Bay port area transit a shared waterway system that includes Head Harbor Passage, Friar Roads, Western Passage, Passamaquoddy Bay, and the St. Croix River. Head Harbor Passage is exclusively Canadian waters, while Friar Roads, Western Passage, Passamaquoddy Bay, and the St. Croix River incorporate the international boundary between Canada (Province of New Brunswick) and the U.S. (State of Maine).

Those vessels currently bound for the Port of Eastport, ME, access U.S. waters through Head Harbor Passage and Friar Roads. Potential Downeast LNG carriers would continue on through Friar Roads and transit Western Passage before turning northwesterly near the mouth of the St. Croix River to arrive at the proposed terminal site.

Vessels bound for the Bayside Marine Terminal in New Brunswick follow the same basic route. They continue on through Western Passage, pass through the westerly part of Passamaquoddy Bay, and then transit about 6 miles up the St. Croix River.

Pilotage is compulsory for foreign vessels and U.S. vessels under registry in the foreign trade when in U.S. waters. All deep draft ships currently entering the shared waterway via Head Harbor Passage and thence transiting Maine waters to Eastport must employ a U.S. pilot. In contrast, there is currently no requirement under Canada's *Pilotage Act* or *Atlantic Pilotage Regulations* mandating compulsory pilotage for vessels transiting these same waters bound for Canadian ports. In practice, however, unlicensed Canadian pilots are employed on 90-95% of all vessels bound for the Bayside Marine Terminal in St. Stephen, New Brunswick. Of note, pilotage is compulsory for all deep-draft vessels bound for the port of Saint John, New Brunswick, which is accessed via the Bay of Fundy.

In May, 2006, a risk-based review was conducted of the St. Croix River and its approaches to determine if the current practice of non-compulsory pilotage should remain in place. The assessment was conducted under the auspices of the Atlantic Pilotage Authority (APA), the Federal Crown Corporation charged with pilotage services, to ensure the waters meet the standards of safety of Transport Canada and the Minister of Transport. Six recommendations resulted from the study:

- The waters and approaches to the St. Croix River to the port of Bayside should be designated as a Compulsory Pilotage Area.

- The APA should adopt as much of the existing pilotage infrastructure as possible.

- A review of existing "Fundy North" monitoring capabilities should be conducted with a focus on improving VHF radio coverage, radar, and Automated Information Systems (AIS).

- The establishment of "designated" anchorages in concert with the commercial fishing industry and in coordination with U.S. authorities.

- Review the location and adequacy of the navigational aids currently in use and add/upgrade aids as necessary to mark all areas posing a hazard to navigation. Update charts of the area, to include the conjoining waters of Head Harbor Passage and Western Passage, to reflect current stationing of all aids and location of any unmarked hazards to navigation.

- Recommend that the U.S. Coast Guard include consultation with the local U.S. pilots when conducting the next Waterways Analysis and Management System (WAMS) review.

Complementing the risk management study, the APA also conducted a review of its pilotage regulations in cross-comparison to those existing, informal procedures currently in practice. After close collaboration with the USCG, joint consensus was tentatively reached on jurisdictional concerns in order that APA's proposal for compulsory pilotage move forward. A proposed amendment to the Atlantic Pilotage Authority regulations has been drafted and is pending further Canadian regulatory review and public comment. The draft regulation respects U.S. sovereignty over its own waters, and the right of U.S. authorities to imposed pilotage requirements on vessels bound for U.S. ports.

At present, there are no designated "anchorage grounds" (anchorage areas subject to pertinent rules and regulations) directly within the Passamaquoddy Bay area. However, deep-draft vessels routinely anchor in the Bay of Fundy (outside of the transit corridor and to the north of Head Harbor Passage – dictated by water depth), inside the waterway south of Eastport in the vicinity of Friars Bay, and within Passamaquoddy Bay itself while waiting for dock availability, to avert traffic, or wait out adverse weather and/or unfavorable tide/current conditions. Along Head Harbor Passage and portions of Friar Roads, there are submarine pipeline and cable crossings that would also preclude vessel anchoring – these are adequately charted.

Specific anchorage criteria were developed by the LNG working group and are contained in Section 3.7.

3.5 LNG Carrier Simulation Tests

During the period July 27-31, 2006, a proof of concept evaluation was performed by Marine Safety International (MSI) at their facility in Newport, RI. The evaluation was conducted on full mission simulators with fifteen trial runs based on inbound vessel transits, ten outbound trips, and eight simulations dedicated solely to docking and undocking maneuvers. For the purpose of the tests, a full transit run was considered to start at the pilot boarding area in the vicinity of East Quoddy Head and conclude at the proposed single-berth terminal site in Mill Cove, Robbinston. All simulations were conducted in 'real time,' with a 34-mile round trip taking about 5 to 6 hours in duration.

In attendance were MSI personnel, Downeast LNG principals and associated engineers/consultants, Canadian and U.S. pilots, U.S. Coast Guard, Federal Energy Regulatory Commission, Transport Canada, Maine Port Authority, and maritime professionals (master mariners).

The objectives of the maneuvering studies were:

- Prove the feasibility of navigating a variety of LNG carriers up to 165,000 cubic meters for Downeast LNG on the planned transit route to its respective terminal site (East Quoddy Head to Mill Cove).
- Identify wind and current windows for transits and dockings.
- Evaluate arrival and departure maneuvers in the vicinity of the berths.
- Ascertain the adequacy of existing aids to navigation for day and night transits.
- Determine the number, size, and bollard pull of tractor tugs needed.
- Define tethering locations, speeds, and arrangements for the tractor tugs.
- Define wind and tidal current limitations for transits and docking operations.
- Determine the need for additional ATON and strategic locations for tidal current meters.

The full mission bridge simulations were conducted “real time” and focused on both basic normal operating conditions and more complex, challenging considerations, such as:

- Various mechanical failures (i.e., loss of rudder/steering, loss of propulsion).
- Emergency departures from the dock with limited tug assistance.
- Extreme/severe climatic conditions (tides/current/winds/fog).

Simulation runs were made using LNG carriers in the 125,000 to 165,000 cubic meter cargo carrying capacity range, and incorporated varying rudder and propulsion configurations. Downeast LNG has preliminarily designed its marine terminal pier to handle vessels approaching 220,000 cubic meter capacity with corresponding drafts of up to 39.4 feet and maximum length overall of 1,033 feet for potential, future expansion. MSI employed a three dimensional analysis for these tests, which included the use of the actual U.S. and Canadian pilots employed in the Passamaquoddy Bay port area. The full-mission bridge simulation provided the pilot(s) with visual cues of the surrounding areas as well as the handling/maneuvering characteristics of each size vessel undergoing testing. The pilots were able to anticipate changing waterway characteristics and varying

traffic conditions commencing at the pilot pickup area to the proposed berth, based on their experience and astute familiarity with the area. This "hands on" simulation strategy provided the pilots with exposure to the proposed LNG carriers, and correspondingly identified potential areas of concern, without compromising real-life safety.

Due to the strength of currents in the area, adequate tug/escort power was determined to be critical, especially during berthing and departure maneuvers. Up to four 60 ton bollard-pull tractor tugs were used to assist with transit, docking, and undocking operations throughout the simulations. The tugs were modeled with fully azimuthing propulsion units, allowing them to quickly change propulsion direction and manage the speed and steering of the LNG carriers, even under "dead-ship" conditions. For the vessel maneuvering analyses a variety of climatic settings were introduced to simulate predominate, seasonal conditions common to the Passamaquoddy Bay region. The simulator interjected varying weather and hydrodynamic conditions, to include current directions and speed, stages of ebb and flood tides, wind velocities and changing directions, wind gusts, and low-visibility factors. The injected variables ranged from normal/routine to extreme conditions. Simulations were also conducted based on worst-case scenarios in order to ascertain breakaway limitations and confirm tug capabilities. Each pilot was advised of the prevailing environmental factors at the beginning of each computer/simulation run, and he then made up the tugs in whichever fashion best suited him to meet the existing and/or expectant, emergent conditions.

3.5.1 General results of the simulations:

- LNG carriers in the projected design ranges (125-165K cubic meter capacity) can be successfully navigated through the channels and passages, and safely maneuvered into and out of the proposed terminal berth. This assessment is largely attributable to the area's naturally deep waters, relatively wide channels, and calculated employment of tugs.

- Four 60 ton bollard pull tractor tugs of 5,000 horsepower each are sufficient for assisting and escorting the design range of LNG carriers to the terminal. Tethered escorting from the pilot boarding area to the terminal is recommended.

- Tests proved that real-time measurements of current velocities and directions are needed and this data be made available to the pilots on a 24-hour basis. The pilots should designate where the current meters will be placed for maximum effectiveness.

- Transits are not recommended when there are sustained winds of more than 25 knots.

- Prior to any LNG carrier nighttime transits, further simulation tests need to be accomplished to further ascertain the suitability of the current ATON system to support non-daylight/restricted visibility operations.

- Additional tractor tug training is needed to ensure the pilots are fully familiar with the tugs' capabilities.

- Transiting the Cherry Islet to Dog Island area should be avoided on a flood tide and during those times when ebb tide currents exceed three knots.

- ATON placement and optimum operability were evaluated by the pilots. Recommended ATON changes included:

    1. Establishing a lighted buoy at Stovers Ledge to mark the shoal area.
    2. Adding a light to the Clark Ledge day beacon.
    3. Intensifying the luminosity of the Dog Island and Deer Island fixed aids.
    4. Relocating and lighting the UH4 buoy at Popes Island.
    5. Establishing a lighted aid on Kendalls Head.

The above is an abridged summary of the MSI simulation results and observations made by the pilots and observers. Within the parameters of those tests conducted, the simulated passages were relatively uneventful, even during virtual mechanical breakdowns and other simulated crises, as long as escort tugs were utilized effectively and the environmental window limits adhered to.

3.6 Transit Analysis and Traffic Study

Quoddy Bay LNG, an alternate firm proposing to build and operate an LNG facility approximately eight nautical miles downstream of the proposed Downeast LNG facility, retained Moffatt & Nichols International (MNI) to evaluate the impact of LNG carriers on the existing marine traffic within the passages and approaches to Passamaquoddy Bay. While specific to the Quoddy Bay planned operation, there were, nonetheless, several conclusions made in that study that lend themselves to both proposals and, therefore, considered relevant to this Report. *(Note: Although the FERC formally dismissed Quoddy Bay LNG's application effective October 17, 2008, the results of the MNI traffic study are still relevant, although perhaps to a lesser degree, in light of a third proposal now under consideration (Calais LNG).*

A computer simulation model was developed and a number of scenarios were run in order to estimate potential delays that could be encountered by other waterway users and to judge the distinct and cumulative impacts of LNG carriers on existing traffic. Scenarios and corresponding data more specific to the Quoddy Bay proposal have not been included for proprietary reasons.

For the purposes of this study the LNG vessel traffic pattern was determined based on the anticipated number of carrier arrivals at the terminal(s) per year. The traffic pattern for all other vessels was based on historical statistics. Climatic information and data was based on weather conditions prevalent for the region and season. The existing scheme for ensuring traffic control involves vessel movements reported to and controlled by the CCG (i.e., "Fundy Traffic"). As well, locally conceived cooperative agreements and transiting practices that exist between the U.S. and Canadian pilots were factors

considered, including an informal one-way vessel traffic scheme. It should be noted that specific operational parameters under consideration by COTP Sector Northern New England were not available at the time the analysis was conducted. Consequently, the simulation was carried out using a number of assumed risks and operating conditions based on input from the local pilots and rules and procedures germane to existing LNG operations. As well, fishing vessels and recreational craft were not factored into the study. The authors reasoned that there would be minimal impact to deep draft traffic due to the seasonal nature of recreational craft and the relatively limited numbers of commercial fishing vessels in operation.

General results of the study concluded that:

- Based on delays computed at key locations along the waterway, vessels transiting to Estes Head and Bayside would be slightly impacted. This would result in a small number of vessels experiencing longer delays in their in-bound transit through Head Harbor Passage and Western Passage.

- Vessels waiting to sail outbound would experience the largest impact. Statistics show that at the existing traffic level (no LNG carriers) 64% of the vessels experience a weather delay of up to 5 hours; 2% between 5 and 10 hours; and 1% experience even longer delays. With the introduction of about 62 LNG carriers, an additional 4% of vessel traffic will experience some form of delay; with the proportion of longer delays increasing, with an additional 6-7% experiencing delays exceeding 5 hours.

- When ferry traffic was incorporated into the simulation runs, using a factor of four crossings every hour throughout the day during the period of mid-June through mid-September, the calculations ultimately showed a ferry-crossing coinciding closely in time with an inbound or outbound LNG carrier transit approximately once every 1.5 days.

Quoddy Bay LNG recognized that, if both operations were to materialize, the cumulative consequences of LNG traffic serving the pair of facilities would have a further impact on regional marine traffic. Consequently, aside from its site-specific scenarios, a further simulation was run by MNI to consider the effect of both terminals operating simultaneously. For the purposes of this particular study, 63 Downeast LNG carriers, serving the proposed Mill Cove facility, were factored into the analysis. Results of this simulation run indicated:

- With both, the Downeast LNG terminal and Quoddy Bay LNG terminal operating, an additional 6% of vessels (as compared to existing traffic conditions) could experience some type of delay when outbound in the waterway. An additional 9% of vessels could experience delays that exceed 5 hours.

- With both facilities operating, an LNG carrier could conceivably cross a ferry route, in the proximity of an underway ferry, approximately once a day.

- The actual impact that LNG carriers will have on ferry traffic is dependent, to a certain degree, on the stand-off distances specified in any safety/security zone established by COTP Sector Northern New England.

The aforementioned simulation results are abridged and only provide a snapshot of the overall study. The full *Transit Analysis and Marine Traffic Study*, prepared by MNI, is contained in Appendix N to the Quoddy Bay LNG WSA.

3.7 Safety/Security Zones and Operational Parameters

Throughout the Waterway Suitability Assessment process the LNG workgroup identified a significant number of issues, concerns, and risks (ICR's) relating to the proposed project. The ICR's were categorized and distributed to ad hoc subcommittees for further consideration and recommended resolution. The subcommittees were comprised of USCG personnel, local officials, stakeholders, and members of the marine community having subject expertise in each of the respective areas. After considerable deliberation the subcommittees developed an inventory of perceived risks and corresponding mitigating measures for the USCG's review. "Operational Parameters" were then developed based on the ICR's and working group input. It was collectively agreed that these measures, once implemented by the COTP, would have a moderate to significant impact on reducing the potential for safety related accidents. Of note, a substantial number of the recommended measures paralleled the findings and conclusions of the Ports and Waterways Safety Assessment (PAWSA) that was conducted independent of the WSA review process. The following is a synopsis of the working group's efforts.

3.7.1 Safety and Security Zone Considerations

Early on in the assessment process, the COTP recognized that a considerable amount of confusion and misconception existed regarding the terms *safety* and *security zones,* and the respective enforcement action of each. In an effort to qualify the terms, COTP Sector Northern New England developed an overview and distributed it to the LNG working group membership to assist in the formulation of tenable operating parameters.

Overview: Interested parties have inquired as to the nature of potential USCG safety/security zones relative to the LNG facility siting proposals in Downeast Maine, and if imposed, the extent of the restrictions and who would have authority to enforce these limitations. This discussion below explains this authority.

The USCG has the responsibility of safeguarding the nation's ports, waterways, port facilities, vessels, persons, and property in the vicinity of the port, from accidental destruction, damage, loss, or injury. In order to protect the navigable waters and adjacent shore areas of the U.S., minimize death, personal injury and property loss, and prevent pollution of the marine environment, the COTP administers multi-mission Marine Safety and Security and Marine Environmental Protection Programs by enforcing federal laws and regulations.

The statutory authority to enforce these laws and regulations is derived from a number of sources, but primarily the Ports and Waterways Safety Act (PWSA) of 1972, 33 USC 1221 *et. seq*. Using this authority, the COTP may, when safety, security, or other national interests dictate, establish certain access areas to control the movement of any vessel, vehicle, or person in, or on, the navigable waterways and adjacent shorelines. A control mechanism commonly used to safeguard navigation, vessels and facilities, and to protect the marine environment includes the setting and enforcement of safety zones.

Regulations applicable to safety zones are codified in 33 Code of Federal Regulations (CFR) Part 165.

A safety zone is a water area, shore area, or combination of water and shore areas to which, for safety and/or environmental protection purposes, access is limited to persons, vehicles, or objects specifically authorized by the COTP or U.S. Coast Guard District Commander. No person may enter a safety zone, remain in a safety zone, or allow any vehicle, vessel, or object to remain in a safety zone, unless authorized by the COTP or the District Commander. Additionally, each person in a safety zone, who has notice of a lawful order or direction, must obey that order or direction, under penalty of law. A safety zone may be described by fixed limits, or it may be a specified zone around a vessel in motion. Safety zones may be established as temporary measures, such as in response to an emergency situation, or they may be established for indefinite periods, such as along the waterfront and shore area of a high-risk waterfront terminal or facility.

Security zones are another control mechanism available to the COTP. Security zones are designated areas of land, water, or combination of land and water, established for such time as necessary to prevent damage or injury to any vessel or waterfront facility; to safeguard ports, harbors, or waters of the United States; or to secure the obligations of the U.S. Security zones are established under the authority of the Ports and Waterways Safety Act, see 33 CFR Part 165, Subpart D; the Magnuson Act, as reflected in 50 USC § 191 and 33 CFR § 6.04-6; or both. Security zones are primarily used for national security interests rather than strictly for safety considerations. To achieve heightened security postures, combinations of safety and security zones are often being employed when the need dictates.

The establishment and enforcement of controlled access areas, such as safety and security zones, are not arbitrary measures. They are established through the federal rulemaking process and must be published in the Federal Register. Rulemaking of a non-emergency nature, as in the case of long term LNG siting proposals, requires the opportunity for public comment. This process provides “constructive legal notice” to the general public and the maritime community as to the rulemaking’s existence and legal enforceability and provides an opportunity to shape the rule in such a way that makes sense for the local area.

Historically, safety and security zones have been control mechanisms employed by COTPs to ensure the safe navigation of vessels transiting U.S. waters carrying bulk products such as liquefied petroleum gas, liquefied natural gas, explosives, and other dangerous articles. Safety/security zones serve important dual purposes. A level of safety is provided to the transiting vessel by minimizing waterway congestion, and a layer of protection is afforded to the surrounding port community through the reduction in casualty risk.

It should be noted that all safety and security zones are site specific and the conditions and parameters of each are solely dependent on the surrounding and/or extenuating conditions. For example, the stand-off distances cited in a safety zone may vary significantly from one waterway to another, depending on local circumstances, cargoes carried, and other needs identified. What does not change, for U.S. safety/security zones, is that only the USCG COTP has authority to determine who may enter a zone, and under what conditions. The COTP may delegate that authority to lawful designated on-scene representatives, who are usually USCG personnel. In Maine and New Hampshire however, under a memorandum of agreement (MOA) with each respective state, the Maine and New Hampshire Marine Patrols may also enforce U.S. Coast Guard safety/security zones.

The USCG's jurisdiction is limited to U.S. navigable waters and its territorial seas (for the purposes of this part of the regulations). Obviously then, COTP Sector Northern New England does not have the authority to establish and/or enforce a safety and/or security zone in Canada's, or any other country's, waters. In the case of the Passamaquoddy Bay proposals, a significant portion of the transit route intended for use by transiting LNG carriers to reach proposed LNG terminals in Maine is contained entirely in Canadian waters. As well, much of the proposed transit route straddles the international boundary. Due to the international maritime boundary and distinct jurisdictional authorities of the U.S. and Canada, bilateral discussions, coordination, and procedures will be necessary relative to the setting and enforcement of complementing safety and security regimens.

3.7.1.1 Safety Zone

Taking the above factors into consideration, coupled with regional concerns, the collective group formulated a recommended safety zone. In arriving at its recommendation, a number of factors, assumptions, and expectations were deliberated. These included:

1. The USCG should establish and enforce a safety zone around LNG carriers while they are underway in U.S. navigable waters within the intended transit route for the safety of transiting and moored deep-draft vessels, excursion boats and ferries, commercial fishing craft, recreational boats, and the surrounding maritime communities.

2. A safety zone around an LNG carrier would result in a moderate reduction in risk in the event a navigation safety accident did occur and resulted in a breach of the LNG containment.

3. The size of the safety zone should not be smaller than the Sandia calculated Zone 1, which for 250,000 cubic meter range LNG carriers is approximately 0.43 miles (750 yards) and for 148,000 cubic meter range carriers about 0.31 miles (547 yards). This is consistent with the Sandia Report's findings and guidance provided in NVIC 5-05.

4. The narrowest portion of the transit route, which is approximately 1000 yards in width, is at the confluence of Head Harbor Passage, Friar Road, and Western Passage, between Dog Island and Deer Island. The second narrowest point between land masses occurs in Head Harbor Passage between Casco Bay Island and Head Harbor and measures approximately 1,200 yards wide; however, this is entirely within Canadian territorial waters.

5. The safety zone should extend sufficiently far ahead of the LNG carrier to reduce the potential for a close-quarters situation between the carrier and small craft, e.g., kayaks, sail boats, other small recreational craft, and commercial/fishing vessels. It should also be sufficiently large to reduce the risk of collision with other vessels, such as ferries, crossing ahead of the carrier. For example, a small craft moving at 2 knots would require approximately 7 ½ minutes to transit from the center of the channel to the outer edge of a 1000 yard diameter safety zone. During this same period an LNG carrier moving at 10 knots (which was the upper speed assumption employed during the simulation trials) would travel approximately 1 ¼ nautical miles, depending on current direction and velocity. At these rates, the small craft would arrive at the outer edge of the safety zone concurrent with the LNG carrier's passing. Therefore, a safety zone extending 2 nautical miles ahead of the carrier would provide a small craft moving at 2 knots adequate time to move out of the channel well in advance of the LNG carrier's passing. Likewise, this distance also provides adequate separation space for vessels that cross the transit path.

6. The distance the safety zone extends astern of the carrier should be sufficient to prevent vessels from crossing too close astern, as well as to ensure that tugs following and/or tethered astern have room to maneuver in the event that the LNG carrier loses steering or propulsion.

7. Examples of **safety** zones currently in place around LNG carriers while they are underway in other U.S. ports are:

    - Boston Harbor, MA: 2 nautical miles (NM) [4,000 yards] ahead, 1 NM (2,000 yards) astern and ¼ NM (500 yards) abeam (on each side).

    - Chesapeake Bay, MD: ¼ NM (500 yard) radii around the LNG carrier.

- Savannah River, GA: 2 NM (4,000 yards) ahead and astern for all vessels greater than 1600 gross tons. Vessels less than 1600 gross tons may be allowed in the safety zone provided they maintain a safe distance (minimum 70 yard approach limit), as determined by the COTP.

- Lake Charles, LA: 2 NM (4,000 yards) ahead, 1 NM (2,000 yards) astern, and the width of the shipping channel on either side.

- Long Island Sound, NY/CT (proposed facility): 2NM (4,000 yards) ahead, 1 NM (2,000 yards) astern, and 0.37 NM (750 yards) on each side of the carriers.

- Piscataqua River (Portsmouth/Newington, NH – Liquefied Petroleum Gas (LPG) cargo carried within COTP Sector Northern New England zone): 1 NM (2000 yards) ahead, ¼ NM (500 yards) astern, and ½ NM (1000 yards) abeam each side of the carrier.

Therefore, taking all factors into consideration the recommended moving Safety Zone for Passamaquoddy Bay would be: 2 NM (4,000 yards) ahead, 1 NM (2,000 yards) astern, and ¼ NM (500 yards) abeam (each side) of the carrier, assuming a maximum LNG carrier transit speed of 10 knots.

3.7.1.2 Security Zone

As with the safety zone, a number of factors were deliberated by the LNG Working Group during the formulation of a recommend security zone. These included:

1. The USCG should establish and enforce a security zone around LNG carriers while they are underway in U.S. navigable waters within the intended transit route. It should be noted that the purpose of the security zone is to protect the LNG carrier from external threats. Public safety and navigation concerns are addressed through the use of a safety zone, as aforementioned above.

2. Based on the assessment of potential risks to the LNG carrier the minimum size of the security zone should be a 500 yard radius around the moving vessel. This distance is based, in part, on existing DoD set-back requirements for U.S. naval vessels.

3.7.1.3. Combined Safety and Security Zone for Vessel Transits

Although the terms safety and security zones are often used interchangeably, safety and security zones are established using different statutory authorities and are intended to accomplish different purposes. Simply stated – safety zones are intended to protect what is outside of the zone from what is inside; whereas, security zones are intended to protect what is inside from what is outside.

In contrast to the purpose of a security zone, the purpose of the safety zone is to protect the public and marine transportation system from the hazards associated with a breach of the LNG carrier's tanks. Therefore, to ensure both the security of the LNG carrier and the general safety of the public, the necessary security zone should have dimensions of the greater of the two – in this case, the safety zone. In other words, the moving zone would be considered to be a combined safety and security zone, and would have the dimensional boundaries of the above recommended safety zone.

The burden of having to adjust traffic patterns/schedules on ferries and other non-LNG related traffic, both commercial and recreational, should be minimized as much as possible. To put the recommended combined safety & security zone into prospective, the time it would take for the total zone of an LNG carrier traveling at an estimated speed of 10 knots to pass any given point would correspond to about 18 minutes.

For efficiency, LNG vessels always maintain a small percentage of cargo in their tanks, termed *heel,* in order to keep the cargo tanks and lines in a refrigerated/liquefied state and ready for the next loading. (*No cargo refrigeration system is employed on LNG vessels*). Consequently, as they are not in an inert or gas-free condition, escort requirements and safety/security zones would continue to apply as determined by the COTP.

3.7.1.4. Safety and Security Zone around Moored LNG Carriers

Assuming the same DoD setback parameters as applied to U.S. Navy Protection Zones, the minimum security zone surrounding an LNG carrier while berthed should be no less than 500 yards. Although the LNG carrier is no longer moving and is moored at a terminal pier/berth, there are still inherent fire risks involved during the transfer of cargo that could substantially impact the surrounding population and infrastructure; therefore, a safety zone needs to be set and enforced to mitigate the overall risk factor. In addition, a security zone is needed to protect against subversive acts.

Examples of fixed **safety/security** zones currently in place around liquefied gas carriers while they are moored pier side in other U.S. ports include:

- Boston Harbor, MA: 400-yard radius while at the dock (increased from a previous 150 feet requirement).
- Chesapeake Bay, MD: 500-yard radius around the berthed vessel.
- Savannah River, GA: 70-yard radius around the vessel while transferring cargo.
- Lake Charles, LA: 50 feet beyond the carrier.
- Long Island Sound, NY/CT (proposed): 1,210 yards around the floating LNG storage and regasification unit (FSRU).
- Piscataqua River, NH: 500-yard radius while the (LPG) carrier is moored at the receiving terminal.

Taking all factors into consideration, the recommended size of the fixed safety/security zone for an LNG carrier berthed at the Downeast LNG terminal would be a 500-yard radius around the moored vessel. Of significance, the distance from the proposed pier-end to the center of the typical commercial vessel track line is approximately 1,200 yards.

This distance figure does not take into account the average beam of a berthed LNG carrier or attending, standby tug.

3.7.2 Assist/Escort Tugs

Preliminary transit runs and docking maneuvers were simulated at Marine Safety International. The simulation tests validated specific tug operating characteristics needed to ensure maximum maneuverability during transits under varying hydrodynamic conditions, adverse weather, and emergency/casualty situations (such as steering/rudder failure and/or loss of propulsion aboard the carrier). Based on these simulations and expertise of the attending pilots, the following escort tug criteria were determined:

- Three to four tractor tugs (depending on carrier size), having azimuthing propulsion units (ASD) rated at a minimum of 5,000 HP, with 60-70 metric ton bollard pull ahead, and 65 metric ton astern, are required to satisfy the entire range of LNG carriers being considered. LNG carriers ranging from 125,000 to 165,000 cubic meter capacity were used in the simulations. For vessels at or below 125,000 cubic capacities, 60 ton bollard pull ASDs were deemed adequate.

- One tug should be made up (tethered) at all times during the transit to berth in the event of a sudden loss of steering or propulsion in order to prevent a collision, allision, or grounding. Tug stationing/arrangements will be as per the attending pilot.

Bulk carriers and break-bulk freighters proceeding to the Bayside Terminal in New Brunswick could potentially pass three moored LNG carriers (two at the proposed Quoddy Bay LNG facility and one at Downeast LNG) at relatively close quarters (less than 1,000 yards separation distance). Historically, vessels currently plying the region and carrying aggregate and other less-valued cargo per ton, by the very nature of their services, may be older and less than optimally maintained. These vessels currently transit the waters without tug assistance and/or escort. A mechanical breakdown, such as sudden loss of steering and/or propulsion, could potentially result in an allision with one of the berthed LNG tankers during cargo offload, resulting in a serious casualty. In order to afford an additional margin of safety, it is therefore deemed prudent to require a standby tug be moored outboard, and at the ready, of all berthed LNG vessels.

- One tug must be on immediate stand-by and moored outboard of the berthed LNG carrier at all times the vessel is at the receiving terminal for emergencies.

- In addition to the determined assist/escort tugs, LNG carriers should also be escorted into and out of “port” by USCG and/or USCG authorized assets, as determined by the COTP.

3.7.3 Marine Firefighting Capability

In addition to the onboard firefighting capabilities of the LNG carriers, which must comply with the requirements established by the International Gas Carrier Code, the

assist tugs are to be equipped with firefighting equipment that meets the International Association of Classification Societies (IACS) "Fi-Fi 1" notation.

The National Fire Protection Association (NFPA) also requires similar criteria for towing vessels in order that they are Class 1 certified. This requirement is outlined in its publication NFPA 1915 – *Standard on Marine Fire-Fighting Vessels*, which addresses the construction of marine fire-fighting vessels and contains criteria on a wide-range of specific standards including outfitting, stability, propulsion, auxiliary machinery, electrical systems, fire pumps and fire-fighting equipment.

It is logical to expect shore-based fire departments to also have appropriate training and equipment to respond to a LNG fire/emergency. Among the local fire departments that would be responsible to respond, none have any LNG capability or significant marine firefighting resources.

3.7.4 Marine Traffic, Anchorages, and Boarding Areas

An LNG carrier transiting to the proposed Downeast LNG terminal site requires an indirect route through Canadian waters, and then follows the international boundary throughout the Passamaquoddy Bay approaches. The transit time would approximate two and one half to three and one-half hours in duration. The existing scheme for ensuring traffic control involves the full cooperation of the U.S. and Canada, with vessels over 20 meters in length and/or over 500 gross tons falling under the operational control of Saint John, New Brunswick Traffic Control (Fundy Traffic). All deep draft vessel movements are reported to and controlled by Fundy Traffic, and are subject to Canadian Shipping Act traffic services, zones, regulations, and requirements. Vessel movements are coordinated though local cooperative agreements among the U.S. and Canadian pilots, Fundy Traffic, and an informal, one-way traffic scheme.

There are distinct differences in how the U.S. perceives and addresses the risks of LNG safety and security as compared to Canada. Under the Canadian Shipping Act and other authorities LNG carriers frequenting Canadian ports are usually subject to routine Port State Control procedures only. For LNG vessels destined for U.S. ports though, standing USCG policy and pertinent federal regulations require specific safety and security functions be performed to responsibly manage and reduce the risk to public safety.

Downeast LNG is anticipating approximately 53 carriers per year, in the 70,000 to 165,000 cubic meter range, to meet their anticipated maximum throughput of 500 million standard cubic feet per day (mmscfd). This number is an average figure, as the actual amount will vary depending on the vessel sizes and cargo carrying capacities of each.

Although this WSR is Downeast LNG specific, for comparison sake, Quoddy Bay LNG anticipates approximately 180 LNG carrier arrivals per year (for its first year of operation) in order to maintain its maximum anticipated throughput of 2 Bcfd and Calais LNG estimates approximately 54 vessel transits. When combined with current numbers of deep draft arrivals, the prospective total for the port area climbs from 125 to about 380, equating to a three-fold, or tripling, of the current deep-draft traffic flow. To put this

anticipated change into perspective, on the average the port area currently experiences arrivals at the rate of one vessel every 3 days. With the addition of LNG carriers (assuming the Downeast and Quoddy Bay proposed facilities receive approval), the average number of arrivals would potentially increase to over one vessel arriving per day. Although the FERC formally dismissed Quoddy Bay LNG's application, Quoddy Bay LNG has indicated that it intends to re-file at a later date; therefore these figures are considered relevant for cumulative considerations. Should the Quoddy Bay LNG facility not materialize and the Downeast LNG and Calais LNG go into operation the average annual vessel arrivals for the port area would equate to about one vessel per day.

Current practice employs informal one-way traffic patterns for deep-draft transits. This would be strictly enforced whenever LNG carriers are moving; i.e., there would be no meeting or passing situations authorized.

At the discretion of the attending pilots and in consultation with vessel masters and Fundy Traffic, all vessel transits will be on a first-come, first-served basis. Inbound vessels should have priority over outbound.

Loaded, inbound LNG carriers transiting Head Harbor Passage and Western Passage must maintain ample separation distance and uphold, at a minimum, the safety and security zone parameters. The intent of this limitation is to preclude the possibility of incurring overtaking situations or causing the need for non-LNG vessels to hold at, or anchor in, Friar Roads.

There are presently no *designated* anchorages; however, three routine anchorages exist for the area: one located in the Bay of Fundy (controlled by Fundy Traffic) outside of the transit corridor and to the north of Head Harbor Passage; one inside the waterway in the vicinity of Friars Bay southeast of Eastport; and one inside Passamaquoddy Bay. LNG vessels will not be allowed to anchor in Friar Roads while waiting for a berth – anchoring or holding under this circumstance must occur offshore. Non-LNG vessels may anchor in, or hold at, Friar Roads while waiting for a vessel proceeding in the opposite direction to transit Head Harbor Passage or Western Passage.

With the exception of temporary boarding areas established by and for USCG authorized resources, the anchoring or holding of LNG vessels within Friar Roads is limited to emergency situations only, such as major mechanical malfunctions and reduced visibility consequent to non-forecasted, abrupt weather changes (fog, squalls, etc.), and/or as directed by, and in consult with, the COTP.

Presently, through locally conceived, informal agreement, U.S. pilots board the majority of deep-draft vessels bound for Eastport in Canadian waters, in the vicinity East Quoddy Head. LNG vessels are designated Certain Dangerous Cargo (CDC) carriers and as such, specific safety inspections and security precautions must be undertaken prior to entering port. These USCG boardings would need to take place in U.S. waters.

3.7.5 Environmental Controls

Loaded or partially loaded LNG carriers (inbound) would only be allowed to transit U.S. waters during daylight hours. Daylight is interpreted as "Civil Twilight" in which the sun may be below the horizon but the "Horizon is clear and larger stars visible". (*Dutton's Navigation and Plotting*). In practical terms, the horizon, shoreline, and receiving berths must be clearly seen with natural light.

Inbound fully or partially laden LNG transits can only begin if there is sufficient time to arrive in the Cherry Islet to Dog Island area near slack tide due to the unpredictability of tide and current patterns in that vicinity. As a general policy and as per the pilots' recommendations and prevailing practice, all transits should be conducted at high slack water or on an early ebbing tide. Transits through the Cherry Islet and Dog Island area should always be avoided on a flood tide and as well, on an ebb tide when currents are in excess of three knots.

Likewise, outbound "empty" LNG transits can only begin if cast-off is within a period of time that permits the carrier to be in the vicinity of the Cherry Islet to Dog Island area during slack tide and there is no vessel departing the port of Bayside and/or deep draft vessels inbound Head Harbor Passage or transiting Western Passage that could possibly result in a meeting or overtaking situation.

Prior to conducting nighttime transits of the area, nighttime conditions should be simulated to best appreciate the suitability of current aids to navigation for nighttime operations.

Depending on the outcome of the simulation tests, outbound, or "empty" (with "heel" allowance) LNG carriers *may* (in the future) be allowed to transit after sunset during periods of fair weather and clear periods of unrestricted visibility (actual and forecasted) upon concurrent agreement between the attending pilot(s) and the COTP. The minimum visibility limits must be commensurate with combined safety and security zone distance parameters.

A minimum of two nautical miles of visibility is required for the movement of LNG vessels in U.S. waters. In marginal weather conditions visibility can vary significantly along the route. The decision as to whether sufficient visibility exists, and is likely to continue for the duration of the transit, is a judgment call to be made jointly by the attending pilot(s) and Fundy Traffic in consultation with, and concurrence by, the COTP.

Wind: 25 knots is the maximum sustained wind speed (ascertained during the simulation tests), as measured on the vessel, in which an inbound or outbound transit shall commence. As with visibility, significant variation in wind conditions can exist along the route, and the decision as to whether wind conditions permit a safe transit will be made by the pilots in consultation with, and concurrence by, the COTP.

3.7.6 Communications, Radar, and Aids to Navigation

As identified during the PAWSA process, the existing communications network (and associated interoperability) is marginal for the port area. As well, regional radar coverage is very limited. Fundy Traffic has radar coverage in the Bay of Fundy, but does not have visual or radar coverage once inside Head Harbor Passage. Upgrades to the current navigation systems and/or acquisition of new technology, such as Physical Oceanographic Real-Time System (PORTS), Differential Global Positioning System (DGPS), and closed circuit television (CCTV), that are cross-border compatible and jointly supported, are needed to ensure safe transits of the carriers and for the safeguard of all water-way users and abutting shore-side communities along the intended route. Without navigation safety system expansion and/or increased coverage, additional operational parameters may need to be considered and implemented accordingly.

The PAWSA and MSI simulation trials also identified several locations within the port area waterway that require the placement of additional navigational aids and/or modification to existing ones in order to better mark obstructions and enhance the pilots' capabilities. These include establishing a lighted buoy to mark Stovers Ledge; adding a light to the Clark Ledge day beacon; intensifying the power of the Dog Island and Deer Island fixed aids; placing a lighted aid at Clam Cove Head; relocating and lighting the HU4 buoy at Popes Island; and establishing a lighted aid on Kendall Head. With the exceptions of the Dog Island aid, Clark Ledge beacon and Kendall Head marker, the manufacture, placement, and servicing of the remaining aids fall under the authority of the Canadian government. It would be helpful if the applicant could establish that the CCG would undertake to make the recommended modifications to its waterway infrastructure in support of LNG and other deep-draft traffic

4.0 Risk Assessment and Management Strategies

Based on a review of the risk factors identified during this assessment and the PAWSA Report, it was concluded that it will be necessary to implement mitigation measures to effectively manage potential risks to navigation safety, security, and environmental impact if FERC does approve the proposed Downeast LNG project and it is subsequently constructed and operated. Mitigation measures generally fall into one of two categories: prevention and consequence management. Whereas prevention seeks to avoid an accident, consequence management seeks to reduce the negative impacts should an accident or incident occur.

As part of the WSA process, a safety and security risk assessment was performed. The analyses were based, in part, on data collected during site and location visits, interviews conducted with area stakeholders, and information gleaned from, and in support of, the FERC Resource Reports. Safety and security measures that are currently in place that help mitigate the associated risks were identified and quantified. Where the identified risk appeared to not have sufficient resource capability to adequately offset or diminish the consequences, a gap was identified and alternate mitigation strategies explored.

The focus of the risk assessment was on the identification of potential measures for mitigating risks associated with either a navigation safety accident or a terrorist attack against the LNG carrier. Downeast LNG performed and documented its safety risk assessment and analyzed security risks utilizing the USCG Risk-Based Decision-Making (RBDM) Guidelines. These assessments used the thermal hazards associated with the respective accidental and intentional zones of concern contained in the Sandia Laboratories Report to describe the expected consequences of large releases of LNG from a carrier onto the water.

In addition to the plotting of Zones of Concern, NVICs 05-05 and 05-08 also require the development of risk assessment scenarios and management strategies to correspond with the calculated zones. Downeast LNG's WSA contained a comprehensive inventory of potentially strategic scenarios and corresponding, well-conceived risk reduction measures. These scenarios took into consideration a number of assumptions on which the overall mitigation strategies were based. Included in the study were parameters and assumptions such as waterway boundaries, carrier size and capacity for the defined hazard zones, potential for vessel groundings, collisions and allisions, hazards consequential to spill/release scenarios, potential vulnerabilities, security risks, existing safeguards, and terrorist-related attacks and activities, among others.

For the purpose of the safety and security assessments, Downeast LNG made the favorable assumption that Canada and the United States would reach joint agreement and bilateral consensus regarding the employment of safety, security, and response capabilities for the protection of the vessel, its crew, and communities and other interests along both sides of the transit route. However, Downeast LNG has not been able to demonstrate that it will be feasible to achieve this level of cooperation. Consequently, in response to Coast Guard initiated data requests disseminated by FERC, alternate safety, security, and mitigation strategies were submitted for further consideration and validation.

Downeast LNG's risk-based assessment methodology suggests that the likelihood of accidental releases and/or threats of intentional interference are relatively low. Its assessment was based on the relative remoteness of the area, virtual width and depth of the transit route, comparative absence of national iconic and/or critical infrastructure, and reduced population densities more common to heavier industrialized and strategically located urban port areas. Nonetheless, potential consequences, albeit proportionately less for the Passamaquoddy Bay port area, do exist. Consequently, COTP Sector Northern New England, in coordination with FERC, will require specific risk reduction measures as outlined throughout this Report.

4.1 Risk Assessment Scenarios

Following the guidelines contained in NVIC 05-05, Downeast LNG applied the Risk Management Quick-Reference Tool in conjunction with the Sandia Report to develop an inventory of safety and security scenarios. After overlaying the calculated Zones of Concern along the proposed transit route, the scenarios were then analyzed to determine the likelihood and severity of risk. Based on the potential impact, resource needs were

then considered to identify and recommend scalable prevention, mitigation, and response strategies necessary to support the proposed operation. A summary of identified concerns, needed resources, and recommended actions was then provided in the WSA. Scenarios were categorized under the headings *Prevention, Mitigation, Potential Prevention, and Potential Mitigation*, with applicability assigned to *Safety* and/or *Security*. A brief discussion of each risk-reduction measure/strategy (existing and/or proposed) was provided, along with corresponding recommendations for each. An abstract of the specific security-related findings is contained in the separate, sensitive Security Supplement of this Report; an overview of the safety-related recommendations is as follows:

- 33 *Prevention* measures were considered, with 21 being related to safety, 30 to security, and 15 applying to both. Examples include the application of or requirement for:

    1. Safety and Security Zones, Notice of Arrivals, Port State Control Programs, pre-arrival safety and security boardings, Broadcast Notice to Mariners, and standards prescribed by international classification societies.

    2. International conventions and protocols such as Standards of Training, Certification and Watchkeeping (STCW), International Safety Management (ISM) Code, Vessel Automatic Identification Systems (AIS), and standards for the design, construction, and operation of LNG carriers under the International Maritime Organization (IMO).

    3. Vessel escorts, vessel traffic management, enhanced Aids to Navigation, mandated pilotage, formalizing one-way traffic, and the development of bilateral safety regimens.

- 15 *Mitigation* measures were considered, with all of them related to combined safety and security. Examples include:

    1. Utilization of escort vessels in numbers and capabilities as determined in the simulation testing.

    2. Application and enforcement of Safety and Security Zones, or their equivalent, in both U.S. and Canadian waters.

    3. Development of emergency response plans; national, regional, and local emergency contingency plans; regional and local incident management plans; and creation of a regional crisis alarm/notification system.

    4. Regional and local emergency preparedness and response training, drills and exercises, and marine firefighting training.

- 11 *Potential Prevention* measures were considered; 6 applied to safety, 11 to security, and 6 applied to both. Examples included:

    1. Establishment of a USCG Regulated Navigation Area (RNA).

    2. Use/establishment of a regional harbormaster and/or port traffic controllers.

    3. Development of a remote maritime surveillance system; increased harbor patrols by Federal, State, and private assets; utilization of aerial surveillance; and

employment of law enforcement personnel (armed with either lethal or non-lethal weaponry depending on jurisdictional authority) aboard LNG carriers.

- Six *Potential Mitigation* measures were considered; five applied to safety, six to security and five to both. Examples included:

  1. Development of an interoperable communications system.

  2. Periodic incident management training and exercises for local, state, and provincial officials.

  3. Development and implementation of an LNG gas cloud ignition system commensurate with applicable procedures and acceptable parameters.

  4. Implementation of a rapid civil emergency advisory system (audible alarm, radio, TV, etc., as well as a community awareness protection program in the event of an LNG release (i.e., shelter in place procedures).

- In summary, findings and/or *Recommendations* drawn directly from the risk management and resource needs identification processes employed by Downeast LNG and listed in Part D of their respective WSA include:

  1. The safety and security scenario inventory revealed that there are risk-reduction measures currently in place that promote the safe transit of LNG carriers along the proposed route.

  2. The development and implementation of many of the proposed mitigation measures would reduce the risks associated with the marine transportation of LNG.

  3. Due to the relative remoteness of the projected site and associated waterway, current law enforcement, fire fighting, medical and emergency response capabilities are inadequate to capably respond to a shipboard casualty involving a cargo of LNG.

  4. A form of bilateral agreement with Canada is necessary in order to promote and implement:

- A mechanism for the setting and enforcing of safety and security zones (or equivalent) in Canadian waters.
- The development of Safety and Security Communications Plans.
- Formalized vessel traffic management throughout the transit route.
- Community programs for safety/security awareness along both sides of the shared waterway.
- Joint training and exercising programs to enhance safety, security, and response capabilities.
- The establishment of general marine and LNG-specific firefighting and incident management training for shoreside firefighters; and revision of local contingency plans to address joint response strategies.
- The establishment of vessel positive control procedures.

- The implementation or acknowledgement of established Maritime Security (MARSEC) Levels and Department of Homeland Security (DHS) Advisories.
- The recognition of USCG established Regulated Navigation Areas.
- The possible utilization of private security force assets.
- Emergency communications compatible with Canadian emergency response agencies.
- The implementation of natural gas cloud ignition systems and procedures for New Brunswick communities.
- The implementation of rapid civil emergency advisory systems to cover the New Brunswick populace.

4.2 Environmental Protection and Response

An accidental spill or release of LNG consequent to a marine casualty or intentional act could pose potential hazards to the public, waterway, and surrounding environment. The nature and severity of the spill, climatic and sea conditions, and whether or not oil pollutants were also spilled are all factors that must be taken into consideration in order to mount a rapid and effective response.

An environmental response protocol is in place between the U.S. and Canada for spills of oil and other noxious substances. The original Canada-United States Joint Marine Pollution Contingency Plan (JCP) was developed to cover the Great Lakes; subsequent geographic annexes have since been added to cover all waters of U.S/Canadian mutual interest where the use of combined resources would improve the response posture and capability of each nation. The Atlantic Geographic Annex to the JCP applicable to the Passamaquoddy Bay region is known as CANUSLANT. CANUSLANT is tested regularly and improved by way of biennial exercises, under coordination of the U.S. USCG, District 1, and CCG, Atlantic Maritimes Region. CANUSLANT also recognizes the rights of U.S. Tribes and Canadian Aboriginal people, and even applies when only one country is affected, if the incident is of significant magnitude to require assistance from the other country.

The primary objectives of CANUSLANT are to:

- provide a joint cross-border mechanism for a coordinated and integrated response by both nations;
- establish a Canada-United States Joint Response Team (JRT) for the Atlantic region under co-leadership of the CCG and the USCG;
- if needed, establish and set up a Joint Command Post (JCP);

- ensure timely notification of cross-border incidents and the accurate transmission of information between responders, and the general public and media;

- facilitate the safe and timely flow of personnel, equipment, and supplies across the international border; and

- complement the Canada-U.S. Joint Inland Pollution Contingency Plan, and its CANUSEAST operational supplement, if needed.

It should be noted that the JCP provides for a coordinated response to "Harmful Substance Incidents," a broadly defined term that encompasses much of the domestic pollution response authority held by the two Coast Guards. CANUSLANT may be invoked when a harmful substance incident presents an imminent and substantial risk to public health and welfare, and/or poses potential danger to the environment on either side of the maritime international boundary. The definition of "harmful substance" is relatively wide-ranging and subject to both Canadian and U.S. laws and regulations. *Harmful substance* includes, but is not limited to, substances subject to control by a number of both national and international conventions and protocols such as the International Convention for the Prevention of Pollution from Ships (more commonly known as MARPOL 78), Federal Water Pollution Control Act, as amended, and the Oil Pollution Act (OPA) of 1990, just to name a few. Conceptually, CANUSLANT provides for a strong and coordinated response regime to combat a noxious substance and/or petroleum-based spill.

There have only been a few vessel-related accidents or allisions reported in the Passamaquoddy Bay area. The only commercial shipping accident in recent memory was on January 12, 2008, when the empty bulk carrier ALEXANDERGRACHT suffered a temporary loss of propulsion in Head Harbor Passage (Canadian waters). The ship was safely anchored in Head Harbor Passage, where the engine failure was quickly diagnosed and temporarily repaired. The vessel was able to continue to its berth at Estes Head, where final repairs and regulatory verification were conducted. The case did not impact navigation or result in any pollution. Additionally, PAWSA workshop participants were aware of only a couple of commercial fishing vessel groundings in the recent past, and a review of USCG records did not reveal any significant marine casualties involving deep draft vessels. According to the local pilots, over 2,400 deep draft vessels have safely transited the waterway during the past 25-year period without major incident or pollution. As typical for an area lacking a large industrial base and metropolitan setting, the region is currently not currently prepared to accept LNG carriers. The extent and nature of the resources, training, and equipment necessary to address emergency response, safety, and security, have yet to be fully determined.

4.3 Consequence Management

Concerns related to emergency response and marine firefighting have been consistently raised by the general public, representatives of emergency response organizations, and elected officials on both sides of the international border throughout the process of identifying and assessing potential risks associated with the Downeast LNG proposal. As

noted during the PAWSA, there are currently very limited resources immediately available to respond to a large marine fire along the current transit route. The consensus of the LNG Working Goup and AMSC subcommittee was that, if the Downeast LNG proposal is approved by FERC, it is imperative that issues relating to emergency response and marine firefighting be addressed during the development of the emergency response plan required by Section 311 of the Energy Policy Act of 2005. Additionally, bilateral arrangements to ensure appropriate cross-boundary emergency response capabilities under the existing CANUSLANT agreement would be required.

4.4 Resource Identification and Needs

The area along the proposed transit route presents a number of significant response challenges due to the relative remoteness of the area (equating to limited resources), jurisdictional implications surrounding the U.S. and Canadian border, and potentiality for high consequences in the event of an LNG spill/release. Downeast LNG was required to categorize safety, security, and response resources that are available to manage the risks associated with LNG carriers along the shared waterway, and concurrently, identify potential prevention/mitigation measures or short falls posed by the proposed operation in their WSA. The following is an abstract of the major public and private assets as provided, as well as a number of recommended prevention and mitigations measures as proposed. The listings are not all inclusive; they are intended solely as a comparative overview.

4.4.1 U.S. Federal Resources

All USCG Marine Safety related activities (Marine Inspection, Port State Control, International Ship and Port Facility Security (ISPS) and Maritime Transportation Security Act (MTSA) compliance exams and vessel boardings, and Pollution Prevention and Response) are handled by the Marine Safety Detachment located in Belfast, ME (under Commander, Sector Northern New England). The following is a representative listing of federal units/resources located in the vicinity of the Downeast LNG proposed route.

- USCG Station Eastport: equipped with a 41’ Utility Boat (UTB), and 25’ Response Boat Small (RBS).
- USCG Station Jonesport: equipped with a 47’ Utility Motor Life Boat (MLB), 25’ RBS, and 27’ Response Boat Homeland Security (RBHS).
- USCGC Moray (WPB 87331): an 87' Coastal Patrol Boat, also home ported in Jonesport, ME.
- U.S. Customs and Border Protection (CBP) for the Eastport area is equipped with 25' RBS and 22' Sea-Ark watercrafts.

4.4.2 State, County, and Local Resources

Along with federal assets, there are a number of trained emergency management, fire, law enforcement, and environmental response agencies available to provide assistance throughout the region. These resources include:

- Maine State Police
- State Fire Marshall's Office
- Maine Emergency Management Agency
- Washington County Regional Communications Office
- Washington County Sheriffs Office
- Washington County Emergency Management Agency
- Calais Fire and Emergency Management Service Dispatch
- Local city and town fire and rescue departments
- Oil Spill Response Organizations (OSRO) for Down East Region 4

The majority of local, on-site public and private emergency response services within the immediate area are predicated on 'everyday' emergent situations based on a largely rural population and risk model. In the event of a large-scale crisis or catastrophe, the acquisition of enhanced response capabilities, such as bomb squads, hazardous materials response, marine firefighting/salvage operations, and major medical assistance, etc., would require significant coordination through the major Federal, State, and County agencies. Due to the relative geographic remoteness of the area, this could be a time-consuming, problematic, and complex evolution.

4.4.3 Canadian Resources

Canada has also developed national prevention, preparedness, and response mechanisms to manage environmental emergencies. Federal policy exists to effectively manage all types of emergencies, including natural ones, such as hurricanes and tornadoes, and human-caused events, such as fire and hazardous materials spills. It should be emphasized, however, that the physical response to emergencies is almost exclusively carried out by the private sector, with monitoring conducted by the government. Within the federal Canadian government, emergency preparedness and response falls under Public Safety and Emergency Preparedness Canada (PSEPC). The mandate of the PSEPC is to lead the national effort to protect the Canadian citizenry from natural disasters, crime, and terrorism.

In addition to the federal PSEPC, each province has an Emergency Management Office or Emergency Measures Organization (EMO). The EMO works at both provincial and municipal levels, and administers disaster financial assistance programs.

The Canadian emergency response system is premised upon the following:

- Initial response action lies with the responsible party (RP).
- If the incident is beyond the scope and capacity of the RP, then municipal services, as directed by the respective mayor respond.
- If the municipality cannot effectively manage the emergency, provincial services are expected to come to the aid of the local authorities.
- If the response capacity of the province or territory is exceeded, then the federal government intervenes and provides emergency assistance.

In Canada, the federal government normally only intervenes upon request, or when the emergency clearly lies within federal jurisdiction. In the event of intervention, a lead Minister heads the Department whose normal responsibilities closely relate to the circumstances of the incident (e.g., Environmental Canada in the case of an environmental emergency on federal land; or the CCG for spills originating from a vessel).

In Atlantic Canada, the key groups which would respond to an LNG spill/release at sea or during docking evolutions are the CCG, the Habitat Management Division of the Department of Fisheries and Oceans, Environment Canada, the Regional Environmental Emergency Team (REET), and Regional Response Organizations (ROs).[11]

Canadian resources identified in the Downeast LNG WSA depend on risk management measures being implemented in agreement with the federal and provincial governments. Identified resources include:

- Transport Canada – Provides experience and expertise in vessel design, construction, stability, and salvage.
- Canadian Coast Guard – Lead federal agency for all spills originating from a ship in Canadian waters. Responds with spill response equipment to all ship source spills either as the primary responder or as a monitor.
- The Royal Canadian Mounted Police (RCMP), an agency of the Ministry of Public Safety and Emergency Preparedness Directorate, provides policing and constable service for national, federal, provincial, and local municipalities.
- Regional volunteer fire/rescue departments.

Due to the relative remoteness of the communities along the Canadian shoreline, low population densities, and lack of critical infrastructure, emergency response inventories and capabilities are limited for the Passamaquoddy Bay region.

4.5 Emergency Response Plan Process

In accordance with Section 311 of the Federal Energy Policy Act of 2005, Downeast LNG is required to develop an Emergency Response Plan in consultation with the USCG and State and local agencies. This plan must be examined by the USCG and approved by FERC before the developer receives an approval to begin construction of its facilities.

During the typical 3-year construction period, the requirement to annually review and update Downeast LNG's WSA may identify changes to the project and/or port area that require the USCG to review and validate the updated WSA.

At least 30 days before transferring LNG, the actual terminal operator must submit copies of its emergency manual to the USCG COTP for examination and approval.

[11] "A Study of the Anticipated Impacts on Canada from the Development of Liquefied Natural Gas terminals on Passamaquoddy Bay by SENES Consultants Ltd

The Community Assistance & Technical Services (CATS) Managers in each Department of Transportation (DOT) region are the primary contacts for state and local governments concerning the Commission's process for approving Emergency Response Plans.

After an LNG terminal is commissioned, LNG inspectors from the DOT Pipeline and Hazardous Materials Safety Administration (PHMSA) regional Office will examine the emergency response and preparedness plan for compliance with applicable regulations as part of their standard facility inspections.

The Plan must incorporate response sections to include:

1. Organization and Contacts

    - Incident management structure, identification of primary contacts, team responsibilities and functions.

2. Responses to emergency incidents such as fires, release of vapors, hurricanes emergency vessel departures, bomb threats etc.

    - Procedures for communications
    - Procedures for responses, shelter and evacuation
    - Description of detection and shutdown systems
    - Hazard control equipment and local agency response

3. Training and exercises

4. Documentation

5. Cost sharing: The Energy Policy Act and Commission orders require a cost sharing plan identifying the mechanisms for funding all project-specific security costs and safety/emergency management costs that would be imposed on state and local agencies. The cost sharing plan must specify what the LNG terminal operator will provide to cover the cost of state and local resources required to manage the security of the terminal and vessel to include:

    - Direct reimbursement (overtime for police and fire etc.).

    - Capital costs associated with emergency management equipment (patrol boats, fire fighting equipment etc.)

    - Annual costs associated with specialized training for fire departments, mutual aid, etc.

The emergency response plan is developed through a transparent, public process that actively involves the USCG, appropriate agencies, and key officials of state and local governments. How this process applies to Canada and whether Canadian officials will wish to be involved are issues as yet to be determined.

4.6 Risk Mitigation Measures

Based on the comprehensive assessment of the waterway, the COTP Northeast New England recommends that the following Risk Mitigation Measures should be implemented prior to allowing Downeast LNG's Passamaquoddy Bay facility to begin operation.

- The development, by the applicant, of standard operating parameters approved by the U.S. Coast Guard and coordinated with the Government of Canada to enable the safe and secure movement of LNG tankers through Canadian and U.S. waters, taking into account the need for:
    1. Number and performance capabilities of assist tugs and escort vessels as well as determining appropriate staging areas. The minimum specified number of escort/assist tugs must be employed at all times to escort LNG carriers throughout their transit and during berthing and unberthing. It should be noted that additional requirements for escort tugs may be identified during the emergency response planning process.
    2. Safe operating parameters and environmental constraints, to include but not limited to: visibility, wind, sea state, currents, and tides.
    3. Identification and implementation of navigation safety upgrades and enhancements, as identified in the applicant's WSA, to include but not limited to: radar, communications interoperability, data buoys, and critical Aids to Navigation.
    4. These parameters must include the following:
        - Daylight Transits - Loaded or partially loaded LNG carriers may only transit the waterway during daylight hours. "Daylight" is interpreted as "civil twilight" in which the sun may be below the horizon, but the "horizon is clear and larger stars visible (*Dutton's Navigation and Plotting*). In practical terms, the horizon, shoreline and receiving berths must be clearly seen under conditions of natural light.
        - Visibility - A minimum of two miles of visibility is required for the movement of LNG vessels in U.S. waters. Since in marginal weather conditions visibility can vary significantly along the route, the decision as to whether sufficient visibility exists, and is likely to continue to exist for the transit, is a judgment call that will be made jointly between the attending pilot(s) and Fundy Traffic, in consultation with and the concurrence of the COTP. The minimum visibility limits must be commensurate with the combined safety and security parameters.
        - Wind – 25 knots is the maximum sustained wind speed (determined during simulation tests), as measured on the vessel, in which an inbound or outbound transit will be allowed to commence. As with visibility, significant variation in wind conditions can exist along the route, and the decision as to whether

wind conditions permit a safe transit will be made by the attending pilot(s) in consultation with, and concurrence by, the COTP.

- Traffic Control – One-way traffic patterns for deep-draft transits will be required and strictly enforced whenever LNG carriers are moving to avoid meeting or passing situations. At the discretion of the attending pilots and in consultation with vessel masters and Fundy Traffic, all vessel transits will be on a first-come, first-served basis, with inbound vessels having priority over outbound.
- Anchoring - There are presently no *designated* (i.e., anchorages specified in regulation) for the area. However, three locations are routinely used: one located in the Bay of Fundy (controlled by Fundy Traffic) just outside of the transit corridor and to the north of Head Harbor Passage; one in the vicinity of Friars Bay southeast of Eastport; and one inside of Passamaquoddy Bay. LNG vessels will not be allowed to anchor, or hold, in Friar Roads while waiting for a berth – anchoring or holding under this circumstance must occur offshore.
- Loaded, inbound LNG carriers transiting Head Harbor Passage and Western Passage must maintain ample separation distance and uphold, at a minimum, the safety and security zone parameters. The intent of this limitation is to preclude the possibility of incurring overtaking situations and/or the need for holding at, or anchoring in Friar Roads. Non-LNG vessels may anchor in, or hold at Friar Roads while waiting for a vessel proceeding in the opposite direction to transit Head Harbor Passage or Western Passage.
- With the exception of temporary boarding areas established by and for USCG authorized assets, the anchoring or holding of LNG vessels within Friar Roads is limited to confirmed emergency situations only, such as major mechanical malfunctions and reduced visibility situations following non-forecasted, abrupt weather changes (fog, squalls, etc.) and/or as directed by, and in consultation with, the COTP.

- The development by the applicant, of an Emergency Response Plan required by Section 311 of the Energy Policy Act of 2005, 15 U.S.C § 717b-1(e), that is approved by the Federal Energy Regulatory Commission and accepted by the U.S. Coast Guard to enable a comprehensive and coordinated response to an LNG emergency, taking into account the need for:

  1. In-transit and dockside emergency procedures in the event of fire, mechanical malfunction, allision, grounding, and/or need of safe anchorage or refuge.
  2. The potential environmental impact of an LNG release and the identification and acquisition of joint resource needs to respond to the potential release.
  3. A contingency response plan specific to LNG and focusing on a layered response approach.
  4. Coordinated marine firefighting training and emergency response, with an emphasis on containing and extinguishing LNG fires.
  5. An incident management training and collaborative exercise program.

- Collaborate with all appropriate jurisdictions on joint, complementary rulemaking to formalize vessel traffic management practices and the establishment and enforcement of comprehensive safety and security zones for the protection of the LNG carrier, alternate waterway users, and area residents, taking into account the need for:
    1. A one-way vessel traffic scheme during transit operations
    2. Deep-draft vessel tug escorts and assistance services.
    3. Mandatory pilotage throughout the transit route and during docking and undocking evolutions at all ports along the waterway.
    4. Implementation of an Automatic Identification System for all vessels involved in the transport of LNG on this waterway.
    5. Implementation of appropriate vessel speed restrictions.
    6. Implementation of appropriate environmental operating parameters (e.g. currents, tides, visibility, wind velocity, ect.)
- The applicant must develop and successfully conduct full mission bridge simulator training for all pilots providing services to LNG carriers. The training must take into account the full spectrum of vessel design and length, cargo carrying capacity, method of propulsion, steering and rudder configuration, thruster arrangements, and maneuvering characteristics for those carriers being considered for charter. In addition, expanded simulator training incorporating the number and design of tug boats having the minimum performance and operating criteria previously outlined, will be required.

- The applicant must develop a Transit Management Plan or other document, in consultation with the USCG and other cognizant agencies, that clearly outlines the roles, responsibilities, and specific procedures for the LNG carrier, the LNG terminal, and all federal, state/provincial, and local stakeholders with responsibilities related to the proposed project and/or whose jurisdiction may reasonably be expected to be impacted by a potential navigation safety accident or terrorist attack.

- The applicant must prepare and submit an Operations Manual, as required by 33 C.F.R. § 127.305, an Emergency Manual, as required by 33 C.F.R. § 127.307, and a Facility Security Plan as required by 33 C.F.R. § 105.120 to the COTP Sector Northern New England for review and approval at least 6 months but no more than 12 months before the facility would begin operations.

- The applicant must provide written verification of collaboration with and acceptance from the Passamaquoddy Nation, ensuring its jurisdictional interests and public safety and security needs associated with this project are adequately met.

Downeast LNG must determine and comply with all applicable Canadian laws and regulations applicable to the safe and secure navigation and the regulation of maritime traffic that comply with customary international law. Such laws and regulations shall not discriminate among foreign ships or in their application have the practical effect of

denying, hampering, or impairing the right of non-suspendable innocent passage through an international strait. Moreover, consistent with international law, the Coast Guard will not require compliance with such laws and regulations that apply to the design, construction, manning, or equipment of foreign ships unless they are giving effect to generally accepted international rules or standards

5.0 Sensitive Security Supplement

This section contains Sensitive Security Information controlled under 49 CFR Part 1520 and has been redacted. This information may not be disclosed to persons without a "need to know", as defined in 49 CFR 1520.11, except with written permission of the Secretary of Homeland Security.

6.0 Conclusions and Recommendations

Based on the results of the assessment of potential risks to navigation safety and maritime security associated with the Downeast LNG proposal, the USCG has determined that the waterway along the intended transit route, which takes in waters of the Gulf of Maine, Bay of Fundy, Grand Manan Channel, Head Harbor Passage, Friar Roads, Western Passage, and Passamaquoddy Bay, is suitable for the type and frequency of marine traffic associated with this proposed project, provided that the Risk Mitigation Measures outlined in Section 4.6 of this report are fully implemented. The hydrographic characteristics of the waterway are suitable to sustain deep draft vessel movement and the simulation tests and traffic studies conducted confirm that the transit and maneuvers are feasible for the design range of LNG carriers anticipated.

If the conditions of the waterway change and or the applicant is unable to implement the recommended mitigation measures, the COTP, Sector Northern New England, may reconsider this determination.

Whether or not the Downeast LNG proposal is approved by FERC, the USCG will continue to systematically analyze the waters of Passamaquoddy Bay and its approaches to effectively manage the potential risks to navigation safety and maritime security associated with the project.

If FERC approves the project and the facility begins operations, additional resources would be needed to mitigate safety and security risks identified during the suitability assessment. The required security resources, in particular law enforcement personnel and associated security craft, and associated operational procedures are based on existing USCG policies. These policies take into account a changing threat environment and the potential for unknown threats. The most probable security regime should consist of a mix of U.S. and Canadian federal, state/provincial, and local law enforcement, which may require cost-sharing arrangements, as outlined in the Energy Policy Act of 2005. As mentioned previously, a major portion of the vessels' route is initially through Canadian waters. Downeast LNG must be able to adequately demonstrate that an effective security regime has been established during the Canadian portion of the vessels' planned route prior to a loaded LNG vessel being allowed to transit to the facility.

Appendices

A. List of Acronyms
B. Ports and Waterways Safety Assessment for the Passamaquoddy Bay Port Area

Appendix A: List of Acronyms

ABS	American Bureau of Shipping
AIS	Automated Information System
AMSC	Area Maritime Security Committee
APA	Atlantic Pilotage Association
ASD	Azimuthing Propulsion Unit
ATON	Aid to Navigation
BCFD	Billion Standard Cubic Feet per day
BLEVE	Boiling Liquid Expanding Vapor Explosion
CANUSLANT	Canada, United States, Atlantic
CATS	Community Assistance & Technical Services
CCG	Canadian Coast Guard
CCTV	Closed Circuit Television
CDC	Certain Dangerous Cargo
CFR	Code of Federal Regulations
COLREGS	International Regulations for Preventing Collisions at Sea
COTP	Captain of the Port
CVTS	Cooperative Vessel Traffic Services
DGPS	Differential Global Positioning System
DOT	Department of Transportation
DNV	Det Norske Veritas
EIS	Environmental Impact Statement
ERP	Emergency Response Plan
EMO	Emergency Measures Organization
FERC	Federal Energy Regulatory Commission
FSRU	Floating LNG Storage and Regasification Unit
IACS	International Association of Classification Societies
ICR	Issues, Concerns and Risks
IMO	International Maritime Organization
ISM	International Safety Management
LE	Law Enforcement
LNG	Liquefied Natural Gas
LOI	Letter of Intent
LOR	Letter of Recommendation
LPG	Liquefied Petroleum Gas
MARPOL	Convention to Prevention Pollution from Ships
MARRSEC	Maritime Security
M & NP	Maritimes and Northeast Pipeline, L.L.C.
MEMA	Maine Emergency Management Agency
MNI	Moffatt & Nichols International
MMBCF	Million Standard Cubic Feet per day
MSI	Marine Safety International
MTSA	Maritime Transportation Security Act

NEPA	National Environmental Policy Act
NOAA	National Oceanographic and Atmospheric Administration
NVIC	Navigation Vessel Inspection Circular
OPA	Oil Pollution Act of 1990
PAWSA	Ports and Waterway Safety Assessment
PHMSA	Pipeline and Hazardous Materials Safety Administration
PORTS	Physical Oceanographic Real-Time System
PSEPC	Public Safety a Preparedness and Emergency Canada
PWSA	Ports and Waterway Safety Act
QRA	Quantitative Risk Assessment
RBDM	Risk-Based Decision-Making
REET	Regional Environmental Emergency Team
RCMP	Royal Canadian Mounted Police
SAR	Search and Rescue
SIGTO	Society of International Gas Tanker and Terminal Operators
SSI	Security Sensitive Information
VHF-FM	Very High Frequency-Medium Frequency
VTS	Vessel traffic Service
UNCLOS	United Nations Convention on the Law of the Sea
USC	United States Code
USCG	United States Coast Guard
WAMS	Waterways Analysis and Management System
WSA	Waterway Suitability Assessment
WSR	Waterway Suitability Report

Appendix B: Ports and Waterways Safety Assessment Workshop Report, Passamaquoddy Bay, ME

Ports and Waterways Safety Assessment
Workshop Report
Passamaquoddy Bay, ME

Introduction

Risk identification and mitigation are and have been ongoing activities within the Passamaquoddy Bay area. As a step toward standardizing methodology, a formal Ports and Waterways Safety Assessment (PAWSA) for Passamaquoddy Bay was conducted in Bangor, ME, on 3-4 October 2006. A group of experts examined the waterway using the risk model pictured here.

Vessel Conditions	Traffic Conditions	Navigational Conditions	Waterway Conditions	Immediate Consequences	Subsequent Consequences
Deep Draft Vessel Quality	Volume of Commercial Traffic	Winds	Visibility Impediments	Personnel Injuries	Health and Safety
Shallow Draft Vessel Quality	Volume of Small Craft Traffic	Water Movement	Dimensions	Petroleum Discharge	Environmental
Commerical Fishing Vessel Quality	Traffic Mix	Visibility Restrictions	Bottom Type	Hazardous Materials Release	Aquatic Resources
Small Craft Quality	Congestion	Obstructions	Configuration	Mobility	Economic

The results of that workshop are provided in this report and include the following information:

- Geographical Area
- Numerical results for the factors listed above as derived from the following activities:
  - Team Expertise
  - Risk Factor Rating Scales
  - Absolute Risk Levels
  - Present Risk Levels
  - Intervention Effectiveness
- Brief description of the process used for the assessment
- List of participants

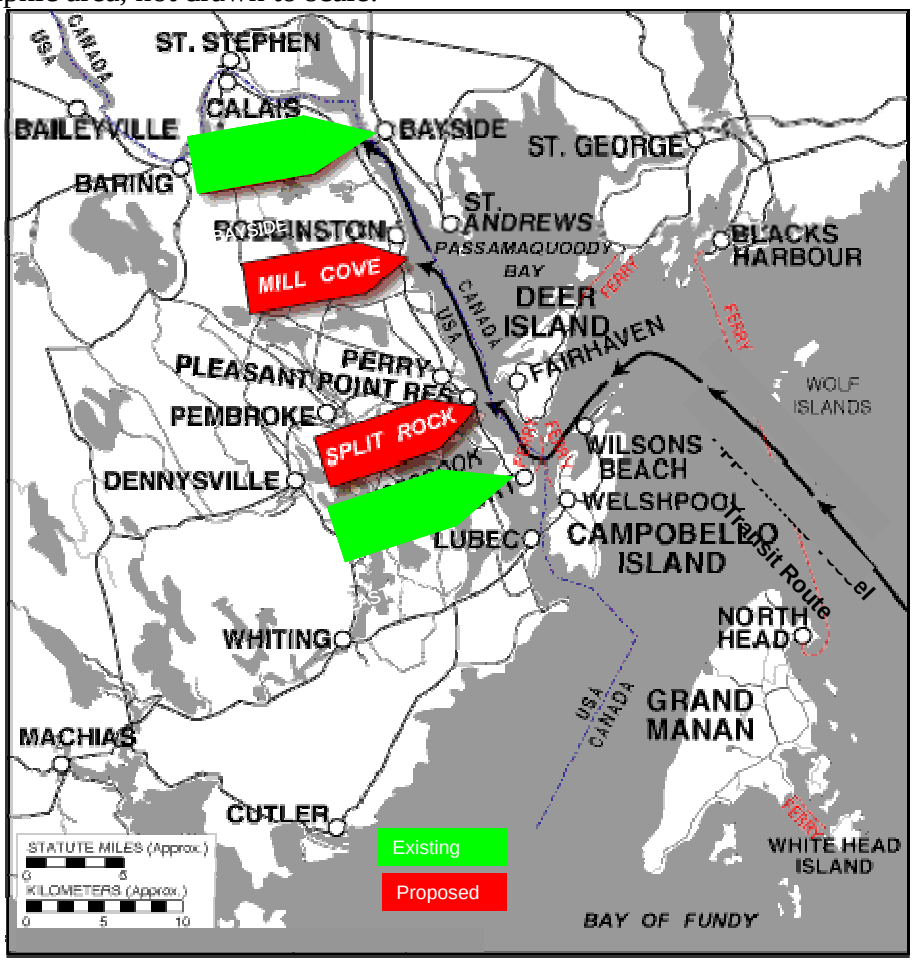
- Planned Actions: Summary of risk(s) and mitigation(s) dialogue
- Survey results presented in tabular format

Geographic Area

The participants defined the geographic bounds of the waterway area to be discussed as:

> The contiguous waters of Passamaquoddy Bay and its tributaries, from the International Bridge at Calais, ME seaward to the eastern shore of Campobello Island and West Quoddy Head.

What follows is a diagram of the geographic area (courtesy of Old Sow Publishing) of the geographic area, not drawn to scale:



Numerical Results

Book 1 – Team Expertise

In *Book 1*, the participants were asked to assess their level of expertise, in comparison to the other workshop participants, for each of the six categories in the Waterway Risk Model. Overall, 41% of the participant teams placed themselves in the upper third, 34% in the middle third, and 25% in the lower third of all teams. This distribution is fairly typical because the participants were chosen for their acknowledged expertise.

Book 2 – Risk Factor Rating Scales

The purpose of *Book 2* is to produce the risk scale numbers that are used in *Book 3*. Participants calibrated intermediate points on the risk assessment scale for each risk factor.

On average, participants from this waterway calculated the intermediate risk points as 2.9 and 5.4, which are close to the national values (2.9 and 5.5) established by the prior PAWSA workshop participants from around the country.

A tabular display of the results of *Book 2* is found at the end of this report.

Book 3 – Absolute Risk Levels with no mitigations

The participants evaluated the absolute risk level in the waterway by selecting a qualitative descriptor for each risk factor that best described conditions in the Passamaquoddy Bay area. Those qualitative descriptors were converted to numerical values using the scales from the *Book 2* results.

On those scales,

1.0 represents low risk (best case) and
9.0 represents high risk (worst case), with
5.0 being the mid-risk value.

In the Passamaquoddy Bay area, 9 of the 24 risk factors were scored at or above the mid-risk value. They were (in descending order):

Risk Category	**Score**	**Risk Category**	**Score**
Visibility Restrictions	7.9	Configuration	7.7
Environmental	7.5	Aquatic Resources	7.5
Small Craft Quality	6.9	Commercial Fishing Vessel Quality	6.4
Water Movement	6.4	Economic	5.9
Hazardous Materials Release	5.3		

Specific hazardous locations identified

Only one location along the transit route was identified as being "hazardous." It was at the approximate confluence of Head Harbor Passage, Friars Road, and Western Passage, which is off the southern tip of Deer Island and opposite Dog Island, where the turn north exceeds 45 degrees.

Book 4 – Present Risk Levels after applying existing mitigations

The participants examined all risk factors along the waterway, including those presumptive risks associated with proposed LNG traffic and cross-checked these risks against mitigation measures and practices currently in place. Group consensus, which is defined as 2/3 majority, indicated that

only one risk factor was fully offset by existing mitigation measures, while 21 other risk factors were NOT adequately balanced. Consensus could not be reached on two of the factors regarding the adequacy of existing measures to nullify the identified risks.

Book 5 – Intervention Effectiveness

The participants selected those specific actions, or interventions, that would be most effective in reducing the identified risks. The Risk Improvement is the perceived reduction in risk when taking the actions specified by the participants. A green "Balanced" indicates that no intervention is needed and risk is balanced in the waterway.

For five of the 21 risk factors identified as needing additional risk reduction action, the intervention categories listed below were judged as being most effective.

Risk Category Selected	Intervention Category	Specific Actions
Vessel Conditions	Active Traffic Mgmt	• Develop joint USCG / CCG requirements to control vessel movements • Make radar, AIS, and VTS compliance mandatory • Improve VHS radio coverage • Update previous WAMS to reflect critical port status (pending LNG approval) • Conduct Port State inspections (U.S. and Canada respectively) • Enhance communications (radio repeaters) • Develop designated traffic lanes • Expand radar coverage
Traffic Conditions	Active Traffic Mgmt	• Specify traffic lanes; develop non-meeting traffic procedures • Formalize designated one-way traffic schemes • Provide designated holding zones • Provide VTS with enhanced radar coverage • Enhance radar and communications capabilities • Improve / upgrade ATON; provide NDBC buoy
Waterway Conditions	Active Traffic Mgmt	• Formalize one-way traffic zones; establish designated no passing zones • Update current WAMS • Establish lighted navigation aids at Stovers and Clarks Ledges; intensify the power of the Dog Island and Deer Island lighted buoys; establish a lighted aid on Kendall Head; install a lighted aid on Clam Cover Head, relocate and light the current HU4 buoy • Provide z-drive tugs having sufficient bollard pull, HP, and fire fighting capabilities • Provide updated hydrographic survey

Intervention Category Definitions

- *Coordination / Planning* – Improve long-range and/or contingency planning and better coordinate activities / improve dialogue between waterway stakeholders
- *Voluntary Training* – Establish / use voluntary programs to educate mariners / boaters in topics related to waterway safety (Rules of the Road, ship/boat handling, etc.)
- *Rules & Procedures* – Establish / refine rules, regulations, policies, or procedures (nav rules, pilot rules, standard operating procedures, licensing, require training and education, etc.)
- *Enforcement* – More actively enforce existing rules / policies (navigation rules, vessel inspection regulations, standards of care, etc.)
- *Nav / Hydro Info* – Improve navigation and hydrographic information (NTM, charts, coast pilots, AIS, tides and currents tables, etc.)
- *Radio Communication* – Improve the ability to communicate bridge-to-bridge or ship-to-shore (radio reception coverage, signal strength, reduce interference & congestion, monitoring, etc.)
- *Active Traffic Management* – Establish / improve a Vessel Traffic Service: information / navigation / traffic organization
- *Waterway Changes* – Widen / deepen / straighten the channel and/or improve the aids to navigation (buoys, ranges, lights, DGPS, etc.)
- *Other Actions* – Risk mitigation measures needed that do NOT fall under any of the above strategy categories

Intervention categories providing the highest mitigation factor for subsequent consequent risk categories focused on coordination, planning, and training.

Risk Category Selected	Intervention Category	Specific Actions
Immediate Consequences	Coordination / Planning	Coordinate with Provincial, State, and local response agencies to formulate joint emergency response plan; identify / assess response assets and capabilities
Subsequent Consequences	Coordination / Planning (for three risk factors)	Coordinate with Canadian, State, and local governments on response plan development and associated training and exercising criteria

Two “consensus alerts” occurred. Consensus alerts can be triggered by a less than strong / majority agreement on risk factor interventions, and/or no real consensus being reached at all. The two alerts, by Risk Factor and associated Intervention, were:

- Volume of Small Craft Traffic (Traffic Conditions) – mitigated by implementing and enforcing rules & procedures.

- Bottom Type (Waterway Conditions) – mitigated by navigation / hydrographic information.

Assessment Process

The PAWSA process is a structured approach for obtaining expert judgments on the level of waterway risk. The process also addresses the effectiveness of possible intervention actions for reducing risk in the waterway. A select group of waterway users / stakeholders evaluate risk factors and the effectiveness of various intervention actions. Thus the process is a joint effort involving waterway users, both professional and recreational, and the agencies / entities responsible for implementing selected risk mitigation measures.

The PAWSA methodology employs a generic model of waterway risk that was conceptually developed by a National Dialog Group on National Needs for Vessel Traffic Services and then translated into computer algorithms by Potomac Management Group, Inc. In that model, risk is defined as the product of the probability of a casualty and its consequences. Consequently, the model includes variables associated with both the causes and the effects of waterway casualties.

The first step in the process is for the participants to assess their expertise with respect to the six risk categories in the model. Those self assessments are used to weight inputs during all subsequent steps. The second step is for the participants to provide input for the rating scales used to assess risk. The third step is to discuss and then numerically evaluate the absolute risk levels in the waterway using pre-defined qualitative risk descriptors. In the fourth step, the participants discuss and then evaluate the effectiveness of existing mitigation strategies in reducing risk. Next, the participants are asked to offer new ideas for further reducing risk, for those factors where risk is not well balanced with existing mitigations. Finally, the effectiveness of various intervention actions in reducing unmitigated risk is evaluated.

The process produces the group's consensus of risks in this waterway and is an excellent tool for focusing risk mitigation efforts. However, risk factors evaluated as being adequately balanced may still be worthy of additional risk mitigation actions. Any reasonable steps for minimizing or preventing the impacts of marine accidents should be encouraged for the benefit of the waterway community.

Participants

The following is the list of waterway users and stakeholders who participated in the process:

Participants	Organization	Phone	Email
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Participation in the PAWSA was through invitation and was designed to include a broad cross-section of waterway users, port stakeholders, and maritime professionals, with the greatest emphasis placed on deep-draft vessel interests. As indicative of the above list, a large segment of the regional marine industry, emergency response and law enforcement community, environmentalists, state, provincial, and local governments, and the fishing and aquaculture industry were well represented by participants from both sides of the border. A number of academia were on hand as well, and contributed to the workgroup discussions. In addition,

representatives of state agencies and elected officials, Canadian governmental officials, members of the LNG industry, and concerned citizens' groups were on hand to observe the assessment process. Other central interests invited, but unfortunately unable to attend, included representation for the Pleasant Point Passamaquoddy Tribe, Canadian commercial fishing industry, and the regional estuaries.

Planned Actions

The catalog of risks and possible mitigation strategies derived from the Passamaquoddy Bay port area PAWSA workshop is set forth on the following pages. This provides an excellent foundation from which the local maritime communities in both, the U.S. and Canada, respective harbor safety organizations, and representative government, state, and provincial authorities can further examine and take appropriate risk mitigation actions for both near-term action and for future risk mitigation planning.

The section has been annotated to include those initial actions that appear appropriate in response to the participants' expressed concerns. Identification of initial actions will help focus subsequent discussions with the local maritime community, waterway users, and stakeholders regarding each risk, permitting the testing of each proposed action for validity and appropriateness prior to implementation. The listing of initial possible actions should be viewed as a starting point for continuing dialogue within the local maritime communities, leading to clear identification of risks and well conceived mitigation measures.

Each new idea is listed along with how many times it was suggested by the participant teams in *Book 5*.

Vessel Conditions: Deep Draft Vessel Quality

Today:

- The majority of the vessels using the waterway are bulk, refrigerated, and general cargo carriers. Problems experienced ten years ago with the bulker fleet have diminished significantly.
- Overall risk is considered relatively minimal.
- Communication and navigation concerns exist due to the lack of full radio and radar coverage by Fundy Traffic.
- Although the bulkers calling on the FEDMAR and Bayside terminals are relatively older than other classes of vessels, there have been no reported casualties in the port area. Deep drafts approximate 130 in number annually, with 60% to Bayside; 40% to Eastport.
- Engineering is usually good; however, shipboard crane maintenance is a concern.
- The U.S. completed a WAMS study in 2005; an ATON study by Canada has not yet been conducted.

Trends:

- Deep draft vessel quality is improving
- LNG cargo and deep draft ships may be coming into the area. Will require additional fire fighting.
- Number of service vessels needed to support LNG traffic will increase.
- Hazardous materials introduced into area will increase. Currently, one ship per year transits area with hazmat.

Existing Mitigations:

- International and domestic safety and construction standards have been improved.
- Crew training standards must be met as per STCW.
- Deep draft vessels must be in full compliance with MARPOL requirements. Both, the U.S. and Canada administer Port State Control procedures and inspections to ensure compliance with STCW, SOLAS, and ISM.
- Risk-based decision making methodologies now exist and emergent systems and procedures are being implemented.
- Deep draft vessels fall under the operational control of Fundy Traffic.
- U.S. has compulsory pilotage requirement. Canadian pilotage is not compulsory; however, 90% take on pilots. A recent Canadian study recommends mandatory pilotage.
- Ferry operators are very competent and well accustomed to the mix of high currents and tides.
- The majority of deep draft operators are fluent in English.
- The pilots have their own stand-alone navigation system.
- Vessels feature safety, machinery, and navigation redundancy to reduce operating risks, downtime, and insurance costs.
- U.S. and Canada has a vessel clearance system that includes an advanced notice of arrival.

Trends (if LNG ships begin to call):

- Additional security issues will be addressed.
- Enhanced / improved communications, radar, and AIS.
- LNG carriers are quality constructed with double hulls.
- Tug / escort vessels with increased HP, bollard pull, and increased fire fighting capabilities.
- USCG safety / security zones will be implemented.
- Proficiency and training standards are higher on LNG vessels than ships carrying low-value cargo.
- Simulator training obtained by pilots.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Provide regulations that rule vessel movement (includes VTS, designated traffic lanes, and radar requirements) or formalize existing practices and policies under joint U.S. and Canada effort.	10	Active Traffic Mgmt
• Compulsory radar, AIS, and VTS.	7	Active Traffic Mgmt
• Enhance VHF radio coverage.	6	Radio Communications
• Have design in place to make vessels and the environment safe as soon as possible after a casualty.	5	Rules & Procedures
• Conduct / update WAMS (pending LNG).	5	Waterway Changes
• Expand safety inspection program and oversight of commercial fishing fleet.	4	Enforcement
• Provide appropriate (number, size) assist / support tugs, escorts, and service vessels.	4	Other Actions
• Promote vessel vetting.	4	Coordination / Planning
• W.R.T. international agreements, consider the arrangements with Canada in Puget Sound and along the Detroit River as a possible best practice. Include pilots in the process.	3	Coordination / Planning
• Compulsory pilotage for Canada.	2	Rules & Procedures
• Required mandatory training for pilots on navigation (simulator).	2	Rules & Procedures
• Possibly restrict all “hazardous” cargo.	1	Rules & Procedures
• Restrict vessel size and tonnage.	1	Other Actions
• Provide education and training for pilots on a voluntary basis.	1	Voluntary Training
• Use technology in ship control, spill detection, and for first responders.	1	Other Actions
• Increased liability (for spills).	1	Enforcement
• Provide terminal specific equipment (for first responders).	1	Other Actions
• Build vessel to meet the unique environmental conditions.	1	Other Actions
• Provide safety management system for shore side facilities.	1	Other Actions
• Provide infrastructure improvements for first responders.	1	Other Actions

Vessel Conditions: Shallow Draft Vessel Quality

Today:

- Tug boat captains are licensed, most crews carry MMDs; however, these vessels are uninspected (and thus operate under less authority and oversight).
- Subchapter T and K vessels have licensed captains but crews are undocumented and may be seasonally employed with high turnover rate.
- On the whole, commercial tug fleet crews are knowledgeable and experienced.

Trends:

- Stricter safety requirements for tugs / tow vessels forthcoming.
- STCW and Responsible Carrier Program have improved the tug / barge fleet and crew competency.
- Regional tourism is slowly increasing and the number of tour / whale watching boats is rising.
- Increased construction shore side
- Need greater public relations to deal with additional LNG ships.

Existing Mitigations:

- Tug and tow crews are STCW qualified.
- Additional / enhanced aids to navigation being employed.
- Bridge Resource Management training.

Trends (if LNG ships begin to call):

- More responder vessels. Additional, highly sophisticated emergency response vessels are needed.
- Consistent coordination and communication needed between LNG ships and ferries / passenger vessels due to the three-fold increase in traffic and moving safety / security zones.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Require vessel inspections (U.S. and Canada).	9	Enforcement
• Enhance communication capabilities (AIS, radio repeaters).	7	Radio Communications
• Provide / formalize designated traffic lane scheme.	4	Active Traffic Mgmt
• Compulsory VTS and AIS	3	Other Actions
• Mandate additional crew size.	3	Rules & Procedures
• Provide better instrumentation for ship control and communication.	2	Other Actions
• Examine multipurpose use of support craft.	2	Coordination / Planning
• Increase education and training.	2	Voluntary Training
• Require mandatory training.	1	Rules & Procedures
• Provide federal safety and/or security zone enforcement.	1	Active Traffic Mgmt
• Develop contingency plans.	1	Rules & Procedures
• Develop updated WAMS.	1	Nav / Hydro Info
• Provide infrastructure improvements to first responders and for community communication.	1	Other Actions
• Provide public service safety announcements in the event of a spill (similar to those provided to communities surrounding nuclear power plants).	1	Other Actions
• Crossing vessels to set and follow schedules.	1	Other Actions
• Mandatory training to pilots for ship control and navigation.	1	Enforcement

Vessel Conditions: Commercial Fishing Vessel Quality

Today:

- Overall professionalism of operators is relatively low to moderate.
- Fishing vessel maintenance is sensitive to economic conditions; overall material condition is marginal.
- There have been recent deaths on fishing boats.
- Boats used for inland fisheries are marginally maintained.
- Area knowledge is high; few fishing vessels are from outside of the area.
- Lack of required certification, navigation equipment, and cold water immersion gear.
- Trouble with communications to other commercial vessels; some operators don't respond to VHF calls or are unintelligible.

Trends:

- Adapting vessels to other fisheries has sometimes led to stability and structural issues.
- More violations of Rules of the Road.
- Casualty investigations reveal about two vessel groundings per year; fatigue and auto-pilot are significant factors.
- USCG and Canada are considering licensing requirements.

Existing Mitigations:

- F/V traffic is minimal. Most boats only go out during good weather; usually just day trips.
- Canadian fishing boats are well maintained.
- The increased market value of product is parlaying into boat improvement.
- Voluntary USCG fishing vessel inspection program inspections gradually improving maintenance and quality of boats.

Trends (if LNG ships begin to call):

- Need greater education / training to deal with additional LNG traffic.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Consider citizenship requirements; require licensing.	1	Not Defined
• More enforcement of existing regulations; conduct more at sea boardings.	1	Not Defined
• Require mandatory standardized equipment and associated training.	1	Not Defined
• Increase enforcement staff; provide more ME State and provincial LE presence.	1	Not Defined
• Provide for a grant for vessel modification. Consider an excise tax break.	1	Not Defined
• Require stability criteria.	1	Not Defined
• Develop better safety procedures within the recreational boating community.	1	Not Defined
• Provide tariffs on imports.	1	Not Defined

Vessel Conditions: Small Craft Quality

Today:

- Number of small craft increasing; recorded the highest number this year. Risk is still considered minimal.
- Increased from 3 marine event permits to 12; ranged from kayak races to regattas.
- The number of USCG boardings escalated from 50 to 170 in three years.

Trends:

- Number of kayaks increasing (maybe involving operation with inebriation).

Existing Mitigations:

- Very few jet skis.
- Guides take out first time kayakers.
- Coast Guard conducts boating education classes.
- Locals know the area and what to expect and how to dress for the weather in their small craft.
- Newer boats being purchased are usually safer and better equipped.
- Relatively small community – pilots share commercial vessel information with the public.
- USCG Station centrally located.

Trends (if LNG ships begin to call):

- No trends in this area were discussed.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Conduct boardings / inspections (Canada and U.S.).	9	Enforcement
• Provide information at the boat ramps… signage. Include public service announcements.	6	Rules & Procedures
• Provide appropriate training.	5	Voluntary Training
• Provide for more voluntary dockside inspections.	4	Rules & Procedures
• Provide weather information at the boat ramps. Include public service announcements.	2	Other Actions
• Require mandatory safety / navigation training.	2	Rules & Procedures
• Mandate licensing.	2	Voluntary Training
• Enforce Rules of the Road with monetary fines.	1	Enforcement
• Better communications with international agencies.	1	Radio Communications
• Provide Canadian assets for possible SAR response to the small craft.		
• Need appropriate education / training to deal with additional LNG traffic.	1	Other Actions
• Provide small craft with auxiliary channel.	1	Waterway Changes
• LNG Safety Zone Escort.	1	Waterway Changes
• Conduct a WAMS.	1	Waterway Changes

Traffic Conditions: Volume of Commercial Traffic

Today:

- Volume is relatively light – approx 130 arrivals per year.
- Volume has decreased in the last 30 years.
- Sometimes have 4-5 ships queuing up.
- U.S. and Canada both require a 96-hour pre-arrival notification.
- U.S. Navy vessels make port calls at least once annually.

Trends:

- If LNG is approved, vessel traffic will increase from 1 ship every 3.5 days to 1.3 ships every day.
- Possibly increased tourism.
- Two new dock areas will be added; to be built well into the waterway. Pier lengths and security zones may restrict the movement of small vessels.

Existing Mitigations:

- Light volume of ships spreads out the traffic.
- Fundy Traffic controls vessel movements and coordinates same with U.S. and Canadian pilots.
- Well defined transit pattern along the waterway.
- Seasonality of the ferry transits.
- Fishery stocks are down, so there is less fishing vessel traffic.
- Deep draft ships transit only on the slack tide.
- Pilots check in with Fundy Traffic at established way points along the transit routes.
- One-way traffic for deep draft vessels.

Trends (if LNG ships begin to call):

- The effect on traffic volume will depend on how transits are handled in relation to imposed operating parameters (security and safety zones size, limitation and duration, day / night transits, wind and visibility restrictions, etc.). Ships may queue up, waiting to come in. This will increase during the winter and heavy periods of fog.
- Additional tug boats will escort the LNG vessel – requirements to be determined.
- More education and training will be provided.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Specify traffic lanes. Develop non meeting traffic situations. Require / formalize designated one-way traffic zones. Provide designated holding zones.	12	Active Traffic Mgmt
• Provide VTS coverage with enhanced radar coverage for entire transit route.	8	Active Traffic Mgmt
• Boost radar coverage and communications capabilities.	7	Radio Communications
• Improve / upgrade ATON. Provide NDBC buoy.	7	Nav / Hydro Info
• Facilitate better scheduling.	5	Active Traffic Mgmt
• More utilization of tugs. Require compulsory Canadian pilotage.	3	Rules & Procedures
• Provide enhanced training for the pilots.	1	Rules & Procedures
• More U.S. / Canadian law enforcement presence.	1	Enforcement

Traffic Conditions: Volume of Small Craft Traffic

Today:

- Three-month seasonal activity, primary volume occurs only in the summertime.
- Volume increases significantly during marine events and major holidays.

Trends:

- Rapidly growing numbers, especially trailered boats.
- Kayak use exploding.

Existing Mitigations:

- Major small boating activity is seasonally related. Foul weather curbs the bulk of small craft activity.
- Safe boating courses and related education is regionally available.
- Fair to good on-the-water enforcement presence.
- Recent, higher fuel prices deterred some boaters.
- Oversight of major marine events (4th of July).

Trends (if LNG ships begin to call):

- No trends in this area were discussed.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Establish / enforce small vessel traffic lanes, safety and security zones. Publish for local dissemination.	5	Rules & Procedures
• Enhance radar and communications capabilities. Monitor N to M information. Require radio reporting / check-in.	5	Radio Communications
• Enhance VTS; provide traffic lanes.	4	Active Traffic Mgmt
• Provide training, workshops, and navigation safety education. Provide public service announcement (awareness campaigns).	3	Voluntary Training
• Mandatory education / training.	3	Rules & Procedures
• Require licensing.	2	Rules & Procedures
• Enhanced State, Canadian, and USCG presence.	2	Enforcement
• Provide weather, current buoy (NDBC).	1	Nav / Hydro Info
• Mandatory AIS.	1	Active Traffic Mgmt

Traffic Conditions: Traffic Mix

Today:

- Waterway is multiple use.
- Canadian and U.S. traffic mixes and mingles.
- Aquaculture farms exist.

Trends:

- Aquaculture business is currently flat but is cyclical and speculated to return to the bay; including farming for sea urchins and mussels.
- Additional escort vessels and service vessels will arrive.

Existing Mitigations:

- Well-marked channels show boaters where ships must transit.
- Foul weather deters recreational boaters.
- Permitted marine events published in BNM.
- Extensive local knowledge by pilots, ferry operators, and the majority of commercial fishermen and neighboring recreational boaters.
- Small craft activity tends to be closer to shore on both sides of the Boundary.

Trends (if LNG ships begin to call):

- Highly trained / quality vessels as the new escort vessels are added.
- Safety zones will alleviate potential close quarter crossings.
- Compulsory pilotage may be required in Canadian waters.
- Dual pilots (1-U.S., 1-Canadian) being considered for all LNG carriers.
- Number in pilot pool will increase.
- LNG may transit Grand Manan Channel to avoid Right Whale activity.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Establish traffic patterns (formally establish a one-way traffic scheme) and publish same.	10	Active Traffic Mgmt
• Provide better routing and transit scheduling.	6	Coordination / Planning
• Enhance VTS, AIS.	4	Active Traffic Mgmt
• Establish better communications between boats, associations, and community. Provide public service announcements.	4	Radio Communications
• Conduct / update WAMS, update Coast Pilot, and consider NDBC buoy.	4	Nav / Hydro Info
• Provide a training / informational symposium / seminar.	4	Voluntary Training
• Provide an auxiliary traffic lane, VTS, and day / night rules.	3	Rules & Procedures
• Step up enforcement presence (USCG and Canada) and related training.	2	Enforcement
• Require VHF monitoring of security channels; require radio reporting / check-ins.	2	Radio Communications
• Provide recommended routes around fixed fishing gear.	1	Not Defined
• Maintain the Fundy Traffic system; maybe add radar atop the USCG Eastport station for more coverage; also add communication repeaters.	1	Not Defined
• Make agreed upon mitigations a condition of LNG construction.	1	Not Defined

Traffic Conditions: Congestion

Today:

- There are seasonal ferry crossings connecting Deer Island, Eastport, and Campobello, and St. Andrews, NB operating on frequent schedules.
- Presence of kayaks in the shipping lanes is becoming a major problem.

Trends:

- Number of head boats (whale boats) is pretty steady.
- Number of recreation boats increasing.
- Small cruise liners may be entering the waterway.
- LNG vessels may queue up – consequent weather delay.

Existing Mitigations:

- Federal, State, and Provincial LE presence and patrols.
- With current traffic numbers, there is minimal risk.
- Waterway is moderately expansive; due to overall depth channel is relatively broad.

Trends (if LNG ships begin to call):

- Mandatory VTS may result.
- AIS will be improved.
- Increase in the number of pilots.
- Greater USCG asset / resource presence.
- Added escort and supply craft and tugs.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Establish recommended routes for deep draft vessels. Formalize anchorage policies.	16	Active Traffic Mgmt
• Require AIS on all commercial vessels. Enhance VTS and radar coverage.	8	Active Traffic Mgmt
• Mandatory monitoring of security channels. Enhanced VHF communications capabilities.	6	Radio Communications
• Provide and publish traffic scheduling.	4	Coordination / Planning
• Conduct a WAMS, update Coast Pilot, and consider NDBC.	4	Nav / Hydro Info
• Provide navigation instruments, equipment, and publications.	2	Other Actions
• Limit hazardous cargoes.	1	Rules & Procedures
• Update Coast Pilot – possibly add information on types of vessel transiting.	1	Not Defined
• Upgrade USCG resources.	1	Not Defined

Navigational Conditions: Winds

Today:

- Most high winds occur in the winter.
- Sustained winds oppose tides from Bay of Fundy and cause high, rough seas – problem for the pilot boat, not for large ships.
- Prevailing winds are from the NE and NW during September through May, and predominately SW from June through August. Wind speeds average 15-20 km per hour in winter and 12-15 km during summer.
- University of Maine R&D is planning to remove one of their weather buoys which gives real time data from the internet. It was claimed to be redundant. Pilots agree there is no accurate reading on the beach and the buoy is important.
- The buoy also has temperature, sea state, and current sensors that aids in fish farming, especially feeding cycles.
- Islands act as a wind block, sometimes giving erroneous readings at the existing wind sensors.
- Funnel effect at Western Passage. Causes wind to swirl / change direction at various locations around the island – challenging traffic transits.
- Approximately every 20 years, a storm comes up that brings strong winds; funnels through the harbor and damages the shorefront of Eastport (from the storm surge).
- 30 kts is the maximum limiting wind speed for effective thruster use on deep draft vessels.
- Maneuvering and docking operations are severely impacted by wind direction, speed, and dock alignment.

Trends:

- USCG is developing vessel operating parameters.

Existing Mitigations:

- Weather avoidance practices are in place.
- Seasonal high winds are strongest during the winter, when recreational boaters are less prevalent.
- Weather buoy maintained by the University of Maine effectively monitors wind speed, direction, current, and wave height data that is available online, in real time.
- Wind trends are historically tracked and reported.
- Buoys off Jonesport are critical in providing real time weather information.
- The Matinicus, Mt. Desert Rock, and Jonesport buoys are relied upon extensively by pilots.
- Tugs stabilize the vessel and provide a large berthing window in terms of weather and design of the pier.
- NOAA broadcasts accurate weather data via radio.

Trends (if LNG ships begin to call):

- Strict vessel operating parameters will be established.
- Extensive simulator training has been provided to the pilots in the navigating and docking of the LNG carriers under varying weather and hydrographic conditions to include emergency maneuvers consequent to machinery failures.
- Downeast meteorological tower to provide extensive weather data information.
- LNG ship berthing parameters will be established.
- LNG ships will have sophisticated mooring monitoring systems.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Provide Physical Oceanographic Real-Time System (PORTS), GoMOOS (University of Maine weather buoy), and down east meteorological tower.	10	Nav / Hydro Info
• Utilize z-drive tugs.	7	Other Actions
• Require specific vessel berthing parameters.	4	Rules & Procedures
• Maintain and/or provide weather buoys.	3	Nav / Hydro Info
• Provide more accurate weather forecasting.	2	Coordination / Planning
• Provide warning signs for small craft.	1	Other Actions
• Establish and enforce freeboard limitations.	1	Rules & Procedures
• Establish vessel operating parameters.	1	Rules & Procedures
• Provide better communications capabilities for weather forecasting.	1	Radio Communications

Navigational Conditions: Water Movement

Today:

- Currents in the area run up to 5-6 kts due to extreme tides.
- Transit times are figured in reverse to ensure vessels enter Western Passage off Dog Island as close to slack water as possible.
- Area off Deer Island is subject to whirlpools consequent to currents converging from Western Passage and Passamaquoddy Bay.
- Tide and current tables are good predictors except when there are high-wind conditions that alter water levels. Study shows that predictions of slack water are less reliable.
- Small vessels (mostly recreational craft) are unfamiliar with the unusually high currents and tides common to the region.

Trends:

- No trends discussed.

Existing Mitigations:

- Tide and current meters generate relatively accurate information.
- Voyage planning / established way point reporting via Fundy Traffic by pilots to avert strong currents.
- Pilot boat precedes ship and provides sea-level traffic report and redundant radar.
- Specific transit timing and docking maneuvers based on slack water.

Trends (if LNG ships begin to call):

- No trends discussed.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Formalize slack water transit practice.	9	Coordination / Planning
• Provide PORTS.	8	Nav / Hydro Info
• Provide highly maneuverable / powerful tractor tugs.	6	Other Actions
• Establish additional weather buoys.	2	Nav / Hydro Info
• Formalize berthing / docking parameters and procedures.	2	Rules & Procedures
• Consider limiting transits during strong ebb / flood tide conditions.	1	Rules & Procedures
• Establish vessel operational parameters.	1	Rules & Procedures
• Follow / enforce required Rules of the Road.	1	Active Traffic Mgmt
• Place a current meter at down east location	1	Other Actions

Navigational Conditions: Visibility Restrictions

Today:

- Fog occurs more than 25% of the days of the year, and has been reported to be as high as 36% of the days during July, often for 24 hrs straight. There have been occasions of no fog… no real predictability.
- Sea fog is much more prevalent at night and during early morning hours. Local knowledge of fog patterns allows pilots to generally work around the winter sea fog.
- Occasionally snow storms can cause vessels to be weather bound for days. Perilous to navigate in snow squalls / white-out conditions.
- Fog is generally localized in the bay.
- Comparatively, less fog at Bayside.

Trends:

- Appears to be less fog over the past 20 years.
- Difficult and dangerous to respond to a casualty in the fog.
- In the event of a release, one cannot see an LNG plume in fog.

Existing Mitigations:

- Radar (increasing number of boaters have it but may not be able to use it well).
- GPS gives precise position.
- Automatic fog signals on electronic equipment.
- Commercial vessels:
  - Are using chart plotting software programs (ECDIS), but may over rely upon it.
  - Radar interpretation instruction / license endorsement.
- NOAA electronic navigation charts are free (S57 standard vector charts). See http://chartmaker.ncd.noaa.gov.

Trends (if LNG ships begin to call):

- Tug / barge will soon be required to carry AIS.
- Establish vessel operating parameters / procedures; vessel movement may be restricted due to reduced visibility.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Improve Fundy Traffic radar coverage.	9	Active Traffic Mgmt
• Enhance VHF radio communication capabilities.	7	Radio Communications
• Decrease the WAMS review cycle – address potential LNG operations. Provide RACONS. Provide better ATON.	7	Waterway Changes
• Regulate all deep draft vessel movements; publish recommended transit routes.	6	Rules & Procedures
• Limit deep draft vessel movement by initiating visibility standards.	4	Rules & Procedures
• Provide weather buoys.	2	Nav / Hydro Info
• Provide PORTS.	2	Nav / Hydro Info
• Mandate ferries and fishing vessels carry AIS.	2	Nav / Hydro Info
• Establish operational parameters.	2	Rules & Procedures
• Reinforce need to monitor VHF security calls.	1	Radio Communications

Navigational Conditions: Obstructions

Today:

- Mean range of tide is 18 ft.; however, 28 ft. tides occur under extraordinary conditions.
- Ice seldom obstructs navigation due to swift currents downstream of Passamaquoddy Bay (St. Croix Island). One-in-twenty year cycle.
- On the average heavy, floating debris and deadheads surface due to the extreme tidal action.
- Commercial fish pens are prevalent, especially off-shore near many of the islands.
- Waters of Fundy Bay and Passamaquoddy Bay approaches are known habitats for whales. Northern Atlantic Right Whales are predominant along the Eastern seaboard, especially north of Grand Manan.

Trends:

- New piers are being built; if approved, LNG facility piers will significantly extend into the waterway.
- LNG ships may have to anchor in Canadian anchorages, or slowly steam in the Bay of Fundy if weather conditions cause delays.

Existing Mitigations:

- Significant efforts are being taken to protect the right whales to include ship traffic zones, speed limits, and whale sighting / reporting procedures.
- Pilot boat listens for whales in the fog and advises the deep draft pilot accordingly.
- Whale Conservation Zones have been established.
- If LNG proposals come to fruition, the carriers will not be allowed to anchor once they've entered Head Harbor Passage, except for emergent, extenuating circumstances.
- Pilots report dangers to Fundy Traffic for further public distribution.

Trends (if LNG ships begin to call):

- No new ideas discussed.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Update current WAMS. Install lighted buoy to mark Stover's Ledge.	15	Nav / Hydro Info
• Initiate NOAA hydrographical survey; consolidate current charts (three needed for navigating the area) into one.	7	Nav / Hydro Info
• Limit pier length.	1	Coordination / Planning
• Provide enhanced VTS.	1	Active Traffic Mgmt

Waterway Conditions: Visibility Impediments

Today:

- Channel visibility is obscured when making the turn off Cherry Island.
- Back scatter from lights on the reservation obscures view of navigational aids and shoreline.

Trends:

- Potential for increased LNG traffic and associated escort boats.
- LNG ships may be moored at new, extended length piers.
- Small boats will have to venture out around the piers and deep draft berths.

Existing Mitigations:

- Intensity of Cherry Island Light increased to take care of backscatter from Eastport.
- Once inside the VTS Fundy Zone, all vessels maintain voice contact with controllers and check-in at designated way points.
- AIS aids in situational awareness and assists in tracking vessels.

Trends (if LNG ships begin to call):

- Due to the relatively constant draft and vessel design height LNG carriers have a higher field of vision.
- The channel is naturally deep and relatively wide; the narrowest points occur in Head Harbor Passage and off Dog Island in the Western Passage approach – width provides sufficient room to navigate. Vessel simulation testing that involved machinery breakdowns (i.e., loss of rudder, propulsion failure, etc.) were conducted at these narrowest points and in the direct vicinity of the alternate LNG site proved successful – tug assistance prevented follow-on collisions or allisions.
- Moored ships will block out lights along the shoreline.
- Education aimed at the small boat operator.
- Provide navigational aids around piers extending out into the waterway or close to the navigating channel.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Update WAMS; consider placing a lighted aid to delineate Stover's Ledge.	15	Nav / Hydro Info

Waterway Conditions: Dimensions

Today:

- Head Harbor Passage narrows to 1,200 yds. between Casco Bay Island and Head Harbor, and the confluence of Head Harbor Passage, Friars Road, and Western Passage narrows to approximately 850 yds. between Dog Island and Deer Island – the two narrowest points between land masses within the waterway.

Trends:

- No trends discussed.

Existing Mitigations:

- Although the channel width potentially permits opposing traffic flow of smaller vessels, the policy is for one-way traffic only to reduce the risk of casualty.
- Pilots time transits to coincide with slack water – way points are pre-established and communicated with Fundy Traffic.

Trends (if LNG ships begin to call):

- No trends discussed.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Formalize one-way traffic zones. Establish designated no passing areas.	10	Active Traffic Mgmt
• Update WAMS. Mark Stover's Ledge.	7	Nav / Hydro Info
• Provide highly maneuverable tractor tugs.	5	Other Actions
• Invoke speed restrictions.	4	Other Actions
• Establish operational parameters.	3	Rules & Procedures
• Provide recommended transit routes and expand VTS coverage.	3	Active Traffic Mgmt
• Limit vessel length.	1	Rules & Procedures
• Provide navigational aids such as GoMOOS and PORTS.	1	Nav / Hydro Info

Waterway Conditions: Bottom Type

Today:

- Bottom composition is hard, gravel / rocky ground with rock ledge prevalent in shoal areas.
- Casualty statistics indicate periodic commercial fishing vessel groundings.
- There have been reported sailing vessel groundings.

Trends:

- No trends discussed.

Existing Mitigations:

- Most shoaling well marked with buoys.
- Charting, Coast Pilot, and hydrologic publications well serve the area.
- Channel is naturally deep, no dredging required.
- More double-hulled vessels being used vice "single-skin."
- Transits are timed with slack water.

Trends (if LNG ships begin to call):

- No trends discussed.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Provide updated hydrographic survey	13	Nav / Hydro Info
• Update WAMS. Establish lighted buoy at Stovers Ledge; add light to buoy at Clark Ledge; intensify power of the Dog Island and Deer Island fixed aids; establish lighted aid at Clam Cove Head; relocate and light the HU4 buoy (Popes Island); and establish a lighted aid on Kendall Head.	2	Nav / Hydro Info
• Enact / enforce reduced speed limitations.	2	Rules & Procedures
• Develop and set operational parameters. Formalize policy of vessel movements based on slack tide conditions.	2	Rules & Procedures

Waterway Conditions: Configuration

Today:

- Sharp course change in vicinity of Dog Island approximating a 45-degree turn. In addition, vessels must hug the U.S. side of the channel due to strong currents during the ebb and flood.
- Seasonal risk of crossing traffic. Two small car / passenger ferry services connect Deer Island, Eastport, and Campobello; scheduled runs are hourly. A small ferry has operated between St. Andrews and Campobello Island in the recent past.

Trends:

- No trends discussed.

Existing Mitigations:

- Ferry service is seasonal (mainly during the summer months) and scheduled service is primarily during daylight hours.
- VHF communications and security calls among operators.
- Deep draft vessel transits are spread out; roughly 130 ships call on the two ports annually.
- Pilots are acutely familiar with the waterway.
- Fundy Traffic maintains traffic control and commercial vessels adhere to the Rules of the Road.

Trends (if LNG ships begin to call):

- No trends discussed.

New Ideas:

- Risks and mitigations were balanced. There were no ideas captured.

Immediate Consequences: Personal Injuries

Today:

- In the past, small cruise ships have made seasonal port calls to St. Andrews.
- Ferries are relatively small; passenger capacity approximates 45 persons.
- Extremely limited emergency response capabilities.
- A number of whale watching and excursion boats operate seasonally.

Trends:

- Small cruise vessels carrying 110-120 passengers had previously called on the port area; regional commerce / tourist bureaus are trying to attract 300-400 passenger capacity vessels.
- Evacuation and emergency response routes are limited. Only one road serves the communities surrounding Eastport. Route 1 is the primary road utilized for area travel and direct access to regional hospitals.

Existing Mitigations:

- Presently, no cruise ships.
- Joint Marine Contingency Plan (U.S. & Canada) and CANUSLANT annex is in place for spill response; however, it exempts LNG.
- USCG Station Eastport is centrally located and SAR capabilities provide framework for other emergency responses.

Trends (if LNG ships begin to call):

- LNG terminals to provide response procedures, resources, and associated training for responding to emergencies at the terminals, communities surrounding the terminal, and along the transit route.
- Joint LNG emergency response training to LNG release / fire is needed and must involve local, state, and provincial responders and LE personnel.
- Regulatory process will ensure safety and emergency response assets / resources are provided via cost sharing in accordance with the ERP process before the process can move forward.
- Potential exposure of crews on board commercial and recreational vessels in the direct vicinity if cargo breach occurs.
- Incident Command System training needed.
- Zones of Concern, as specified in the Sandia Lab Report, establish concentric risk levels for death, injury, and property damage in the event of an LNG release.
- At present, there are less than minimal response / emergency capabilities along the shared waterway and within the surrounding maritime communities to effectively deal with a sizeable LNG release.
- The paper mill, located 25 miles away, maintains the only available hazmat response capability.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Revisit interagency and international plans – update as necessary and provide associated training with respect to mass casualty response.	11	Voluntary Training
• Improve radio communication interoperability among all agencies and bi-national infrastructure. Make available an additional radio tower. Identify / publish emergency radio channels.	10	Radio Communications
• Develop / update local contingency / emergency management plans. Identify egress routes.	10	Rules & Procedures
• Enhance cell phone coverage.	6	Other Actions
• Develop mass-casualty plan; identify available emergency medical personnel, medical hospital and clinics, and life flight capabilities. Provide shortfalls where needed.	4	Coordination / Planning
• Provide a warning system and procedures to implement emergency broadcasts.	3	Other Actions
• Develop better coordination / planning for a catastrophic event; conduct interagency / international training / simulations / exercises.	2	Voluntary Training
• Limit hazardous cargoes.	1	Rules & Procedures
• Conduct safety audit inspection.	1	Enforcement

Immediate Consequences: Petroleum Discharge

Today:

- 130 annual ship transits by deep draft vessels… 2,000 tons (500,000 gallons) of bunkers per ship. Two vessels are present in the waterway at any one time.
- Petroleum products:
  - Eastport and Bayside terminals do not handle petroleum cargo in bulk nor bunker vessels via fuel barge or ship.

Trends:

- Will need plan to fuel all the support vessels.
- A petroleum based fire will burn longer than an LNG fire; however, with much less intensity and at a lower temperature.
- Waterside / floating fire mitigation capabilities are extremely limited.

Existing Mitigations:

- Joint bi-national agreement exists (CANUSLANT) between U.S. and Canada for oil spill response.
- Canadian spill response equipment is pre-positioned in St. John; USCG response equipment maintained in Portland, ME.
- Minimum of six hours to respond by commercial spill response entities such as NRC, Clean Harbors, etc.
- Mandatory double hull compliance under MARPOL; aggressive phase out dates for single hull tankers.
- ME DEP has hazardous materials response team and limited resources to assist in oil spill mitigation and recovery.

Trends (if LNG ships begin to call):

- No trends discussed.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Provide more response / preposition teams and equipment; include OSROs.	10	Coordination / Planning
• Provide more response training; hold annual joint spill response drills.	6	Voluntary Training
• Provide improved cell coverage and tower.	6	Radio Communications
• Designate response vessels as multipurpose escorts and spill response vessels.	4	Rules & Procedures
• Re-establish Quoddy Oil Spill Coop.	4	Coordination / Planning
• Establish speed controls.	1	Rules & Procedures
• Improve bilateral agreements; update all contingency plans; install PORTS for spill tracking.	1	Coordination / Planning
• Provide multiple tug escorts; ensure tugs have FiFi 1 fire fighting capability.	1	Other Actions
• Consider ship / cargo owner liability.	1	Other Actions

Immediate Consequences: Hazardous Materials Release

Today:

- Bulk ammonium nitrate is shipped to Bayside, NB on the average of one ship / 2,000 tons annually.

Trends:

- Hazardous materials entering the area would dramatically increase if LNG is approved.

Existing Mitigations:

- NOAA has a Scientific Support Coordinator to assist with response planning / mitigation.
- Federal, State, and local agency training in ICS.
- Pre-identified / designated incident command post and associated response structure in place.
- Response software (such as CHRIS) exists.

Trends (if LNG ships begin to call):

- No trends discussed.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Conduct training / drills / exercises (consider CANUSLANT). Obtain additional fire fighting and response assets; improve coordination efforts among state, provincial, and local.	10	Coordination / Planning
• Follow prescribed regulations regarding facility inspections; incorporate local enforcement where available. Bolster local USCG assets and resources to meet regional demands and requirements.	5	Enforcement
• Provide better education / outreach; certify training.	4	Voluntary Training
• Improve radio communications and interoperability.	3	Radio Communications
• Incorporate evacuation planning / routing into current contingency plans.	2	Coordination / Planning
• Conduct extensive LNG carrier oversight.	2	Enforcement
• Designate response vessels and tugs as multipurpose escort and spill response vessels.	2	Other Actions
• Improve first responder training focusing on fire fighting and hazmat release; recognize increased possibility of significant personnel casualties.	1	Other Actions
• Establish speed limits.	1	Rules & Regulations
• Develop and exercise joint response management procedures.	1	Coordination / Planning
• Provide floating barriers and/or booms for docked vessels.	1	Other Actions
• Improve cell coverage.	1	Other Actions

Immediate Consequences: Mobility

Today:

- There is only one main channel / transit route into the port area. A casualty occurring in one of the bottlenecks along Head Harbor Passage or at the entrance to Western Passage would effectively shut down both port facilities and/or the shared international waterway.
- Route 1, which basically runs along the entire Maine coastline, is vital to regional traffic flow; closures and/or temporary interruptions will significantly impact the area.
- Residents of Deer Island, Campobello Island, and other island communities are particularly dependent on ferry service for supplies / deliveries.
- Route 190 is the main and only source of road access to / from Eastport and the communities along the way. A major casualty resulting in the blocking of this roadway would significantly impact evacuation efforts by land.

Trends:

- If approved, LNG and natural gas will be piped under the only access road to the peninsula.

Existing Mitigations:

- Small vessels have access to the coast via an alternate channel (i.e., Lubec Narrows). Vessel size / height is restricted by the International Bridge to Campobello.
- Fundy Traffic and the associated VTS procedures provide a significant margin of safety while in Canadian waters; however, there is no formal vessel traffic system for vessels transiting on the U.S. side of the international boundary.

Trends:

- Two LNG facilities have been approved by Canada and are under construction – Canaport in St. John, NB, and Bear Head at Cape Breton Island. Can Maritimes Northeast Pipeline capacity accommodate two additional U.S. terminals

Trends (if LNG ships begin to call):

- No trends discussed.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Develop alternate means of transportation to supplement the local highway to move response equipment.	6	Other Actions
• Explore local and regional (U.S and Canada) salvage capabilities.	4	Other Actions
• Provide enhanced communications.	1	Radio Communications
• Conduct air patrols.	1	Enforcement
• Install and use mooring system arrangements that meet the demands of the extreme tidal range, winds, and high currents of the region.	1	Coordination / Planning
• Provide tug escort of sufficient number, HP, and bollard pull.	1	Other Actions

Subsequent Consequences: Health and Safety

Today:

- Relatively speaking, the Passamaquoddy Bay port area is considered "rural" with population figures for the U.S. side approximating 3,450 persons.
- Eastport is the largest populated town on the U.S. side of the port area with an approximate total of 2,000 persons, equating to 540 persons per sq. mi.
- Population density criteria for the WSA, as set forth in NVIV 05-05, is: High – 9,000 persons per sq. mi.; Medium – 1,000 persons per sq. mi; and low – <1000 persons per sq. mi.
- A significant petroleum discharge could seriously affect fish farms and other forms of aquaculture.
- Bulk ammonium nitrate in sizeable quantity poses potential health, safety, and hazard risks.
- No site specific evacuation plans have been generated. Maine Emergency Management Agency (MEMA) has developed general egress plans. No formal evacuation plans.
- Majority of regional fire fighting capability rests on all-volunteer forces with dated, limited equipment. There is little to no waterside fire fighting capability.

Trends:

- LNG ships entering the area will increase health and safety risks.

Existing Mitigations:

- Strong prevailing winds help disperse spills.
- Calais is the nearest hospital. It has a bed capacity of 25 and is located approximately 20 miles from Eastport. Eastern Maine Medical Center, located in Bangor, is the nearest large medical facility and trauma center; life flight helicopter transports utilized.
- "Mass casualty" numbers potentially lowered due to current population densities.
- Joint federal, state, county, and provincial planning and exercising for nuclear power stations has laid the framework for other types of energy programs and emergency procedures.
- Multiple local, county, and state agencies have trained and worked together to combat forest fires.
- MEMA very proactive in and health / safety arena.

Trends (if LNG ships begin to call):

- Washington County Emergency Preparedness is updating regional response and evacuation plans.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Develop / update local, county, and regional (including joint Canadian) contingency plans. Provide egress routes.	9	Rules & Procedures
• Provide warning system and emergency broadcast.	7	Other Actions
• Coordinate emergency preparedness, fire fighting, and training plans with Canadian resources.	5	Voluntary Training
• Pre-position equipment.	4	Coordination / Planning
• Provide enhanced fire fighting capability; land and water.	4	Other Actions
• Formalize U.S. / Canadian agreements.	3	Coordination / Planning
• Provide additional emergency medical personnel, medical clinics, and life flight capabilities.	2	Coordination / Planning
• Enhance cell phone coverage.	1	Other Actions
• Limit hazardous cargoes.	1	Rules & Procedures
• Conduct interagency / international training / simulations / exercises.	1	Voluntary Training
• Conduct predictive modeling and plume trajectories.	1	Coordination / Planning
• Develop emergency response web page.	1	Other Actions

Subsequent Consequences: Environmental

Today:

- 250 feet around the shoreline of Eastport… development setback
- The area is characterized by its pristine environment and natural attractions.
- The waters of Fundy Bay are known habitats for right whales. Minke, finback, and other whales have been sighted in the approaches to Passamaquoddy Bay.
- Cobscook Bay, St. Croix Estuary, Campobello International Park, and Moosehorn Refuge are extremely environmentally sensitive areas containing a myriad of endangered species.
- Cultural resources and archeological-based studies need to be conducted on tribal land.
- Some ships carry different grades of fuel oil in their bunker tanks as they shift from heavy bunker (no. 2) oil to lighter diesel fuel during maneuvering operations. A spill of either could be devastating to the regional environment.
- Stressed ecosystem; aquaculture farming, ecotourism, sea urchin farming, shellfish, lobsters, and oysters would be affected by pollution.

Trends:

- Vessel strike risk to the federally protected Northern Right Whale.
- New ships… bunker tanks are double hulled… may not be used here.
- LNG ships will enter the waterway, resulting in more traffic, and the potential for increased air pollution, noise, and the introduction of invasive species (Note: LNG carriers do not deballast).
- LNG is odorless, colorless, non-corrosive, and non-toxic; environmentally benign until flammability range is reached and source of ignition provided.
- Some LNG ships use boil off from cargo tanks; others burn IFO fuel, which could taint fish if spill involved.

Existing Mitigations:

- Ballast water program required.
- Right whale sighting / reporting program, speed limits, and traffic schemes to route ships away from breeding / feeding areas.
- Fundy Traffic notifies ships of whale sightings.
- Extensive knowledge / studies of species and locations that might be impacted.
- Spill notification infrastructure is well established.

Trends (if LNG ships begin to call):

- LNG ships do not deballast.
- Some ships use a blend of diesel fuel and heavy fuel oil vice boil off.
- Scientific resources are available to assist with monitoring and mitigating effects of pollution discharges.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Conduct training / drills / exercises (consider CANUSLANT) and develop priorities.	7	Coordination / Planning
• Improve real-time hydrographic / navigation information (PORTS).	7	Nav / Hydro Info
• Conduct response / equipment training.	4	Voluntary Training
• Conduct predictive modeling.	3	Other Actions
• Develop evacuation contingency planning and spill response.	2	Coordination / Planning
• Develop routing methodology for environmentally sensitive areas.	2	Active Traffic Mgmt
• Develop and formalize an environmental / whale informational system.	2	Other Actions
• Implement pre-positioned spill response resources.	2	Coordination / Planning
• Establish contracts with spill contractors such as NRC, Clean Harbors, MSRC, etc.	1	Other Actions
• Have vessels provide bunker fuel oil specifics for spill pre-planning.	1	Rules & Procedures
• Develop joint response management plans, OSROs.	1	Coordination / Planning
• Provide better education / outreach, training, and proficiency certifications.	1	Voluntary Training
• Improve radio communications.	1	Radio Communications
• Develop web page.	1	Other Actions

Subsequent Consequences: Aquatic Resources

Today:

- Marine commerce in the area consists almost entirely of aquaculture, fish farming, ecotourism, and commercial fishing.
- The area is populated with lobster fishing, fish weirs, and aquaculture.
- Due to strong currents in the approaches to Passamaquoddy Bay commercial fishing inside the Bay of Fundy is relatively light to moderate; most of the lobster fishing is done in the Grand Manan Channel and along the coast south of Lubec Narrows.
- Aquaculture is one of the largest industries, with salmon and cod being the primary marine commodity.
- State issued leases are generally closer to the channel edge in shallower water vice the deep draft transit route.
- A variety of marine life and shellfish (e.g., sea cucumbers, herring, clams, quahog, scallops, etc.) are commercially harvested throughout the geographic area. A spill would be devastating to the industry.
- Recreational fishing is very active during the summer season.

Trends:

- Commercial and recreational fishing and ecotourism is increasing.
- If both LNG facilities are approved the resultant three-fold increase in deep draft traffic will negatively affect fishing reducing the number of spaces to fish.

Existing Mitigations:

- Existing authorities close shellfish beds during periods of red tide and probable pollution.
- NOAA has a sensory analysis lab available to test and chemically analyze the fitness of fish product.
  - Active State and local fisheries enforcement capabilities.
- Depending on the season, some fisheries are less impacted by a pollution event.
- Whale alerts are provided by Fundy Traffic.
- Maine DEP, St. Croix Estuary, Passamaquoddy Tribe, and other U.S. and Canadian organizations map and record sensitive aquatic resources.

Trends (if LNG ships begin to call):

- No trends discussed.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Establish definitive post spill fisheries opening and closing protocols in concert with Canada.	6	Rules & Regulations
• Improve communications; develop joint U.S. / Canadian call-down list.	6	Radio Communications
• Develop and formalize an environmental / whale information system.	2	Other Actions
• Develop web page dedicated to aquatic resource management.	2	Other Actions
• Conduct baseline assessment of water quality and aquatic resources; update sensitivity maps.	1	Coordination / Planning
• Provide better education / outreach; certify training. Improve spill response / coordination planning / preparedness.	1	Voluntary Training

Subsequent Consequences: Economic

Today:

- Fish contamination consequent to a hazmat spill would be economically devastating to the industry.
- Closure of the waterway due to a spill would significantly impact fisheries in both countries. The industry contributes more than $2M annually into the economy.
- Severe economic disruption would be felt within two weeks of a port closure.
- The salmon market is strong along the entire East Coast; lobster and sea urchins are marketed internationally as well.
- Potential income derived from tourism and fishing would be negatively affected, even if there is just a perception that the area has been "tainted" by spills, etc.
- Reimbursement through claim process possible for loss of income attributable to an oil spill.
- May not be able to get product to market… may affect the regional and national economy.
- A major casualty would affect tourism, especially in St Andrews, NB, a major resort community. Likewise, whale watching tours would be significantly impacted.
- Regional paper mills depend on waterborne commerce; approximately 350,000 tons of product are exported from the region annually.
- In the event the waterway was closed due to a casualty / spill, Bayside Terminal could lose revenues at the rate of one ship per week.
- OPA 90 framework for oil spill response and mitigation.

Trends:

- No trends discussed for this section.

Existing Mitigations:

- No existing mitigations were discussed.

Trends (If LNG ships begin to call):

- People like to watch deep draft traffic.
- May add $250M to the regional tax base.
- Young people may remain in the area.
- Will provide site specific compensation package to local fishermen.
- Will provide a fish / gear trap replacement program for U.S. and Canadian fishermen.
- LNG industry will increase local job market, spin-off; additional support vessels / chandlery, agents, etc. will boost local economy and job potential.
- People may stop coming to tourist area in Canada (St. Andrews, Campobello Island, etc.); environmentally pristine areas.
- Additional traffic may push the whales elsewhere, hurting the whale-watching / tourist industry.
- Energy Policy Act (U.S. only):
  - Provides extensive emergency response plan for communities along the waterway and surrounding the proposed terminal sites.
  - Provides cost sharing plan to provide additional emergency response, medical, and enforcement assets and resources.
- Potential for international concessions.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Pre-positioned spill response recovery / mitigation.	10	Coordination / Planning
• Joint Canada / U.S. MOU for hazmat response.	7	Other Actions
• Fishermen compensation plan.	5	Other Actions
• Trap / fish gear replacement program.	2	Other Actions
• LNG via offshore terminal vice on-shore.	1	Coordination / Planning
• Develop web page devoted to ideas and activities about economic issues and development.	1	Other Actions

Book 2 Tabular Results:

Risk Factor	A Value	B Value	C Value	D Value
Deep Draft Vessel Quality	1.0	3.0	5.6	9.0
Shallow Draft Vessel Quality	1.0	3.0	5.6	9.0
Commercial Fishing Vessel Quality	1.0	3.0	5.6	9.0
Small Craft Quality	1.0	3.0	5.6	9.0
Volume of Commercial Traffic	1.0	3.0	5.3	9.0
Volume of Small Craft Traffic	1.0	2.8	5.7	9.0
Traffic Mix	1.0	2.3	4.7	9.0
Congestion	1.0	2.7	5.0	9.0
Winds	1.0	2.5	5.2	9.0
Water Movement	1.0	2.9	5.0	9.0
Visibility Restrictions	1.0	2.9	5.7	9.0
Obstructions	1.0	2.0	4.5	9.0
Visibility Impediments	1.0	3.1	5.5	9.0
Dimensions	1.0	3.1	5.5	9.0
Bottom Type	1.0	2.4	5.1	9.0
Configuration	1.0	2.8	5.3	9.0
Personnel Injuries	1.0	3.1	5.7	9.0
Petroleum Discharge	1.0	3.8	6.2	9.0
Hazardous Materials Release	1.0	3.7	6.2	9.0
Mobility	1.0	3.0	5.3	9.0
Health and Safety	1.0	3.1	5.6	9.0
Environmental	1.0	3.2	5.9	9.0
Aquatic Resources	1.0	2.8	5.5	9.0
Economic	1.0	3.1	5.7	9.0

Book 3 Tabular Results:

Vessel Conditions	Traffic Conditions	Navigational Conditions	Waterway Conditions	Immediate Consequences	Subsequent Consequences
Deep Draft Vessel Quality	Volume of Commercial Traffic	Winds	Visibility Impediments	Personnel Injuries	Health and Safety
1.3	1.3	4.5	3.9	3.0	2.5
Shallow Draft Vessel Quality	Volume of Small Craft Traffic	Water Movement	Dimensions	Petroleum Discharge	Environmental
1.7	1.6	6.4	3.3	2.1	7.5
Commercial Fishing Vessel Quality	Traffic Mix	Visibility Restrictions	Bottom Type	Hazardous Materials Release	Aquatic Resources
6.4	3.1	7.9	7.0	5.3	7.5
Small Craft Quality	Congestion	Obstructions	Configuration	Mobility	Economic
6.9	2.1	3.5	7.7	3.2	5.9

Book 4 Tabular Results:

Vessel Conditions		Traffic Conditions		Navigational Conditions		Waterway Conditions		Immediate Consequences		Subsequent Consequences	
Deep Draft Vessel Quality		Volume of Commercial Traffic		Winds		Visibility Impediments		Personnel Injuries		Health and Safety	
1.3	2.4	1.3	4.6	4.5	6.0	3.9	3.9	3.0	6.5	2.5	6.2
RISING		RISING		RISING		Balanced		RISING		RISING	
Shallow Draft Vessel Quality		Volume of Small Craft Traffic		Water Movement		Dimensions		Petroleum Discharge		Environmental	
1.7	2.9	1.6	4.1	6.4	7.1	3.3	3.4	2.1	4.2	7.5	8.1
RISING		RISING		RISING		RISING		RISING		RISING	
Commercial Fishing Vessel Quality		Traffic Mix		Visibility Restrictions		Bottom Type		Hazardous Materials Release		Aquatic Resources	
6.4	6.3	3.1	5.2	7.9	7.8	7.0	7.3	5.3	7.3	7.5	8.1
Maybe		RISING		NO		RISING		RISING		RISING	
Small Craft Quality		Congestion		Obstructions		Configuration		Mobility		Economic	
6.9	6.8	2.1	4.7	3.5	5.1	7.7	6.8	3.2	4.9	5.9	6.3
NO		RISING		RISING		Maybe		RISING		RISING	

KEY

Risk Factor	
Book 3	Book 4
Consensus	

Book 3	Absolute level of risk
Book 4	Level of risk taking into account existing mitigations
Balanced	Consensus that risks are well balanced by existing mitigations
Maybe	No consensus that risks are adequately balanced by existing mitigations
NO	Consensus that existing mitigations do NOT adequately balance risk

Book 5 Tabular Results:

Vessel Conditions	Traffic Conditions	Navigational Conditions	Waterway Conditions	Immediate Consequences	Subsequent Consequences
Deep Draft Vessel Quality	**Volume of Commercial Traffic**	**Winds**	**Visibility Impediments**	**Personnel Injuries**	**Health and Safety**
Active Traffic Mgmt	Active Traffic Mgmt	Nav / Hydro Info	Balanced	Radio Communications	Other Actions
1.8	4.1	5.9		6.4	5.9
Shallow Draft Vessel Quality	**Volume of Small Craft Traffic**	**Water Movement**	**Dimensions**	**Petroleum Discharge**	**Environmental**
Enforcement	Rules & Procedures	Rules & Procedures	Active Traffic Mgmt	Other Actions	Coordination / Planning
2.7	3.9 Caution	6.4	2.8	3.7	6.9
Commercial Fishing Vessel Quality	**Traffic Mix**	**Visibility Restrictions**	**Bottom Type**	**Hazardous Materials Release**	**Aquatic Resources**
Balanced	Active Traffic Mgmt	Rules & Procedures	Nav / Hydro Info	Coordination / Planning	Coordination / Planning
	4.7	7.2	6.7 Caution	7.2	8.0
Small Craft Quality	**Congestion**	**Obstructions**	**Configuration**	**Mobility**	**Economic**
Voluntary Training	Active Traffic Mgmt	Nav / Hydro Info	Balanced	Other Actions	Coordination / Planning
6.5	4.0	4.8		4.8	6.2

KEY	
Risk Factor	Intervention category that was judged most effective in further mitigating risk
Intervention	Expected improvement in risk level if new mitigation measures were implemented
Risk Improvement	Caution — No consensus alert

Legend:

The intervention category listed is the one category that most participant teams selected for further reducing risks. The Risk Improvement is the perceived reduction in risk when taking the actions specified by the participants. A green Balanced indicates that no intervention is needed and risk is balanced in the waterway, and a yellow Caution indicates that there was a difference between the most effective category and the category most selected by the participants for action. Intervention category definitions are:

Coordination / Planning	Improve long-range and/or contingency planning and better coordinate activities / improve dialogue between waterway stakeholders
Voluntary Training	Establish / use voluntary programs to educate mariners / boaters in topics related to waterway safety (Rules of the Road, ship/boat handling, etc.)
Rules & Procedures	Establish / refine rules, regulations, policies, or procedures (nav rules, pilot rules, standard operating procedures, licensing, require training and education, etc.)
Enforcement	More actively enforce existing rules / policies (navigation rules, vessel inspection regulations, standards of care, etc.)
Nav / Hydro Info	Improve navigation and hydrographic information (NTM, charts, coast pilots, AIS, tides and current tables, etc.)
Radio Communications	Improve the ability to communicate bridge-to-bridge or ship-to-shore (radio reception coverage, signal strength, reduce interference & congestion, monitoring, etc.)
Active Traffic Mgmt	Establish / improve a Vessel Traffic Service: information / navigation / traffic organization
Waterway Changes	Widen / deepen / straighten the channel and/or improve the aids to navigation (buoys, ranges, lights, LORAN C, DGPS, etc.)
Other Actions	Risk mitigation measures needed that do NOT fall under any of the above strategy categories