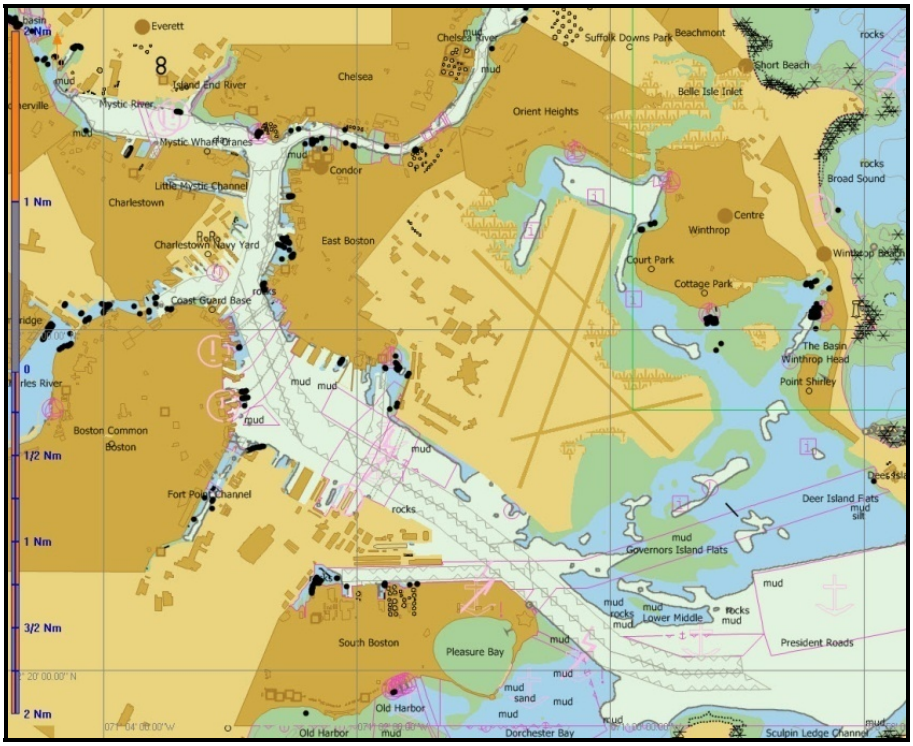
Ports and Waterways Safety Assessment

Workshop Report

Boston, Massachusetts

12 - 13 July, 2011



United States Coast Guard

Marine Transportation Systems Directorate

Providing Navigation Safety Information
for America's Waterways Users

Executive Summary

The United States Coast Guard (USCG), Marine Transportation System Management Directorate, is responsible for developing and implementing policies and procedures that facilitate commerce, improve safety and efficiency, and inspire dialogue with port and waterways users that will make waterways as safe, efficient, and commercially viable as possible. Through the 1997 Coast Guard Appropriations Act, the Coast Guard was directed to establish a process to identify minimum user requirements for new Vessel Traffic Service (VTS) systems in consultation with local officials, waterways users and port authorities, and also to review private / public partnership opportunities in VTS operations. The Coast Guard convened a National Dialogue Group (NDG) comprised of maritime and waterway community stakeholders to identify the needs of waterway users with respect to Vessel Traffic Management (VTM) and VTS systems. The NDG was intended to provide the foundation for the development of an approach to VTM that would meet the shared government, industry, and public objective of ensuring the safety of vessel traffic in U.S. ports and waterways, in a technologically sound and cost effective way.

From the NDG came the development of the PAWSA process and the Waterways Risk Model. PAWSA is a disciplined approach designed to identify major waterway safety hazards, estimate risk levels, evaluate potential mitigation measures, and set the stage for the implementation of selected risk reduction strategies. The process involves convening a select group of waterway users and stakeholders and conducting a structured workshop to meet these objectives. The process requires the participation of professional waterway users with local expertise in navigation, waterway conditions, and port safety. In addition, stakeholders are included in the process to ensure that important environmental, public safety, and economic consequences are given appropriate attention as risk interventions are selected.

Boston PAWSA Workshop

A PAWSA workshop for the Port of Boston was held in Boston, Massachusetts on 12 – 13 July, 2011. The workshop was attended by 20 participants, assembled into 10 two-person teams, representing waterway users, regulatory authorities and stakeholders with an interest in the safe and efficient use of Boston Harbor from both a commercial and recreational perspective. Participants discussed and evaluated each of the 24 risk factor that make up the Waterways Risk Model, which includes Vessel Conditions, Traffic Conditions, Navigational and Waterways Conditions, and Immediate and Subsequent Consequences. For 17 of the 24 risk factors, there was consensus (defined as 2/3 of the workshop participant teams being in agreement) that risks were well balanced by existing mitigations. For 6 risk factors, there was no consensus that risks were well balanced by existing mitigations, and for 1 risk factor, there was consensus that risks were not balanced.

A key driver and important aspect of the workshop was to also evaluate the impacts to navigation safety posed by the Chelsea Street Bridge replacement project on the Chelsea River. Participants discussed challenges facing larger commercial vessel navigating on the Chelsea River, and the risks associated with navigation through the Chelsea Street Bridge area itself. As a result of this evaluation, all participant teams agreed that a Regulated Navigation Area should be established for Chelsea Creek, limiting the use of the waterway to commercial traffic. All participant teams further agreed that increased dialogue with bridge owners and vessel operators was needed in order to convey the navigation limitations placed on large commercial vessels when approaching bridge openings.

This report outlines the findings of the workshop, the Chelsea Street Bridge evaluation, and a summary of participant comments and observations on trends in the port, existing risk mitigation strategies that serve to "balance" the risks associated with each of the 24 risk factors in the Waterways Risk Model evaluated by the workshop participants, and additional risk intervention strategies for those risk factors which were determined to not be well balanced by existing mitigations. The results of this workshop should be viewed as a starting point to further improve navigation safety and efficiency in the Port of Boston, Massachusetts.

Ports and Waterways Safety Assessment - Workshop Report

Boston, Massachusetts

12 – 13 July, 2011

Table of Contents **Page**

Appendices

Introduction

The PAWSA process represents a significant part of joint public-private sector planning for mitigating risk in waterways. When applied consistently and uniformly, the process provides a basis for making best value decisions for risk mitigation investments, both on the local and aggregate level.

The long-term goals of the PAWSA process are to:

1) Provide input when planning for projects to improve the safety of navigation and support the Marine Transportation System,
2) Further the Marine Transportation System goals of improved coordination and cooperation between government and the private sector, and involving stakeholders in decisions affecting them,
3) Foster development and strengthen roles of Harbor Safety Committees within each port, and
4) Support and reinforce the role of Coast Guard Sector Commanders/Captains of the Port in waterway and vessel traffic management within their assigned geographic areas of responsibility.

Section 1: How PAWSA workshops are conducted

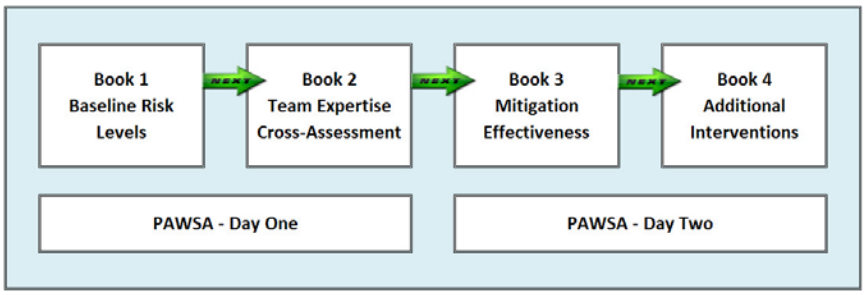
The PAWSA process uses structured workshops for obtaining expert judgments on the level of risk in a port or waterway. The process used a series of discussions and completion of workbooks to establish baseline risk levels, evaluate the effectiveness of existing risk mitigations, and identify additional risk intervention strategies to further reduce risk in the port / waterway.

The **first step** (workbook 1) in the PAWSA process is for participants to discuss and then numerically evaluate the baseline risk levels using pre-defined qualitative risk descriptions for pre-defined risk factors.

The **second step** (workbook 2) is for participants to assess the expertise of each other with respect to the risk categories in the model. Those expertise assessments are used to weight inputs obtained during the other steps in the workshop process.

In the **third step** (workbook 3), participants discuss existing risk mitigation strategies, evaluate how effective the mitigation strategies are at reducing risk, and determine if the risks are well balanced or not.

Finally, for those risk factors where risk is judged to be not well balanced by existing mitigations, participants use workbook 4 to identify additional risk intervention strategies and evaluate how effective those new strategies could be at reducing risks.



Section 2: Explanation of the PAWSA Waterway Risk Model

The Waterway Risk Model includes variables dealing with both the causes of waterway casualties and their consequences. In the Waterway Risk Model, risk is defined as a function of the probability of a casualty and its consequences. The risk model includes variables associated with both the causes and effects of vessel casualties.

The six risk categories used in the model are:

1. **Vessel Conditions** – the quality of vessels and their crews that operate on a waterway.
2. **Traffic Conditions** – the number of vessels that use a waterway and their interactions.
3. **Navigational Conditions** – the environmental conditions that vessels must deal with in a waterway relating to wind, water movement (i.e., currents), and weather.
4. **Waterway Conditions** – the physical properties of the waterway that affect how easy it is to maneuver a vessel.
5. **Immediate Consequences** – the immediate impacts of a waterway casualty: people can be injured or killed, petroleum and hazardous materials can be spilled and require response resources, and the marine transportation system can be disrupted.
6. **Subsequent Consequences** – the subsequent effects of waterway casualties that are felt hours, days, months, and even years afterwards, such as shore side facility shut-downs, loss of employment, destruction of fishing areas, decrease or extinction of species, degradation of subsistence living uses, and contamination of drinking or cooling water supplies.

Figure 1

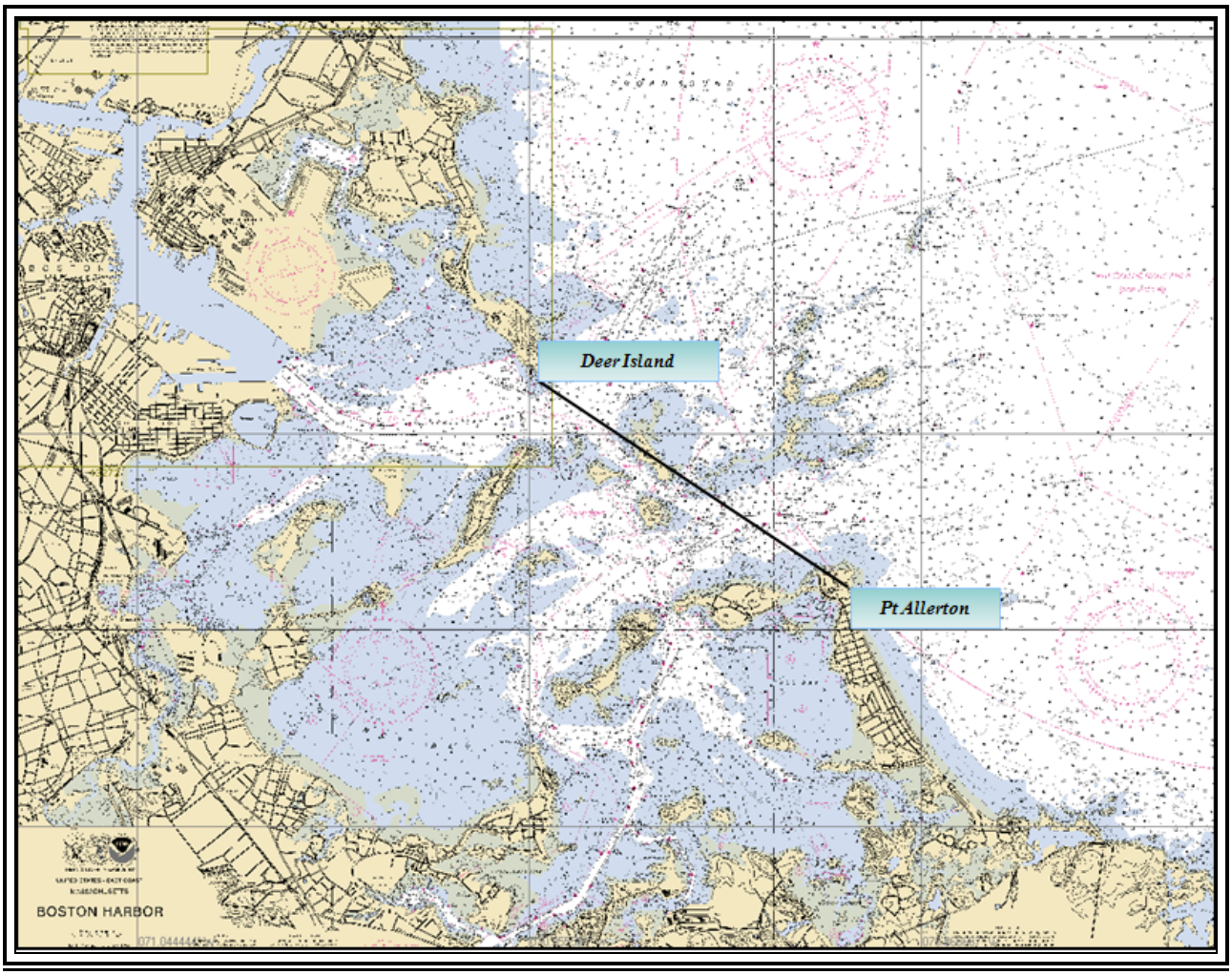
Waterway Risk Model					
Vessel Conditions	Traffic Conditions	Navigational Conditions	Waterway Conditions	Immediate Consequences	Subsequent Consequences
Deep Draft Vessel Quality	Volume of Commercial Traffic	Winds	Visibility Impediments	Personnel Injuries	Health and Safety
Shallow Draft Vessel Quality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

Section 3: Boston PAWSA - Assessment Area

The geographic area assessed during the workshop included all waters west of a line drawn between Deer Island and Point Allerton.

A separate assessment was also conducted to evaluate the impacts to navigation safety posed by the Chelsea Street Bridge replacement project on the Chelsea River. Section 8 of this report outlines the results of the Chelsea Street Bridge / Chelsea River assessment

Figure 2



Section 4: Book 1 – Establishing Baseline Risk Levels

The first step in the PAWSA process (completion of workbook 1) is to determine a baseline risk level value for each risk factor in the Waterway Risk Model. To establish baseline risks levels, participants discussed each of the 24 risk factors in the Waterways Risk Mode and selected a qualitative description for each risk factor that best described the conditions in the port. These qualitative descriptions were converted to discrete values using numerical scales that were developed during earlier PAWSA workshops.

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. Figure 3 below shows that 16 of 24 risk factors were scored at or above the mid-risk value. Risk values highlighted in red (values at or above 7.7) denote very high baseline risk levels; risk values highlighted in green (values at or below 2.3) denote very low baseline risk levels

As the participants discussed trends and observations for each of the 24 risk factors, their comments and observations were documented for inclusion in this workshop report. An Electronic Charting System (ECS) was also utilized to plot the charted location associated with participant comments and observations, and assign a risk factor marker number for that specific comment and/or observation. Appendix B includes participant comments and observations, appendix C includes ECS chart extracts with the plotted locations associated with the comment/observation.

Figure 3

Baseline Risk Levels					
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
1.7	4.9	3.3	7.2	8.4	9.0
Shallow Draft Vessel Quality	Volume of Small Craft Traffic	Water Movement	Dimensions	Petroleum Discharge	Environmental
4.7	5.8	4.5	6.6	6.3	8.0
Commercial Fishing Vessel Quality	Traffic Mix	Visibility Restrictions	Bottom Type	Hazardous Materials Release	Aquatic Resources
5.2	5.4	3.8	6.4	8.1	5.7
Small Craft Quality	Congestion	Obstructions	Configuration	Mobility	Economic
9.0	4.5	3.9	9.0	8.7	6.5

• Small Craft Quality (9.0)	• Dimensions (6.6)	• Volume of Commercial Traffic (4.9)
• Health and Safety (9.0)	• Economic (6.5)	• Shallow Draft Vessel Quality (4.7)
• Configuration (9.0)	• Bottom Type (6.4)	• Congestion (4.5)
• Mobility (8.7)	• Petroleum Discharge (6.3)	• Water Movement (4.5)
• Personnel Injuries (8.4)	• Volume of Small Craft Traffic (5.8)	• Obstructions (3.9)
• Hazardous Materials Release (8.1)	• Aquatic Resources (5.7)	• Visibility Restrictions (3.8)
• Environmental (8.0)	• Traffic Mix (5.4)	• Winds (3.3)
• Visibility Impedements (7.2)	• Commercial Fishing Vessel Quality (5.2)	• Deep Draft Vessel Quality (1.7)

Section 5: Book 2 – Team Expertise Cross-assessment

The next second step in the PAWSA process is the completion of a team expertise cross-assessment (workbook 2). The team expertise cross-assessment was conducted early in the workshop process and was used to weigh the relative strengths of each team with respect to the six risk categories. The results of the team expertise cross-assessments were used to weight the inputs that each team provided in the other workbooks completed during the workshop.

After being presented with the concepts underlying the model, each participant team was asked to discuss (among themselves) how their background and experience aligns with the model. They then verbally presented their conclusions to the other teams. These presentations gave all teams a sense of where everyone thought they were strong – or perhaps not so strong. After all teams had spoken, each team then evaluated whether they were in the top, middle, or lower third of all teams present with respect to knowledge and expertise in the six risk category areas.

The participants assessed their own and all the other participant teams' level of expertise for each of the six categories in the Waterway Risk Model. Overall, 39% of the participant teams were placed in the upper third, 36% in the middle third, and 26% in the lower third of all teams. While the "ideal" split should be closer to a 33% / 33% / 33% distribution, the expertise in the room were strong for all categories.

The following table further breaks down the participants' expertise for each risk category.

Figure 4

Team Expertise - Distribution

Risk Category	Top 1/3	Mid 1/3	Lower 1/3
Vessel Conditions	36%	38%	26%
Traffic Conditions	49%	28%	23%
Navigational Conditions	39%	37%	24%
Waterway Conditions	37%	35%	28%
Immediate Consequences	38%	38%	24%
Subsequent Consequences	32%	37%	31%
All Categories Average	39%	36%	26%

Section 6: Book 3 – Evaluating the Effectiveness of Existing Risk Mitigation Strategies

The third step in the PAWSA process is for participants to evaluate the effectiveness of existing mitigation strategies in reducing the risk level for each risk factor. Participants discuss existing risk mitigations for all risk factors in the model, and then completed workbook 3 to evaluate how effective they though the mitigations were at reducing risks.

For 17 risk factors (green), there was consensus that risks were well balanced by existing mitigations.

For 6 risk factors (yellow), there was no consensus that risks were well balanced by existing mitigations.

For 1 risk factor (red), there was consensus that risks were not balanced.

Consensus is defined as 2/3 of the workshop participant teams being in agreement.

Figure 5

Mitigation Effectiveness												
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	
1.7	1.6	4.9	4.5	3.3	3.0	7.2	6.5	8.4	6.3	9.0	8.3
Balanced		Balanced		Balanced		Maybe		Balanced		Maybe	
Shallow Draft Vessel Quality		Volume of Small Craft Traffic		Water Movement		Dimensions		Petroleum Discharge		Environmental	
4.7	4.1	5.8	5.3	4.5	3.9	6.6	6.7	6.3	5.5	8.0	7.1
Balanced		Balanced		Balanced		Maybe		Balanced		Balanced	
Commercial Fishing Vessel Quality		Traffic Mix		Visibility Restrictions		Bottom Type		Hazardous Materials Release		Aquatic Resources	
5.2	4.8	5.4	5.6	3.8	3.6	6.4	6.1	8.1	6.7	5.7	5.4
Balanced		Maybe		Balanced		Balanced		Balanced		Balanced	
Small Craft Quality		Congestion		Obstructions		Configuration		Mobility		Economic	
9.0	8.2	4.5	5.0	3.9	3.4	9.0	7.9	8.7	7.6	6.5	6.3
NO		Balanced		Balanced		Maybe		Maybe		Balanced	

Risk Factor	
Book 1 Score	Book 3 Score
Consensus Reached ?	

	EXPLANATION
Book 1	Baseline risk level
Book 3	Level of risk taking into account existing mitigations
Balanced	Consensus that risks are well balanced by existing mitigations
Maybe	No Consensus that risks are well balanced by existing mitigations
Not Balanced	Consensus that existing mitigations do NOT adequately balance risk

Section 7: Book 4 – Identifying Additional Risk Intervention Strategies

The workshop participants next completed book 4, which evaluated how successfully a proposed risk intervention strategy would be at lowering risk levels for each of the 7 risk factors determined to require additional interventions.

The table below shows the expected reduction in risk when taking the actions specified by the participants. A green "balanced" indicates no additional intervention is needed because risk in the waterway was judged to be well balanced by existing mitigations.

Appendix D is a description of each risk intervention general strategy.

Appendix E describes all additional risk intervention strategies identified by the participants.

Figure 6

Additional Interventions					
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**
Balanced	Balanced	Balanced	Coordination / Planning	Balanced	Coordination / Planning
			3.4		**3.2**
Shallow Draft Vessel Quality	**Volume of Small Craft Traffic**	**Water Movement**	**Dimensions**	**Petroleum Discharge**	**Environmental**
Balanced	Balanced	Balanced	Waterway Changes	Balanced	Balanced
			2.8		
Commercial Fishing Vessel Quality	**Traffic Mix**	**Visibility Restrictions**	**Bottom Type**	**Hazardous Materials Release**	**Aquatic Resources**
Balanced	Voluntary Training	Balanced	Balanced	Balanced	Balanced
	1.9				
Small Craft Quality	**Congestion**	**Obstructions**	**Configuration**	**Mobility**	**Economic**
Voluntary Training	Balanced	Balanced	Coordination / Planning	Coordination / Planning	Balanced
4.6			**3.3**	**2.7**	

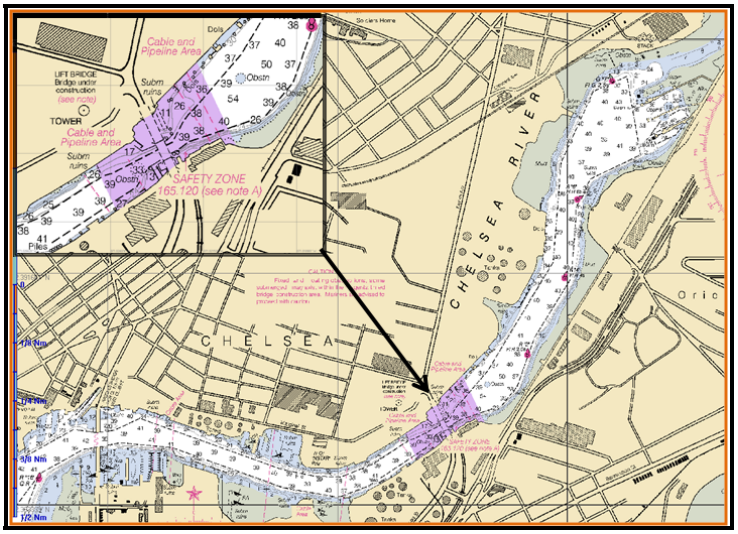
Risk Factor
Intervention Category
Risk Improvement

	EXPLANATION
Intervention Category	Intervention general strategy that most participants selected for furthur risk mitigation actions.
Risk Improvement	The amount that present risk levels might be reduced if new mitigation measures were implemented

Section 8: Chelsea Street Bridge Replacement – Channel configuration evaluation

An important objective of the Boston PAWSA workshop was to discuss the Chelsea Street Bridge replacement project and evaluate several channel configuration proposals previously identified by the Chelsea Street Bridge Replacement Project - Maritime Workgroup (CSB-M). The CSB-M is an advisory committee formed under the Boston Port Operators Group (POG), a Harbor Safety Committee, and includes memberships comprised of maritime industry, port stakeholders and various local, state and federal entities that share a vested interest in the Chelsea Creek shipping channel.

Figure 7



Participants were asked to complete a separate book 4 assessment for each of the following channel configuration options previously developed by the CSB-M, and determine the additional risk reduction each option presented.

Option 1: A 175 foot horizontal clearance without a fender system.

Option 2: A 175 foot horizontal clearance with a fender system.

Option 3: A 220 foot horizontal clearance without a fender system.

The number at the bottom left corner is the configuration risk factor score from book 3, the number in the center is the expected risk reduction for that option, and the number shown at the bottom right corner is the mitigated risk factor rating that channel configuration option would be expected to produce.

Figure 7

Option 1 175' - no fender system		
7.9	1.8	6.1

Option 2 175' - with fender system		
7.9	3.9	4.0

Option 3 220' - no fender system		
7.9	5.6	2.3

All participant teams agreed that a Regulated Navigation Area should be established for Chelsea Creek, limiting the use of the waterway to commercial traffic. All participant teams further agreed that increased dialogue with bridge owners and vessel operators was needed in order to convey the navigation limitations placed on large commercial vessels when approaching bridge opening.

Conclusion

The goal of a PAWSA workshop is not only to further the Marine Transportation System (MTS) objective of improved coordination and cooperation between government and the private sector, and involving stakeholders in decisions affecting them, but to provide the Coast Guard Sector Commanders and members of the waterway community with an effective tool to evaluate risk and work toward long term solutions tailored to local circumstances. The goal is to find solutions that are both cost effective and meet the needs of waterway users and stakeholders. In support of this goal, this report should be viewed as a starting point for continuing dialogue within Boston's maritime community.

The United States Coast Guard, Marine Transportation System Management Directorate, extends a sincere appreciation to the workshop participants for their contributions to the Boston PAWSA workshop. Their expertise was critical to the success of the workshop, and their recommendations will greatly assist the Coast Guard as it continues to work with the maritime community to further improve safety and efficiency in the Port of Boston, Massachusetts.

United States Coast Guard

Marine Transportation Systems Directorate

Providing Navigation Safety Information
for America's Waterways Users

Appendix A

Workshop Participants and Facilitation Team

Sgt. Joe Cheevers	Boston Harbormaster	CheeversJ.bpd@cityofboston.gov
Chris Deeley	Foss Maritime	CDeeley@FOSS.com
Jim Deyermond	Massachusetts State Police	james.deyermond@pol.state.ma.us
LT Gary Duncan	Massachusetts Marine Environmental Police	Gary.Duncan@state.ma.us
LT Robert Gillan	Quincy Harbormaster	rgillan@quincyma.gov
Pete Gilson	Massachusetts Boat & Yacht Club Association	petegilson@aol.com
Andy Hammond	Boston Harbor Pilot Assoc.	AHammond@BostonPilots.com
CAPT John Healey	USCG Sector Boston	John.N.Healey@uscg.mil
George Lee	Boston Harbor Docking Pilots	GELee@Comcast.net
Paul Milone	Weymouth Harbormaster	pmilone@weymouth.ma.us
Jack McLaughlin	First District (USCG) Waterways	Jack.J.McLaughlin@uscg.mil
Capt. Angel Montanez	Angel Montanez	captainangel@gmail.com amontanezjr@comcast.net
Steve Palmer	Moran Shipping Agencies, Inc.	SPalmer@MoranShipping.com
LT Brent Pounds	NOAA	Brent.Pounds@noaa.gov
Red Shannon	Pilot Commission, District 1	RTShannon1@Comcast.net
Capt. Jay Spence	Massachusetts Bay Lines, Inc.	jay@massbaylines.com
Capt. Richard Stover	Boston Harbor Pilot Association	rstover@bostonpilots.com
Chief Matthew Vaughn	USCG Station Boston	Matthew.D.Vaughn@USCG.Mil
Brad Wellock	MassPORT - Maritime Affairs	BWellock@Massport.com
Scott White	USCG Sector Boston	Scott.C.White@uscg.mil
Mike Walsh	U.S. Army Corps of Engineers	Michael.E.Walsh@usace.army.mil

Facilitation Team	**Organization**	**Email Address**
Mr. Burt Lahn	USCG Commandant (CG-5533)	Burt.A.Lahn@uscg.mil
Ms. Chrissie Foster	ATS Corporation	cfoster@atsc.com
Mr. Dave Lersch	ATS Corporation	dlersch@atsc.com
Ms. Stephanie Muska	ATS Corporation	smuska@atsc.com
Mr. Nathan Peirce	ATS Corporation	Nathan.T.Peirce@uscg.mil

Appendix B

Participant Observations- Trends in the Port and Existing Risk Mitigations

Deep Draft Vessel Quality

Trends of Today:

Overall, the deep draft vessels operating in the Port of Boston are of high-quality surpassing the quality of the vessels of 15 years ago. Ships of today are larger and have the capacity to carry larger amounts of cargo. The majority of the foreign crews exhibit a satisfactory mastery of the English language, and over the past 10 years, there is only one known incident where a language barrier presented an issue. Crewmember skill improvement can be attributed to the regulations and laws currently in place. Deep draft vessels that are "repeat customers" in the Port are of quality build resulting in less than 2-3 detentions over the past few years, and only one expulsion. The request for deep draft vessel lay berths in the Port area has declined and ships are not being delayed as long for inspection as they were in previous years. Smaller coastal foreign-flagged ships transporting U.S. cars out of East Boston to the Caribbean are generally the only deep draft vessels having quality issues in the port.

Existing Mitigations:

There are many existing mitigations that help to reduce risk due to deep draft vessel quality in the Port of Boston. Vetting by large oil companies and financial penalties for vessel noncompliance are incentives for vessel owners to keep their vessels in top-notch condition and comply with existing regulations. Pilots are transported via tugboat to meet incoming deep draft vessels offshore so that the pilots are able to guide and assist deep draft vessels through the narrower waterways and main traffic areas. State pilots have licensing and registration requirements, and it often ends up where there are two pilots on the bridge of a vessel (state pilot and docking pilot) providing an extra set of eyes during vessel transit. Overall, the pilots provide high quality service to these deep draft vessels from the "sea buoy to the dock".

Shallow Draft Vessel Quality

Trends of Today:

The Port of Boston has a considerable amount of shallow draft vessels transiting the waterways daily. The shallow draft vessel community is comprised of tug boats, barges, towing vessels, ferries, passenger vessels (T & K), charter dinner boats, and articulated tug and barges (being built to replace tank ships). Overall, these vessels are of good quality, and it is a rare occurrence that any of these vessels break down and need to be towed ashore. Some of the shallow draft vessels operating in the Port were built in the 1960's and are still running today thanks to proper maintenance and upkeep.

Approximately 50% of tug and barge traffic sailing on a coastwise voyage utilize a State Pilot for navigation into the Port of Boston. Although approximately 90% of the barges that transit the Port of Boston are double-hulled, the old single-hulled ethanol and petroleum barges operating in the Port of Boston are cause for concern. Automatic Identification System (AIS) shortfalls are also a reason for concern especially when weather conditions deteriorate. Also, all ferries do not currently have AIS on board.

The small passenger vessel crew quality is improving every day. Commuter ferries have to compete with train transportation and now carry about 40% less passengers than they carried 10-20 years ago. Since these vessels have to compete with other forms of transportation, the ferry services are very consistent and reliable. Most Captains on passenger vessels work a part-time schedule, however, they are well trained, reliable, and demonstrate longevity in their positions. Passenger vessels are built of good quality. There are no passenger vessels over 100 gross tons operating in the Port of Boston. The small passenger vessel fleet is obedient in following "no wake" zones. Small passenger vessel operators feel more pressure to keep their boats in good working condition so that they are able to maintain an affordable insurance policy. It has been shown that rates can rise by as much as 60% following a collision or allision, which would severely impact many companies' finances or even put them out of business.

Uninspected construction barges tend to be the shallow draft vessel types, and pose a potential risk of waterway obstruction since they are of poorer quality and do not get inspected.

Existing Mitigations:

Existing mitigations in the Port of Boston significantly reduce the risk attributed to shallow draft vessels. Passenger vessel crews are given a thorough education and compliance training, and the vessels are well maintained in order to reduce liability and keep insurance premiums low. Well written training manuals and a variety of training videos are used to supplement passenger vessel crew training, and currently the Passenger Vessel Association (PVA) is working with the Coast Guard to develop a flag ship program that would require these vessels to include a safety management system. Drills, exercises, and training occur daily. Longevity of the local Captains is also a mitigating factor in reducing risk. The regulatory weight limitations used to calculate stability for passenger vessels have increased. Additionally, vessels (excluding subchapter T) are required to have security plans. A voluntary towing vessel examination program is offered and is well received by the vessel owners and operators. Towing vessels have increased their safety over the past 10 years due to vessel bridging programs and new construction of ATB's. Internal company safety programs and requirements are implemented in most cases which help further reduce risk. AIS equipment is used onboard many shallow draft vessels helping to reduce the event of a collision, allision, or grounding.

Commercial Fishing Vessel Quality

Trends of Today:

The commercial fishing industry in the area has declined dramatically over the past 20 years, reducing the number of commercial fishing vessels seen in the harbor. Commercial fishing vessels in the area are generally built of good-quality. A majority of the commercial fishing vessels that operate in and out of the Port of Boston are lobster boats. The lobstermen are extremely familiar with the waterways, perform their jobs well, and have good communication with authorities and pilots. Occasionally local lobstermen will drop traps in close proximity to the channel which creates risk. There was an observation that the lobstermen should communicate on channel 13 and not on channel 16.

Existing Mitigations:

There is a very proactive dockside fishing vessel inspection conducted by the Coast Guard as well as a large Coast Guard presence on the waterways to help deter risk. On board instrumentation, such as Global Positioning Systems (GPS), and the U.S. National Oceanic and Atmospheric Administration's Vessel Monitoring System (VMS), also help to mitigate risk from commercial fishing vessels.

Small Craft Quality

Trends of Today:

The overall quality of small craft vessels in the Port of Boston are mostly of good build, however, the quality of the vessel usually correlates to the vessels size (i.e. yachts always seem to be under control and pass administrative safety checks without many violations). The vessels that range from 15'-30' tend to have the most violations during inspections and cause the most issues. 85% of small craft vessels in Massachusetts are less than 25 feet. The major issue in the port tends to be with small craft vessel operators, as opposed to the craft itself. The majority of these operators demonstrate little to no knowledge of the "rules of the road" and the 8-10% of operators that do operate properly seem to be mostly local boaters that have excellent knowledge of the waterways. Inland small craft operators often do not have the same experience of the offshore operators which creates risk in the Port. Massachusetts and Maine are the only states in the U.S. that do not have state run boater education programs. Although voluntary boater safety classes are offered frequently in the area, they are poorly attended. Since there is no licensing requirement for small craft operation, vessel operators do not see the need to attend a boating class. It was observed that mandatory education and licensing is not the same thing. Over the past decade, the Port has seen incredible growth in kayaking, paddle boating, and canoeing. In Coast Guard District 1, 50% of the boating fatalities involved canoe or kayak

operators/passengers. This may be attributed kayakers are not wearing their life jackets as required from September 15-May 15.

Existing Mitigations:

There are boating safety classes offered frequently by a variety of organizations in the Port of Boston which can help to mitigate risk, if the classes are attended. The Captain of the Port is also involved in educating the public and published a boating safety pamphlet this past spring to assist with boater awareness. Legislation is currently pending in Massachusetts that would make boating safety courses mandatory and also carry staggered education requirements depending on mariner history. The First Coast Guard District's "Operation Paddle Smart" is a safety outreach program targeting small self-propelled paddle vessels such as canoes and kayaks that advocates the marking of kayaks for easier identification on the waterways. There are currently two locations in the port being built to cater to canoe and kayak operations. Local law enforcement, the Coast Guard, and the Harbor Master all have a strong presence in the waterways to help mitigate risk. Recently an area familiarization training program was conducted through the Massachusetts Boat and Yacht club. Vessel assistance towing is offered in the port; they have a good knowledge of the local boaters which helps in lowering risks.

Volume of Commercial Traffic

Trends of Today:

The Port of Boston has seen an increase in Ro-Ro car carrier activity over the past several years. Most of the tank ships that arrive in the port are between 20,000-40,000 gross tons, and liquefied natural gas ships range between 80,000-100,000 gross tons. It was stated that there are on average at least three deep draft vessel arrivals per day including the Fore River and main shipping channel. Although in general shipping has been on the decline in the Port reducing deep draft commercial vessel traffic; tug and barge transport, oil shipping, and passenger vessel transit has increased over the past 15 years.

There is a greater amount of passenger vessel traffic in the early morning and late afternoon/evening time periods due to commuter demand. Additionally, the morning hours also see an increase in the volume of larger tankships due to daylight-only navigation restrictions of the Chelsea Street Bridge. The overall volume of commercial traffic is well spread out, however, September-October are the busiest months due to the arrival of tankships, salt ships, and cruise ships. Winter is also a busy season for commercial vessel traffic due to the increase in demand for oil barges transporting home heating oil. Commercial vessels moving cargo into port are busiest during January and February.

Existing Mitigations:

Pilots carry laptops with electronic charting and geographic positioning systems. Using an AIS system helps to mitigate risk by being able to identify the name and location of vessels in the area. Most of the commercial traffic routes are well known and do not change frequently. Amphibious "DUKW", or Duck, boats have restricted routes helping to alleviate risk. Vessels generally operate on the extreme sides of the channel relieving some of the traffic volume.

Volume of Small Craft Traffic

Trends of Today:

In the Port, there are three commercial sailing centers/clubs that lease sailboats and provide on-water instruction (Marker TC 2). One of these sailing centers has approximately 500 members who have the ability to take boats out at any time. In addition, there are also three sailing schools in the Port that instruct kids how to sail (Marker TC 1). It is common for summer races to occur in the channel and the entrance to the Charles River. Races also take place in the Fore River from May-September (Marker TC 3). Every Wednesday evening in the summer there is a large number of 30'-50'sailboats that participate in a race in the Fore River (Marker TC 4). Some race routes take boats across the channel creating a hazard for other vessels transiting up and down the channel. Organizers of planned regattas are good about giving advanced notice of the event to the port community. Summertime racers/sailors/and mini-boats usually move aside and get out of the way of larger

commercial vessels in the waterway. At times it seems like "uncontrolled chaos" with recreational traffic being wide spread in the Fore River.

Existing Mitigations:

Larger ships are escorted when there is an increased volume of traffic in the waterway, which in turns moves the smaller craft traffic out of the way making it safer for all vessels.

Traffic Mix

Trends of Today:

The entrance to the harbor (President Roads area) is a melting pot of traffic (Marker TC 5). This area sees all types of vessels from all directions trying to enter the harbor creating a dangerous mix of traffic. Some areas of the waterway see a mix of recreational boats conducting recreational water activities and commercial vessels. The downtown area has a tendency to get highly populated with a variety of vessel types. It was the general consensus of the group that there could be a mix of traffic anywhere at any time on the waterways of Boston, and that all waterways are authorized for multiple use. Passenger ferries and recreational boats transiting out of the Fore River from Quincy meet other vessels and vessel types in Western Way. It can be a "free for all" with many boats coming at each other from all directions and it is not always clear as to who will do what when. Commuter boats generally move fast and mind the "rules of the road" while smaller boats will get in the way of larger vessels (Marker TC 6). There are approximately 50 commuter boat transits in Western Way every day.

The newly constructed amphibious (DUKW) vessels operate in the Mystic River while the older amphibious vessels operate in the Charles River (Marker TC 7 and TC 8). It is a rare occasion to see these vessels operate where they are not supposed to be; however, there have been incidents where they have been caught in the way of other transiting traffic. A kayaking dock is slated to be built in the Little Mystic Channel (Marker TC 10) to be used for rehabilitation of hospital patients. The Hull Gut area of the Weymouth-Fore River approach is a popular spot for private fishing boats. These boats sometimes anchor in the channel (Marker TC 09) making it difficult for pilots to navigate the waterway, especially when police escorts have not yet met the piloted vessel. Recreational traffic sometimes finds itself placed in choke points and inopportune locations which can cause risks to all vessels in the Port.

Existing Mitigations:

A large Coast Guard presence in the area helps to facilitate the mix of traffic in the Boston waterways. The Port Operators Group, comprised of representatives from all vessel classes, meets monthly to discuss waterway issues helping to reduce risk. The escorting of larger ships into and out of the Port and the regular patrol by law enforcement agencies also help to reduce risk resulting from traffic mix.

Congestion

Trends of Today:

There is regularly occurring congestion in the Boston waterways. Deep draft congestion is rare, but when it does occur, the main shipping channel is well defined to accommodate deep draft traffic on one side and lighter vessels on the other side. Marker TC 11 illustrates an area of deep draft vessel congestion in Hull Gut. The congestion is comprised of a mix of vessel types including ferries, commuter boats, recreational vessels, tugs and barges, and deep draft vessels. The commuter boats have excellent communication, especially in the Fore River, making Channel 13 a fairly busy communication channel (Markers TC 12, TC 13, and TC 14 - commuter boat congestion areas). The Inner Harbor area can get congested with water taxis and recreational vessels traveling north/south across the channel and deep draft vessels transiting east/west (Marker TC 15 - heavy traffic areas). This congestion happens mostly on weekends during the months of July and August. The "no wake zones" and the area from where the water taxi departs out of the airport can be a hot spot for congestion (Marker TC 16).

There are two areas within the harbor where the waterway maneuverability can be restricted: the Reserved Channel is restricted seasonally from September and October due to increased transits of cruise ships

and increased container activity (Marker TC 17). The turning time for cruise ships departing port is limited because of the proximity to the airport runway. Maneuvering room for cruise ships is tight and can slow them down (Marker TC 18). The second restricted waterway location is the Chelsea Street Bridge area (Marker TC 19). When a tanker is at berth at the Sunoco Logistics berth it restricts access to the remaining petroleum terminals upriver on the Chelsea Creek. If a vessel over 500 feet long is at the Global Chelsea Terminal, a liquefied natural gas carrier (LNGC) cannot be moored at the Distrigas facility. The Schnitzer facility, Distrigas, and the Exxon-Mobil terminals all share mooring points that overlap each other (Marker TC 20). A vessel at either the Schnitzer facility or the Exxon-Mobil terminal would prohibit a LNGC mooring at Distrigas

On average LNGCs arrive in the Port weekly. There was not a consensus in the group that liquefied natural gas is the most dangerous ship/cargo in the port, and therefore should not be responsible for contributing to the congestion due to the implemented security zone around the vessels. The "moving" security zone around LNGC transits through the port can congest the area, slow down ferry service, or force someone to navigate a channel they do not usually use. Several yacht clubs near the Amelia Earhart locks can congest the Mystic River seasonally.

Existing Mitigations:

The Port of Boston has many existing mitigations to reduce waterway congestion. Law enforcement patrols help to remove clogs and keep waterways clear. Pilots take alternate routes during periods of heavy congestion. Vessels can wait at the sides of the approaches or use the anchorage in President Roads to allow other traffic to pass. The Coast Guard communicates congested areas to vessel operators to help mitigate risk. Agents will reschedule sailings around the LNGC transits to help reduce congestion. Although LNGC schedules are not announced to the general marine public until they are on the inbound approach, there are enough escorts and "blue lights" that boaters are able to recognize a liquefied natural gas transit.

Winds

Trends of Today:

When wind speeds are 25-30 knots, vessels are able to operate comfortably within the Port. Sustained wind speeds ranging from 15-25 knots are normal on a daily basis. There are several days each winter when the wind speeds exceed the safety threshold. The winds in the area are very predictable with the prevailing winds mostly out of the Northwest. When wind speeds exceed 40 knots, the Fore River Bridge will close operations (Marker NC 1). Although the winds are usually predictable and steady, they can affect the variety of vessel operations in the port differently. Wind speed can also vary depending on where in the Port the wind speed measurement was obtained. Sustained wind speeds are the determining factor in making navigational operation decisions, not wind gust speeds. Operational cutoffs specific to wind speed may not be warranted considering that mariners typically make good decisions. There is no regulation that specifies the type of tugboat that can be used in windy conditions.

Existing Mitigations:

When necessary, local entities will contact the National Weather Service for real time conditions regarding winds.

Water Movement

Trends of Today:

The narrows on Hull Gut usually runs at 5 knots (Marker NC 2). There is a strong cross current leading out of Western Way to the buoy (Marker NC 3). Environmental factors, such as bottom type, can also affect vessels dragging anchor in the President Roads anchorage (Marker NC 4). Certain areas of the waterway have tidal constraints and will not bring in a vessel on a low tide. The Fore River tidal currents can restrict inbound tankers for up to an hour and a half making for difficult passage. The Chelsea Creek is restricted by a minimum under keel clearance requirement and it is difficult to bring in a loaded tanker if they enter on low water slack (Marker NC 5-currents in the Chelsea Creek). In some shallow water areas within the harbor vessels anchored on mooring balls can lie on the bottom of the waterway at low tide. The waterways north and east of Logan airport and Winthrop areas (Marker NC 6 and NC 7) are difficult to get to and cause problems for private

vessels, commuter vessels, and recreational vessels due to tidal fluctuation and a narrow channel. The area is not well marked, and the navigational aids in this area are not optimally placed and are difficult to see at night (Marker NC 8). It was stated that if you do not follow the aids to navigation, the water movement and tidal fluctuation can create issues with vessels (Marker NC 9). The water movement and existing aids to navigation set-up is especially confusing near the JFK Library. From the 3-A Bridge into the estuary, there is a strong 6-7 knot flow where recreational vessels have to ramp up their RPM's to make it through, however, at ebb, recreational vessels can put the boat in neutral and move through due to the strong current (Marker NC 10). The soundings on harbor charts proximate to tidal zones/areas are out of date and updating them would be helpful to the sailing community.

Existing Mitigations:

No additional mitigations were discussed.

Visibility Restriction

Trends of Today:

Fog is not constant or prevalent in the Port of Boston over the course of the year; however, it is also not very predictable. Fog tends to be limited to springtime months and occurs occasionally in the winter. Easterly winds are more predominate in the springtime and when combined with 50 degree water temperature, there is a greater chance of fog formation. There are several locations in the Port where fog reoccurs regularly. When fog is a factor, it hangs in the Nantasket Roads area. There are 10-15 times a year in the Fore River narrows when vessel arrivals have to be cancelled due to fog and low visibility (Marker NC 11). From Castle Island to the Inner Harbor fog can be thick, but not as thick as in the Fore River. A band of fog can hang from the Long Island Bridge down through Western Way into President Roads (Marker NC 12). It was noted that fog bands can go in and out and may not always affect the entire waterway at one time.

Existing Mitigations:

To mitigate risk resulting from fog, Pilots use GPS, radar, and security calls for commercial and passenger vessels. There are also greater restrictions when moving a LNGC into the port during a fog event.

Obstructions

Trends of Today:

Obstructions that can always be found in the Boston waterways include deadheads and lobster pots. Springtime tides increase debris, deadheads, and timber. There is an absence of authority to remove debris outside of the channel. If debris is in the channel, the Army Corps of Engineers will remove the waterway obstruction. When debris is located outside of the channel, no one wants to claim responsibility, and it does not get removed. Within the Boston Harbor, a group of sponsors will pick up garbage, but not wreckage. There are also some derelict barges that are located in the Hull Gut area.

Existing Mitigations:

Coast Guard broadcasts of debris locations help to mitigate obstruction risks.

Visibility Impediments

Trends of Today:

The Fore River Bridge structure obstructs vision for inbound and outbound vessels (Marker WC 1). Inbound vessels are unable to see the ferry terminal and any traffic that is disembarking from it. Northbound vessels have difficulty coming out of the Town River (Marker WC 2). There are several bends where a vessel may have to utilize sound signals due to visibility impediments: the Hull Gut bend, the bend into Boston Inner Harbor, and the Reserved Channel. When there are cruise ships docked in the Reserved Channel, the field of vision for vessels traveling outbound is obstructed. The buildings located on the edge of the Reserved Channel also obstruct the field of vision for a Pilot or Captain backing out of the channel (Marker WC 3). Outbound vessels have difficulty seeing inbound vessels around the Mystic bend (by the Mystic Pier) due to building

obstructions. Also, if a vessel in the Mystic River is heading southeast it can be hard to see inbound vessels traveling up the main shipping channel. It was observed that the entire Chelsea Creek area is a “blind spot”. Near the McArdle Bridge, background lighting is an issue and it is hard to see the bridge fenders (Marker WC 4, WC 6). The flood lighting from commercial airport parking facilities adjacent tothe Chelsea Creek are very bright in addition to the lights from the terminals making nighttime navigation difficult (Marker WC 7, WC 8). The lights are more intense than they were 20 years ago, causing navigation to be more challenging and having a greater impact on safety. The Port has found it difficult to get attention to have the lighting issues fixed. (Marker WC 5 - multiple vessel congregation area)

Existing Mitigations:

The majority of the property on the Chelsea Creek is part of a Designated Port Area. Due to this designation, it is possible to ask the tenant with bright lighting to shield their lights. It was requested that a coordinator or agent of the tenant be contacted instead of contacting the tenant directly. There is also excellent communication between all levels of the Port and the waterway users. This communication helps to reduce risk caused by visibility impediments.

Dimensions

Trends of Today:

The Chelsea River and Fore River both tolerate one-way traffic only for deep draft vessels (Marker WC 9 and WC 14). There is one area; however, in the Chelsea Creek where it is possible to have a small tug and barge (less than 60 feet) pass a commercial deep draft vessel (Marker WC 15). Traffic on the Chelsea mostly navigates slowly and is aware of surrounding traffic. The draft of a vessel is the decisive factor in determining if it can transit up the Chelsea Creek. In order to transit under a full opening of the McArdle Bridge, technicians must be notified 12 hours in advance to remove the grating (Marker WC 12). Bridge tenders do not communicate as much as they should which can cause allisions with the McArdle Bridge. The Fort Point Channel is still a Federal channel and the city of Boston is responsible for opening and closing the Northern Avenue Bridge (Marker WC 13). A two hour notification must be given in the winter in order to open the bridge. Commercial traffic cannot access this channel due to the air draft restriction imposed by the new (fixed) Northern Avenue Bridge. Tunnels beneath Boston Harbor (subway/vehicular) limit channel deepening to 40 ft; although none of the harbor has been maintained to 40 ft notwithstanding the tunnels. It is desired that from the entrance of the main channel up to the Irving and Global terminals be dredged.

In the Fore River, some of the classes of ships are wider than they were 20 years ago leaving no possible way for two tankers to pass each other in the narrow channel. Ferry boats are sometimes able to pass a tanker in the Fore River by going outside of the channel, and in these instances, the ferry boats are very professional about contacting the local marine unit to alert them of their intentions. There is deep water on the outsides of the aids to navigation in the Fore River channel, and the survey data is outdated. The survey data does not accurately represent the current depths and conditions of the channel as they exist today (Marker WC 10). Anchorage #5 in Hull Gut (AKA the old explosives anchorage) is still located in the waterway; however, it is not being utilized. It can be used to anchor an inbound ship in the event of an emergency or can be used as a bailout area for vessels before they commit to the Hull Gut (Marker WC 11). A choke point between Quincy and the Fore River Bridge is an area of concern.

The main shipping channel in the Inner Harbor can accommodate two-way traffic, except when a LNGC is transiting. Due to the original "sloping" channel design, laden vessels are forced to the outbound side of the channel which by nature restricts two-way traffic for deep draft vessels.

It is not possible for two loaded ships to meet from the North Channel inward. Logan Airport monitors vessels measuring taller than 175 feet above sea level. The control tower will restrict use of the runway 4R when vessel air draft exceeds the self imposed safety standards. The tidal range in the area is 10 feet, however, the airport air draft monitors may not account for tidal fluctuation. The controlling depth of the Inner Harbor is 35 feet due to shoaling (Marker WC 18). The main shipping channel is in need of maintenance dredging, however, the cost is extreme and the project cannot be financed until all of the funds have been raised. It is desired that the area from the entrance of the main shipping channel up through the Mystic River and Chelsea Creek be dredged. The Inner Harbor from the shipyard to the confluence is silting in causing risk in the waterway.

Loaded vessels, tankers, salt ships, scrap steel vessels, and container ships are all tide restricted when carrying the maximum cargo. The Island End River on the Mystic is a shallow, narrow waterway used by pleasure boats. This waterway is privately maintained. Tugs are required for both inbound and outbound transits of commercial vessels due to the narrowness of the river and no turning basin (Marker WC 19).

Existing Mitigations:

No additional mitigations were discussed.

Bottom Type

Trends of Today:

Rockier outcroppings are located outside of the main shipping channel not affecting transiting traffic and allowing for all areas inside of the channel to be dredged. A separate observation was that it is not known where the rocky bottom locations are in the Port, so it is a good rule of thumb to assume that the bottom type is rocky wherever you are in the waterway. In particular, it was stated that the North Channel has a rocky bottom. There are few groundings that occur as a result of rocky bottom conditions, so bottom type is not a big factor. The charting data shown at the workshop was observed to be outdated showing that the water outside of the navigational channel is shallow. It was stated that if vessel traffic is operating in the areas outside of the channel, a new survey can be arranged to update the data. Even though there have been deep water surveys conducted over the past 10-20 years, waters less than 12 feet deep were not surveyed in this time period.

Existing Mitigations:

Advances in technology have helped navigators to identify and avoid unfavorable bottom conditions. Even though the charting information may be outdated, charts are still used to mitigate risk in the deeper waters and navigational channels.

Configuration

Trends of Today:

The McArdle Bridge has a 175 foot opening which presents a tight squeeze for multiple vessel meetings (Marker WC 20). The optimal width for operating would be 220 feet. The Chelsea Street Bridge width is also constrained to a 96 foot horizontal clearance with fenders (Marker WC 21). Optimal width would also be 220 feet. Pipeline cables crossing in the river factor into the waterway configuration. To properly navigate the waterways, assist tugs are required and sometimes perform tethered escorts at the Pilot's discretion depending on the type of ship being escorted. The ballast, draft of the vessel, and any daylight restrictions all factor in to the type of tug used in an escort. It was observed that the permanent Fore River bridge replacing the temporary structure should be designed and built wide enough to handle the largest vessel. It was also questioned as to the type of bridge it will be bascule or lift. The Higham ferry maneuvers a tight bend near the old Hingham shipyard (Marker WC 22). Overall, the configuration of the port has brought about more awareness of issues such as under keel clearance and the ability to carefully navigate a vessel in the waterways.

Existing Mitigations:

The safety zone surrounding the Chelsea Street Bridge and smaller vessel sizes help to reduce risk caused by waterway configuration.

Personnel Injuries

Trends of Today:

There is a relatively high potential for injuries on the numerous daily passenger vessel transits within the Port., There have been several previous incidents that demonstrate the aptitude of Port resources to quickly and adequately respond to an event involving personnel injuries. A passenger vessel near Spectacle Island going approximately 20 knots experienced an engine fire and was able to navigate under the bridge and safely unload all passengers onto a passing vessel within 10 minutes of the incident starting. A grounding occurring near Devil's Back was quickly attended to and no one was hurt; and a commuter boat (K-boat) collided with a small recreational vessel and no serious injuries resulted.

Existing Mitigations:

The Coast Guard conducts mass casualty drills, aircraft drills off of the airport, and tabletop exercises on a regular basis to prepare for personnel injuries occurring in the port. These drills and exercises are coordinated with local water and land assets who display an excellent Port partnership relationship. Covered in these drills and exercises are preventative strategies as well as follow-up procedures. The last drill resulted in the creation of a Port communication plan which is still under construction. Radio communication over Channels 13 and 16 alerts other traffic in the port to the location and nature of a distress and can help relief resources arrive faster. Commercial entities also have their own training programs and are able to assist in an event if they are in the area.

Petroleum Discharge

Trends of Today:

There are many vessels entering the Port that carry petroleum products, especially in the winter. These products range from #6, asphalt, heavy oils, jet fuel, gasoline, and diesel. For the most part bulk oil shipments are delivered in vessels measuring less than 40,000 gross tons. The current Chelsea Street Bridge configuration prohibits vessels over 40,000 gross tons to pass through. Generally vessels 30,000 gross tons or more are not able to transit farther than the bridge and it is the hope that when the bridge is widened ships 40,000 gross tons or greater will be able to transit up the Chelsea Creek. An oil terminal up the Mystic River accepts 30,000 gross ton vessels and there is a history of 850 foot panamax ships delivering product in the past, however, they do not arrive in Boston any longer due to current market conditions. There are concerns regarding emergency response access points off of the Chelsea Creek. The road structure and access points are extremely limited and it is unknown how emergency response vehicles and personnel would get to the waterway to evacuate people after an incident.

Existing Mitigations:

Oil spill response resources and strategies are detailed within the Area Contingency Plan and Geographic Response Plans to help with spill mitigation. Assist tugs, Federal Pilots, and Docking Masters navigate oil tankers through the port reducing the risk of a spill resulting from unfamiliar navigation of the area.

Hazardous Materials Release

Trends of Today:

There are no chemical ships that transit in the Port. Coconut oil and shipments of ethanol arrive in the port regularly. (Marker IC 1). Sodium hydrochloride arrives in Boston by truck and is no longer transported by vessel. LNGCs are over 40,000 gross tons and are of major concern to Port safety.

Existing Mitigations:

A large safety and security zone around moving and moored LNGCs reduces the potential for collisions. Broadcast announcements made when a liquefied natural gas vessel is being brought into port alert all other traffic to the safety and security zone associated with the transit.

Mobility

Trends of Today:

If a marine casualty occurred involving the sinking of a deep draft vessel in the channel within the Inner Harbor maritime mobility would be seriously impacted and cause significant disruption to the entire area. There is no capability within the Port for heavy lift and salvage. The nearest resources are located in New York.

Existing Mitigations:

No additional mitigations were discussed.

Health and Safety:

Trends of Today:

Local drinking water does not come from the Port waterways. Boston is a densely populated area with a large number of people whose health and safety could be compromised in the event of a Port catastrophe. A liquefied natural gas release, ethanol discharge, or gasoline discharge resulting in a fire or explosion could impact the Boston city population (Marker IC 2). The total number of people that would be affected is mostly dependant on the area where the event occurs. For example, the transit in on the Fore River is not a heavily populated area, whereas, the downtown Quincy area on the Fore is heavily populated. A discharge in the waterway near the downtown Quincy area could potentially affect populations in the Quincy, Braintree, and Winthrop areas.

Existing Mitigations:

A plan exists in Weymouth to evacuate inhabitants in the event of a release. These plans include blanket calls made from a reverse 911 system. The city of Everett also has a citywide evacuation plan. A joint command has been established with local fire, police, and waterway personnel in order to safely organize an evacuation if necessary. A Consequence Management Plan exists, however, it needs updating. There is also a local first responder training program (MIRT) which includes Emergency Medical Technicians, police, and members of the fire department.

Environmental

Trends of Today:

The Port of Boston is a diverse environmentally and economically sensitive area. A collaborative effort was undertaken last year by key stakeholders to develop comprehensive Geographic Response Plans in order to pre identify sensitive areas and develop response tactics to minimize impact on these areas of a oil spill.

Existing Mitigations:

The Geographic Response Plans and environmental sensitivity indexes are used to locate areas of environmental sensitivity and help to reduce risk to the local environment. Booming strategies are in place to protect environmentally sensitive areas. Pollution response trailers are set-up along the coast line to be accessed quickly in the event of a spill. It was observed that due to the natural environmental sensitivity of the area, the PAWSA model may not reflect a score regarding the actual mitigations that are currently being carried out or have been implemented in the previous years. Even though the environmental risk factor was ranked extremely high, the port community has been very proactive in taking steps to avoid a significant environmental impact.

Aquatic Resources

Trends of Today:

The Port of Boston sees lobstering in the Harbor, fishing, and clamming year round. The waterways are rich in shellfish, finfish, crustaceans, and marine mammals (Marker SC 2).

Existing Mitigations:

There are restrictions in place from February-June associated with in-water dredging, demolition or construction in order to protect the native aquatic species. During this time period, individuals are not allowed to perform waterway or bulkhead repairs in the area so that the species may spawn.

Economic

Trends of Today:

In the event of a discharge or marine casualty obstructing the main shipping channel, the regional supply of petroleum product and liquefied natural gas would be disrupted. Logan airport operations would be negatively impacted since vessels carrying jet fuel to terminals on the Chelsea Creek would not be able to deliver their shipments. A shutdown of the Port of Boston lasting more than 3-5 days would cause serious economic downfalls. Cargo would not be able to be rerouted to Providence as these terminals do not have the storage capacity to handle additional product. The Quincy/Braintree area would also experience a significant economic impact in 3-5 days in the event of a waterway closure.

There have previously been 3-5 day waterway closures in the Port, however, the Chelsea Creek capacity has been lowered since then and there has been a change in the gasoline standards between Maine and Massachusetts, so gasoline could not be rerouted to Maine and then trucked down to Massachusetts. If a significant discharge or marine casualty occurred during cruise ship season the area would see a significant decrease in tourism (Marker SC 4). Commuters utilizing ferries would not be able to get to work in downtown Boston, which translates to approximately 1,600 commuters per day. Additionally, this could impact commuters that are ferried into Boston from Salem. The regional supply of home heating oil could be seriously impacted depending on time of year. The power plant on the Mystic River, which provides an estimated 20% of electricity to the region and is supplied by the Distrigas LNG facility, would shut down upon exhausting the LNG feed, creating a significant energy supply void for the region (Marker SC 5).

Existing Mitigations:

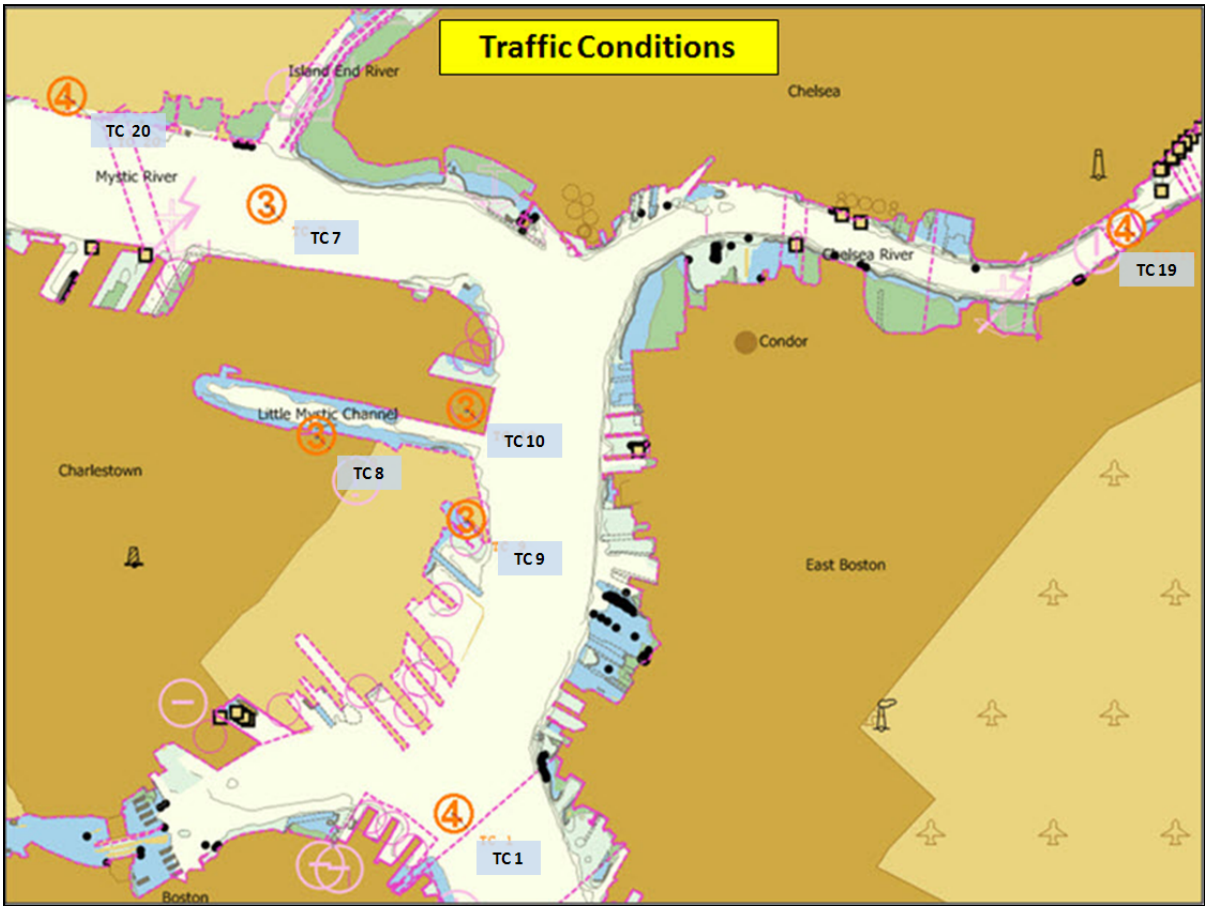
Many companies in the area have long-term plans they would implement in the event of a catastrophic incident that closed the port.

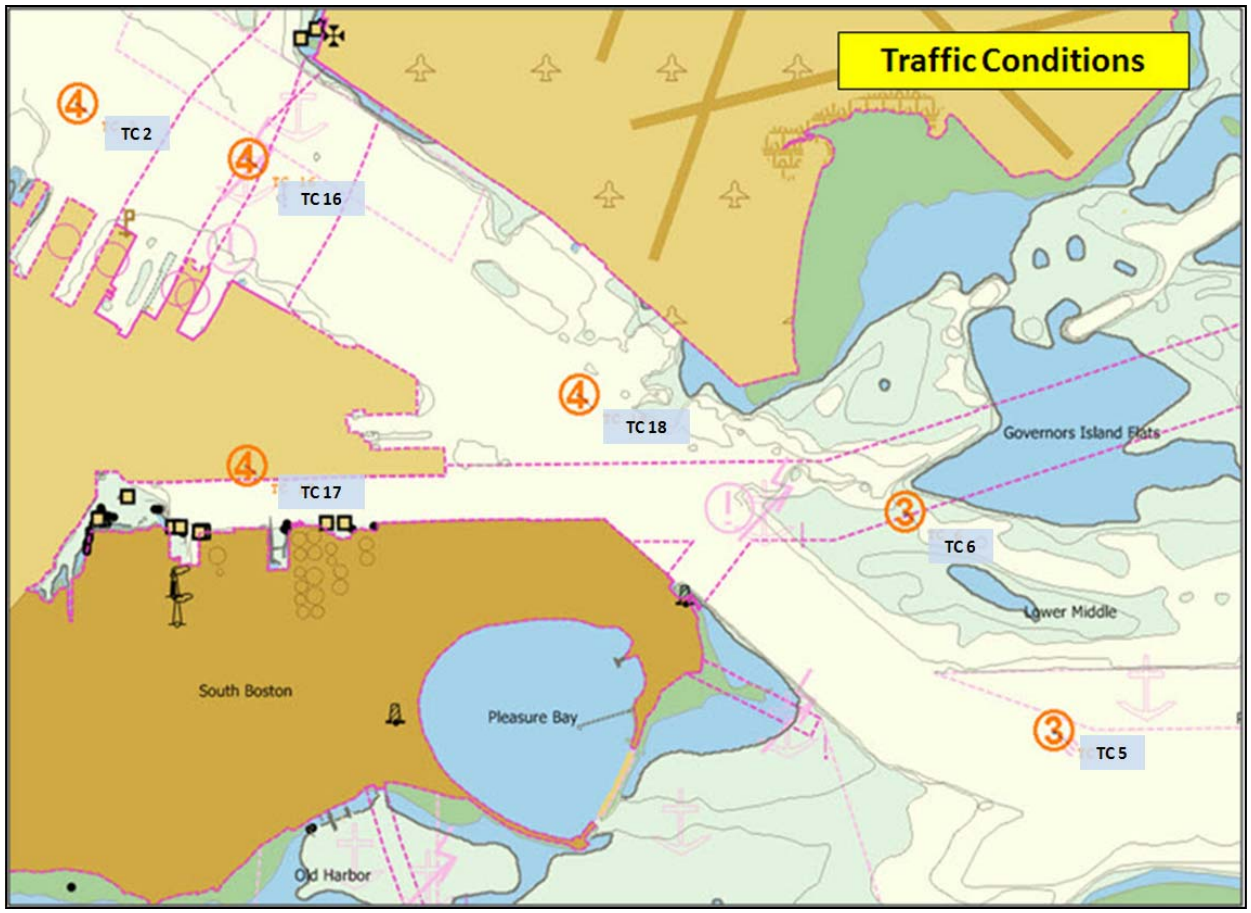
Appendix C

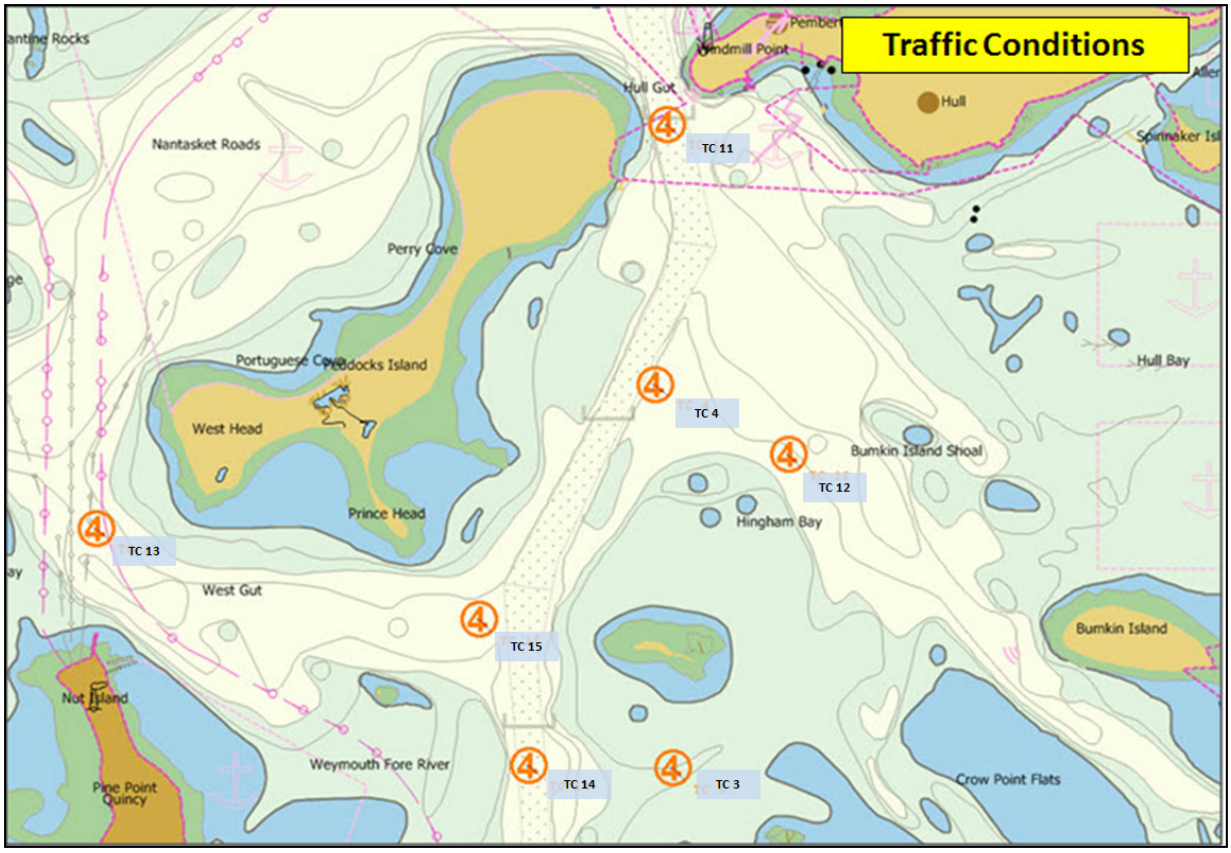
ECS Risk Factor Locations

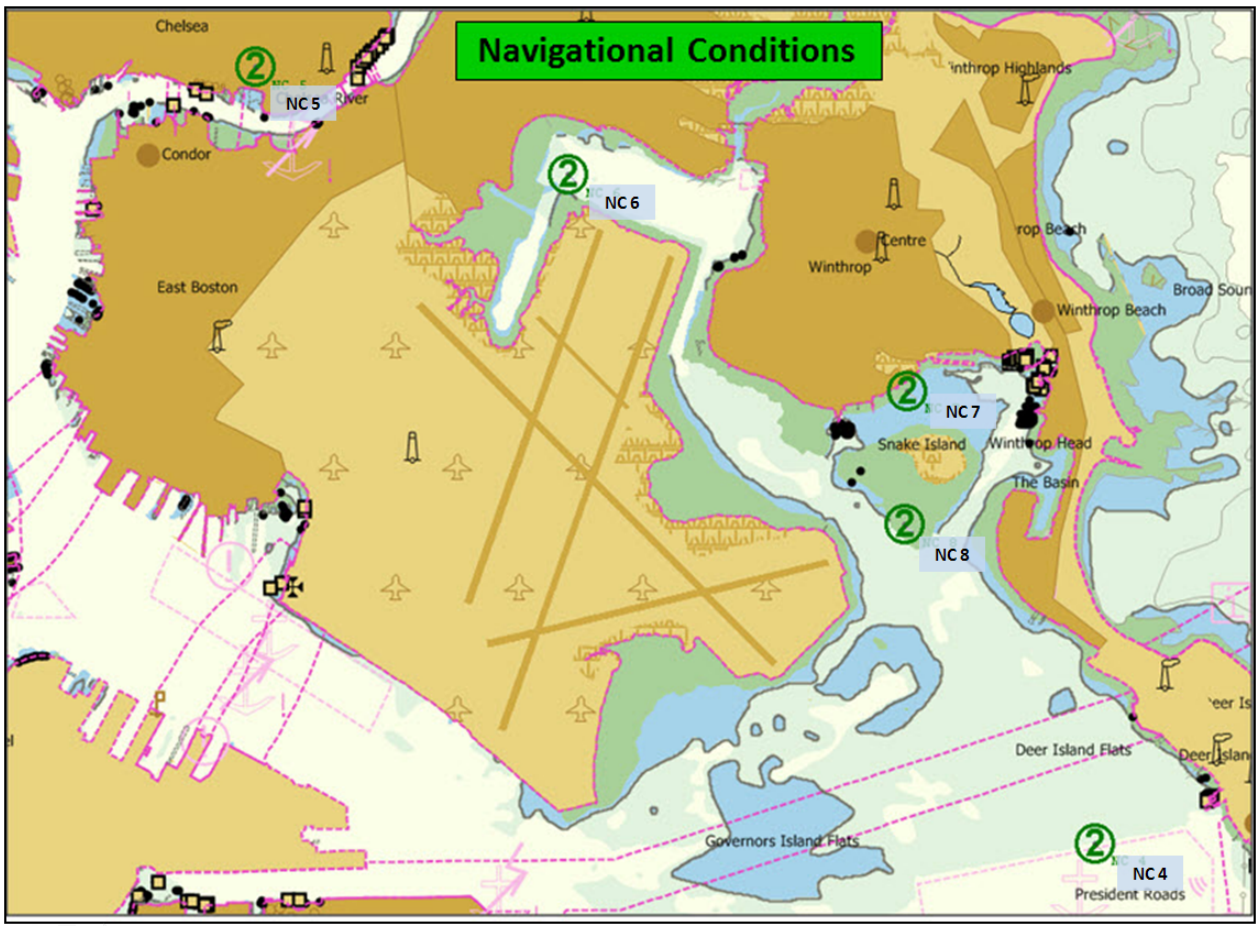
Legend

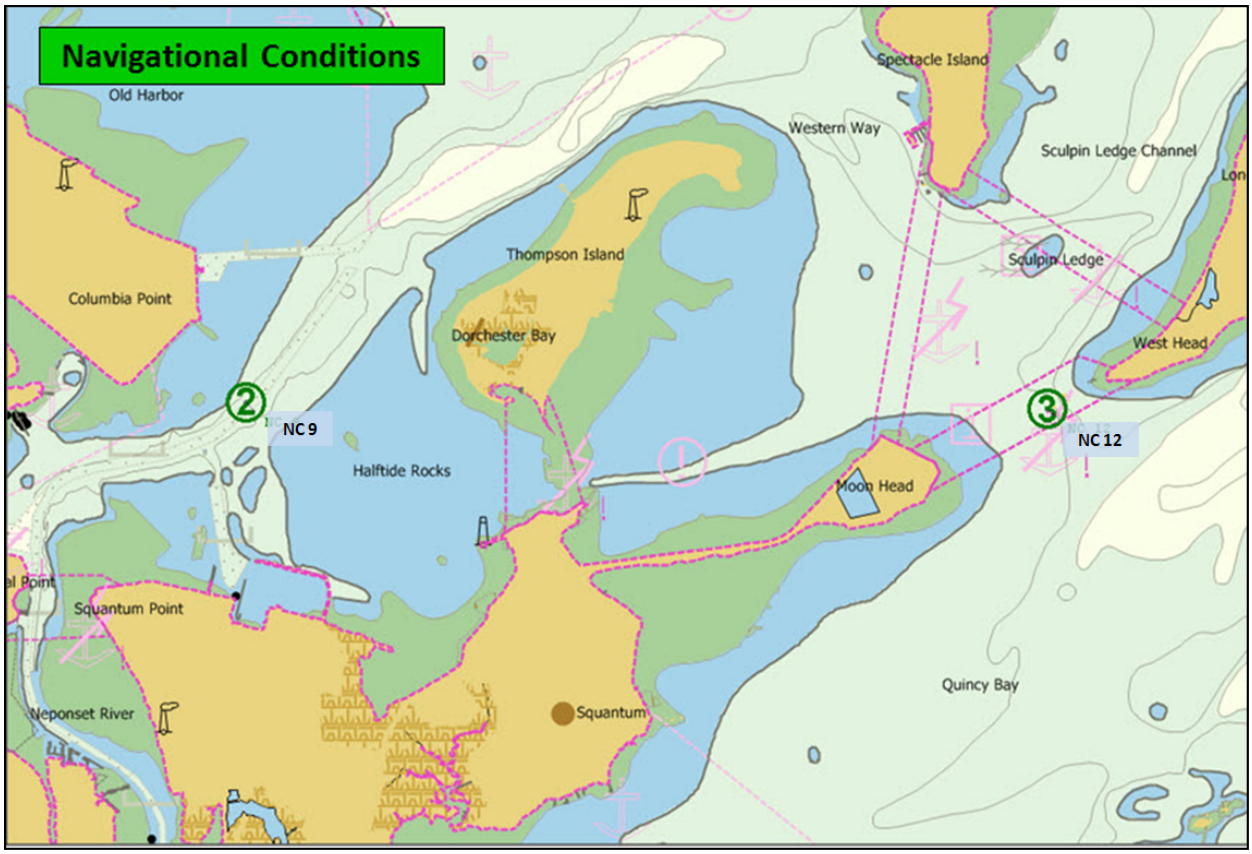
Vessel Conditions		Traffic Conditions		Navigational Conditions		Waterway Conditions		Immediate Consequences		Subsequent Consequences	
1	Deep Draft Vessel Quality	1	Volume of Commercial Traffic	1	Winds	1	Visibility Impediments	1	Personnel Injuries	5	Health and Safety
2	Shallow Draft Vessel Quality	2	Volume of Small Craft Traffic	2	Water Movement	2	Dimensions	2	Petroleum Discharge	6	Environmental
3	Commercial Fishing Vessel Quality	3	Traffic Mix	3	Visibility Restrictions	3	Bottom Type	3	Hazardous Materials Release	7	Aquatic Resources
4	Small Craft Quality	4	Congestion	4	Obstructions	4	Configuration	4	Mobility	8	Economic

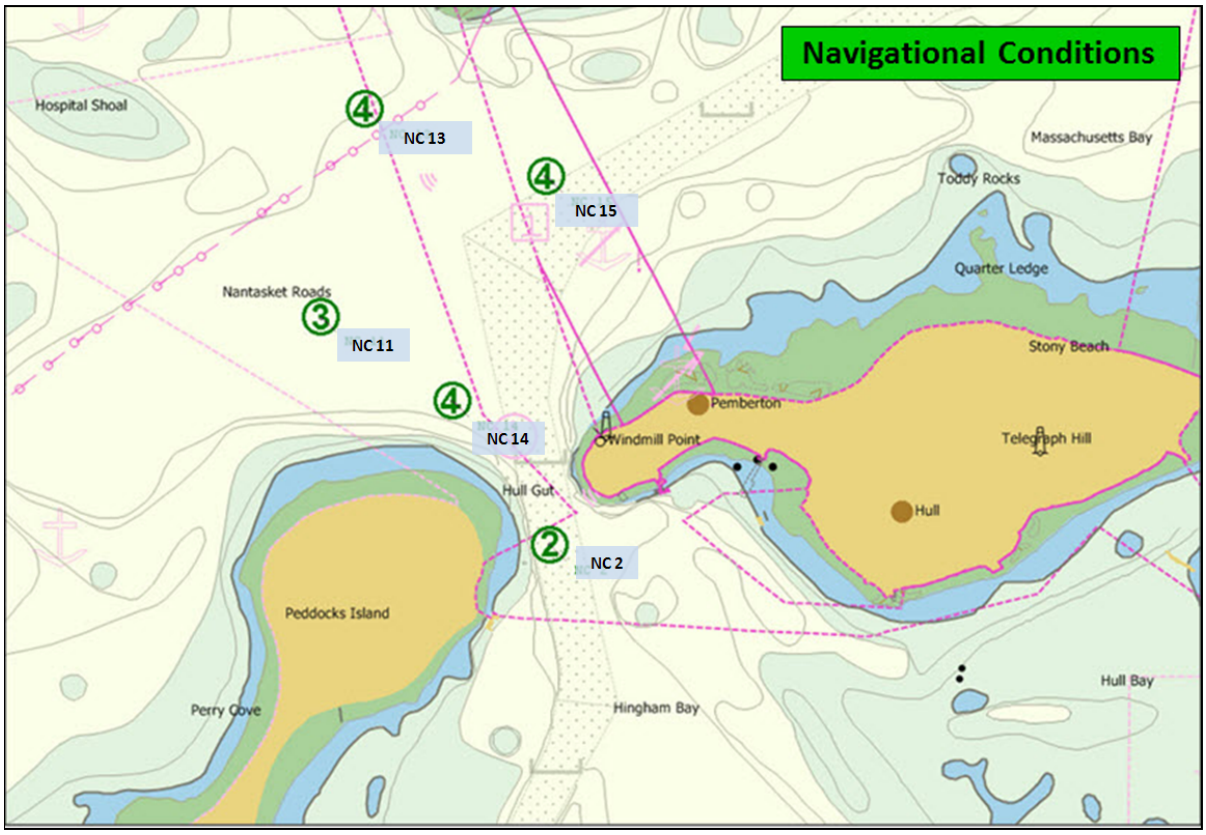


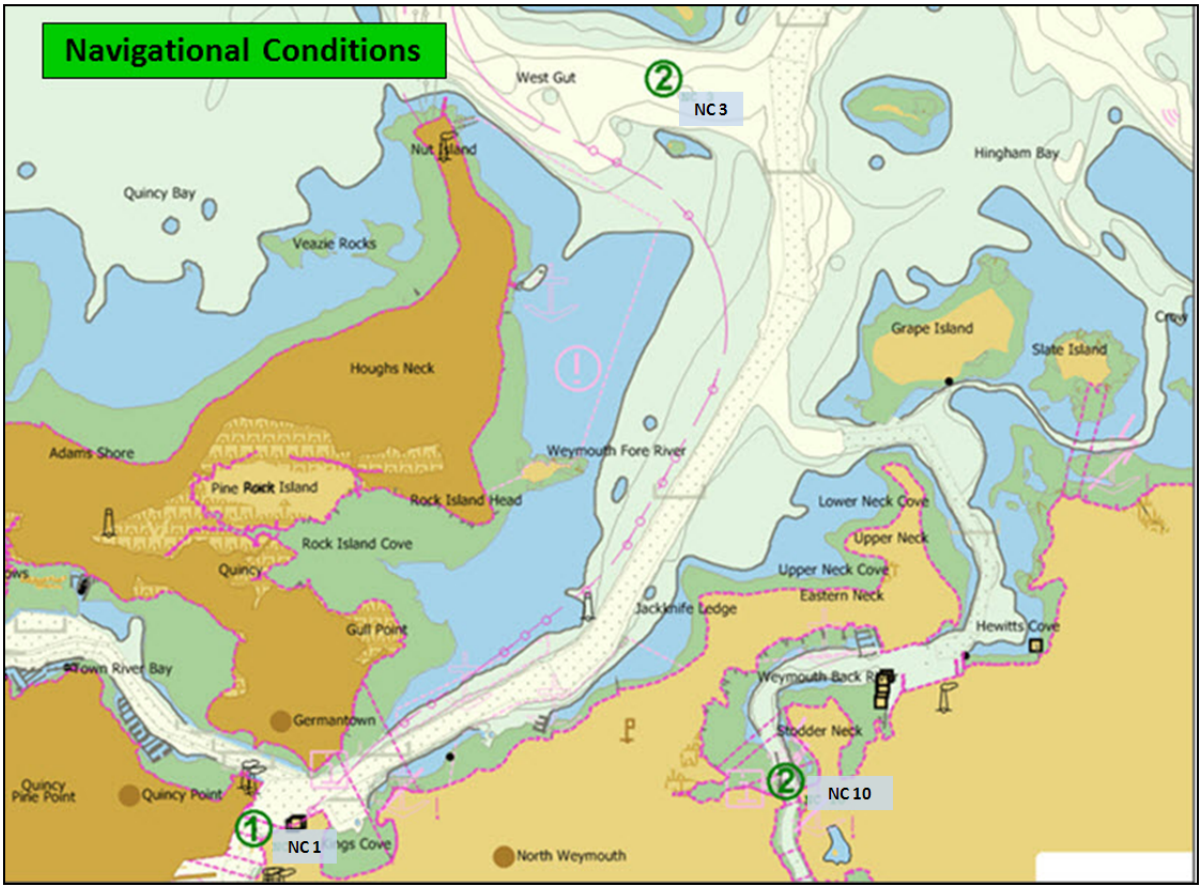

Traffic Conditions
TC 2
TC 16
TC 18
TC 17
TC 6
TC 5
Governors Island Flats
Lower Middle
South Boston
Pleasure Bay
Old Harbor

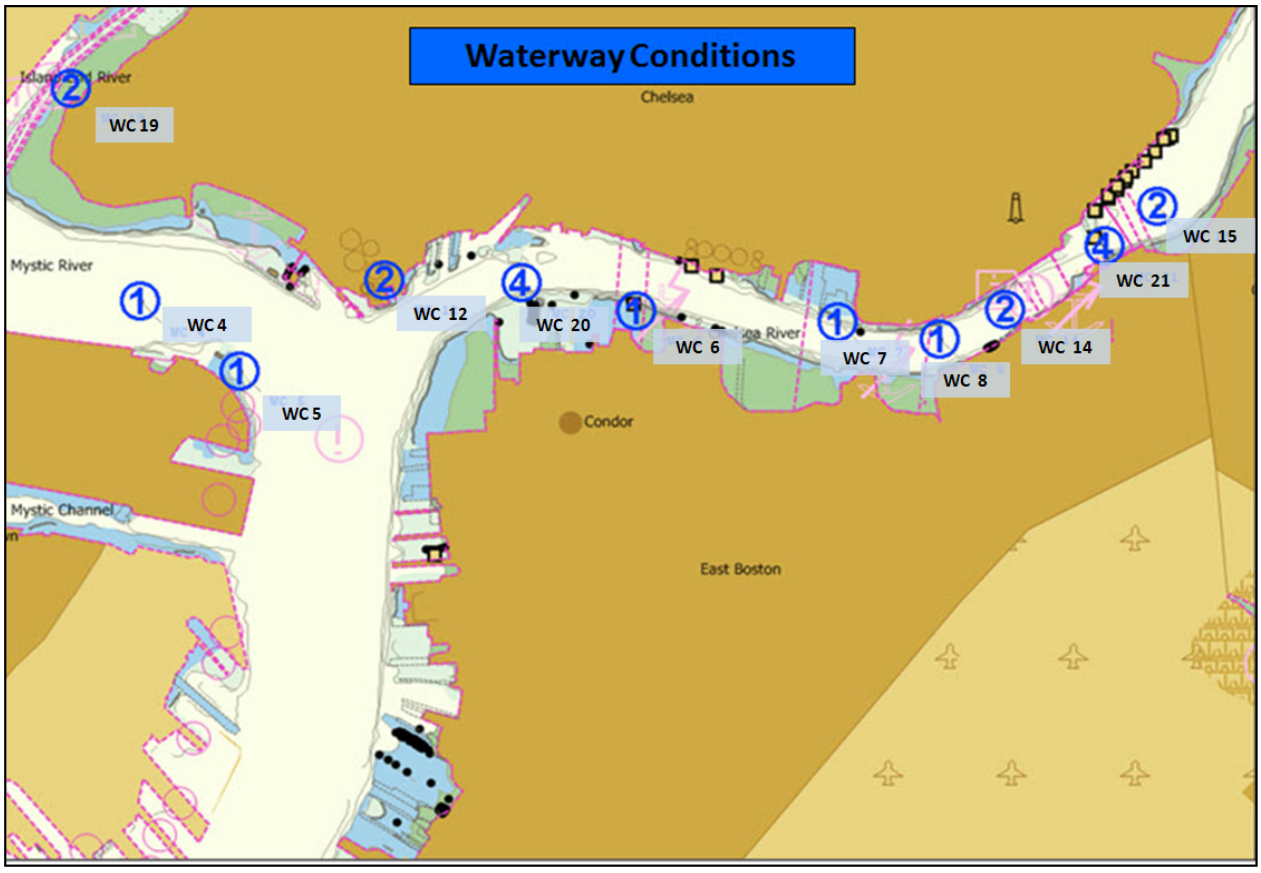

Traffic Conditions
Windmill Point
Hull Gut
Hull
TC 11
Nantasket Roads
Perry Cove
Portuguese Cove
Peddocks Island
West Head
TC 4
Hull Bay
Bumkin Island Shoal
TC 12
Prince Head
Hingham Bay
TC 13
West Gut
TC 15
Bumkin Island
Nut Island
Weymouth Fore River
Pine Point
Quincy
TC 14
TC 3
Crow Point Flats

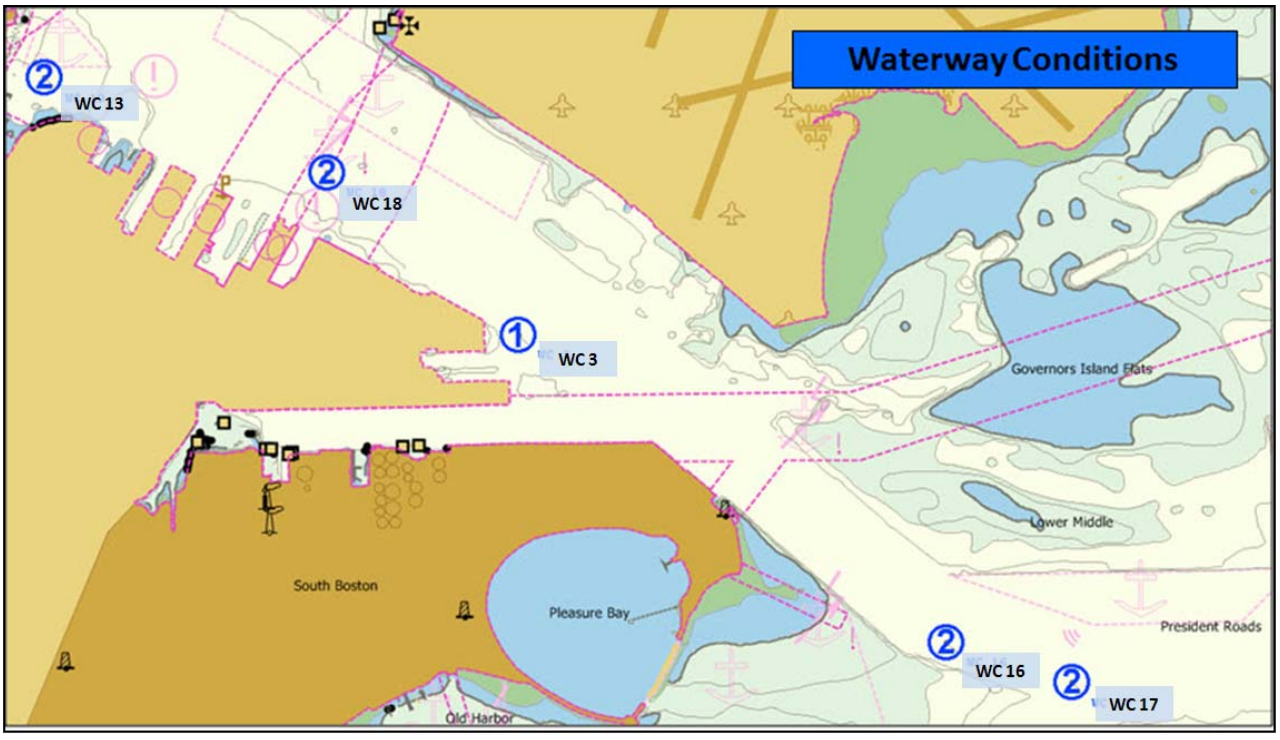

Navigational Conditions
Chelsea
NC 5
Condor
East Boston
NC 6
Winthrop
Winthrop Beach
NC 7
Snake Island
Winthrop Head
The Basin
NC 8
Deer Island Flats
Governors Island Flats
NC 4
President Roads

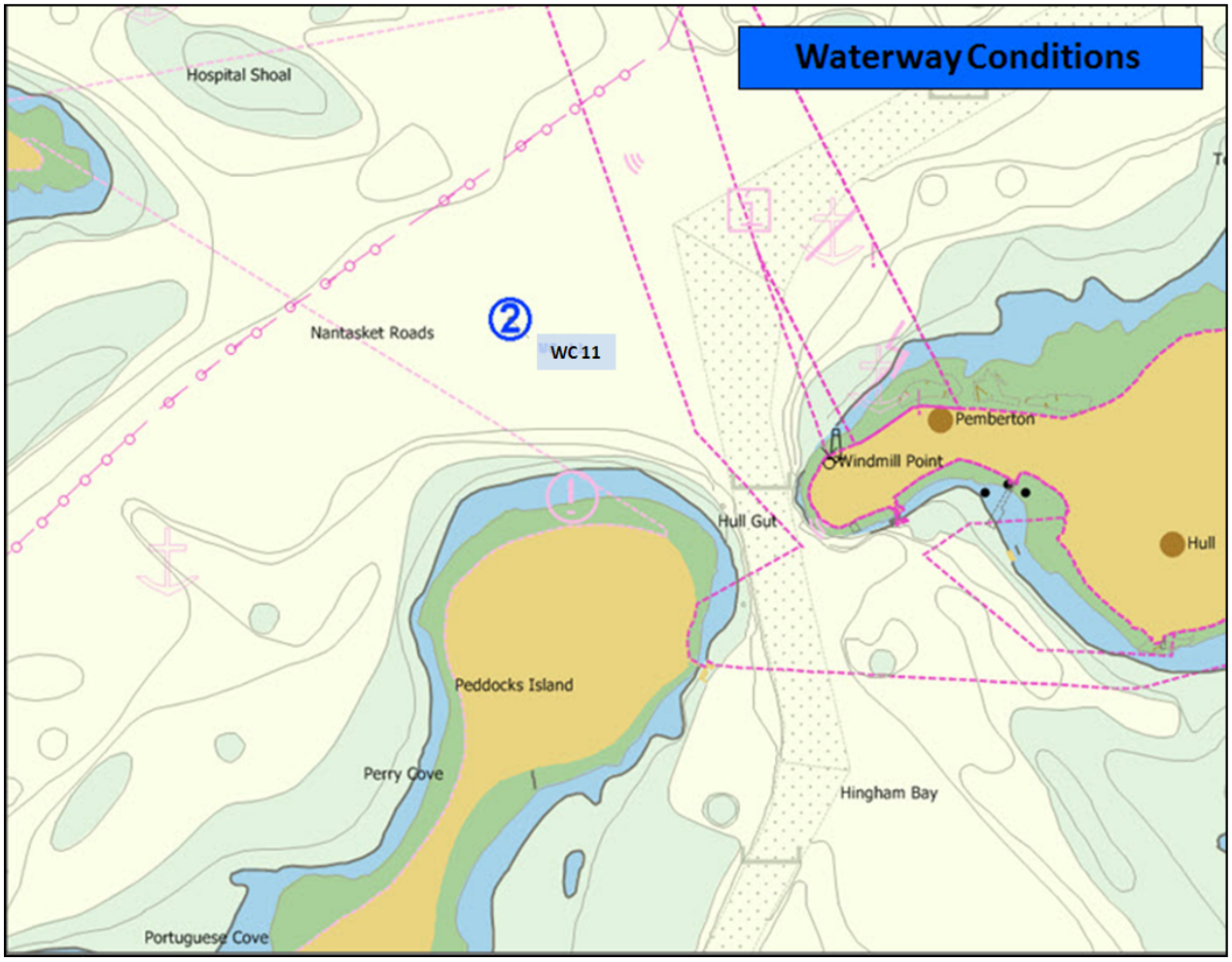

Navigational Conditions
Old Harbor
Spectacle Island
Western Way
Sculpin Ledge Channel
Thompson Island
Sculpin Ledge
Columbia Point
Dorchester Bay
West Head
NC 9
NC 12
Halftide Rocks
Moon Head
Squantum Point
Quincy Bay
Squantum

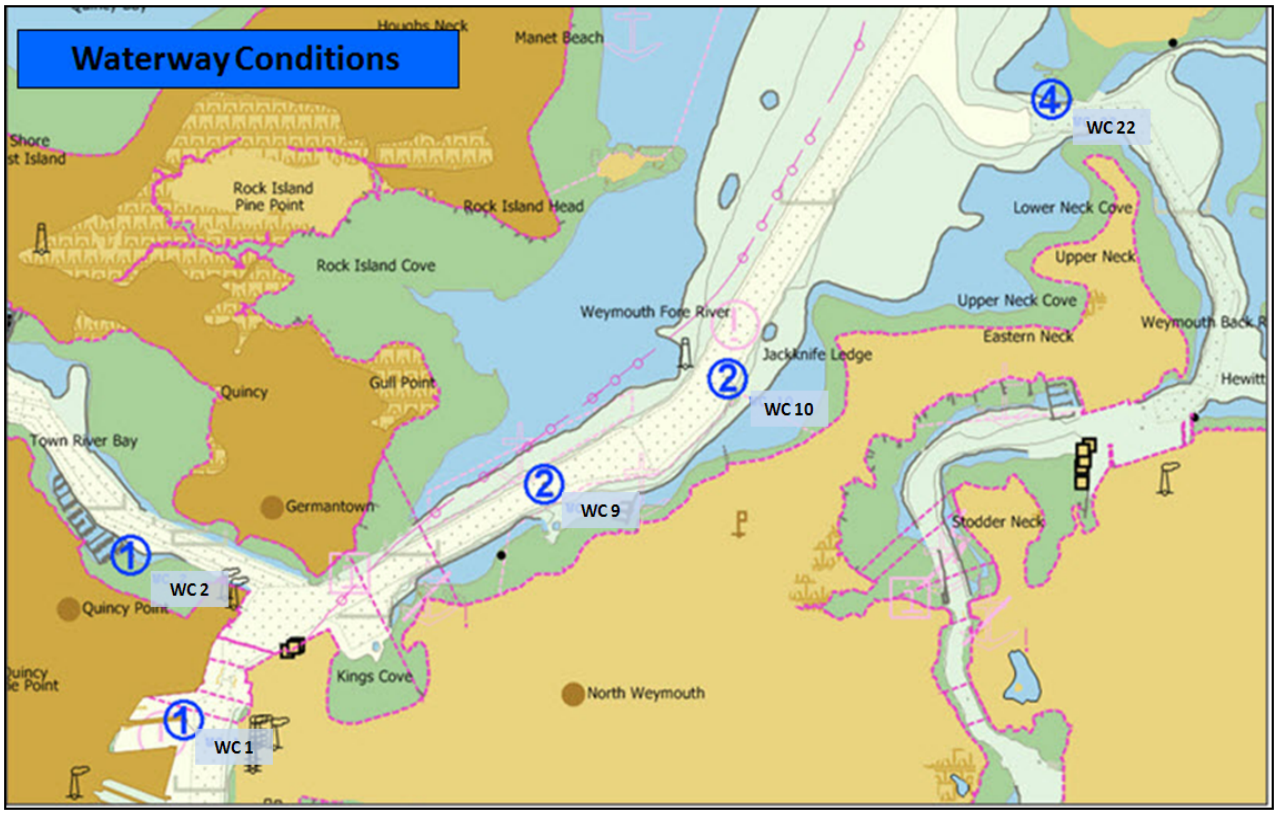

Navigational Conditions
Hospital Shoal
NC 13
NC 15
Massachusetts Bay
Toddy Rocks
Quarter Ledge
Nantasket Roads
NC 11
Stony Beach
Pemberton
NC 14
Windmill Point
Telegraph Hill
Hull Gut
Hull
NC 2
Peddocks Island
Hull Bay
Perry Cove
Hingham Bay

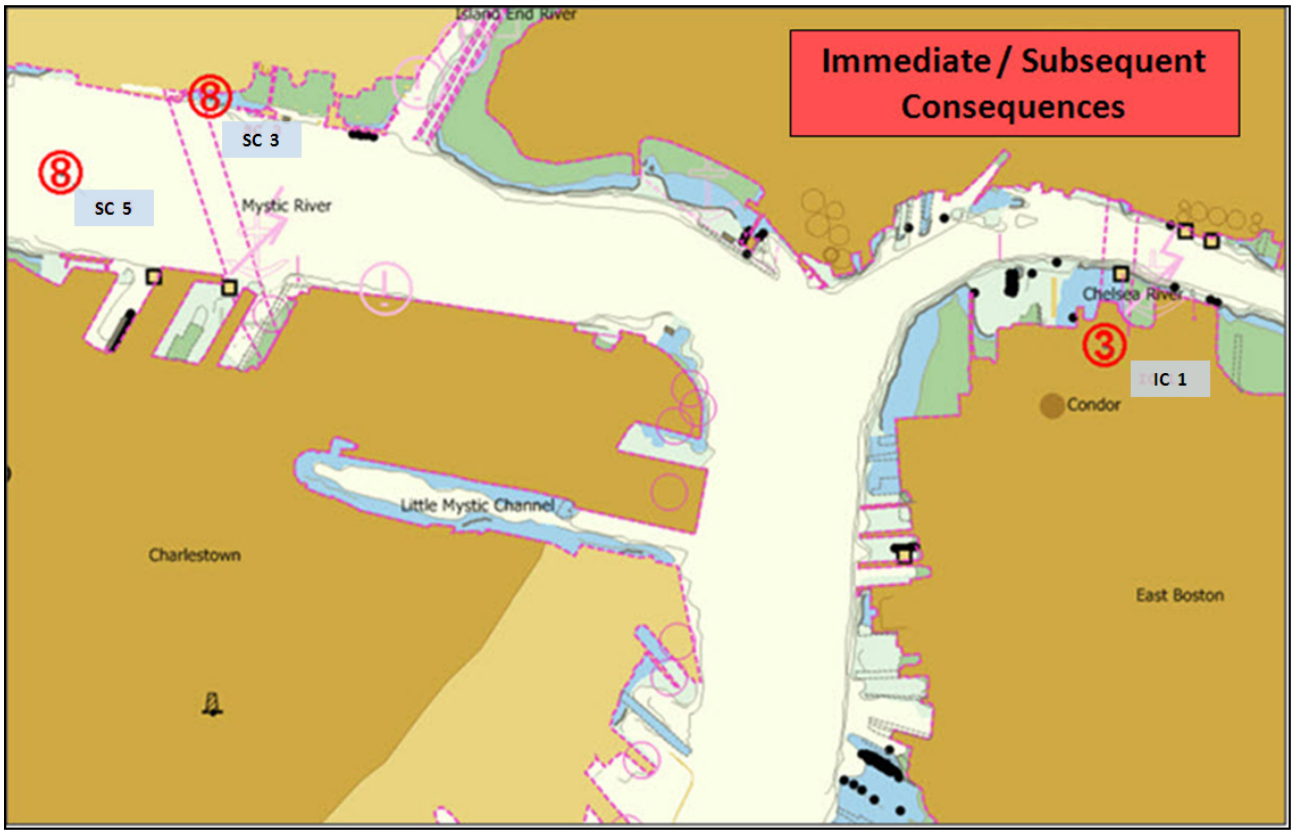

Navigational Conditions
West Gut
NC 3
Nut Island
Hingham Bay
Quincy Bay
Veazie Rocks
Houghs Neck
Grape Island
Slate Island
Adams Shore
Weymouth Fore River
Pine Rock Island
Rock Island Head
Lower Neck Cove
Upper Neck
Rock Island Cove
Quincy
Upper Neck Cove
Eastern Neck
Jackknife Ledge
Gull Point
Hewitts Cove
Germantown
Stodder Neck
NC 10
Quincy Point
NC 1
North Weymouth

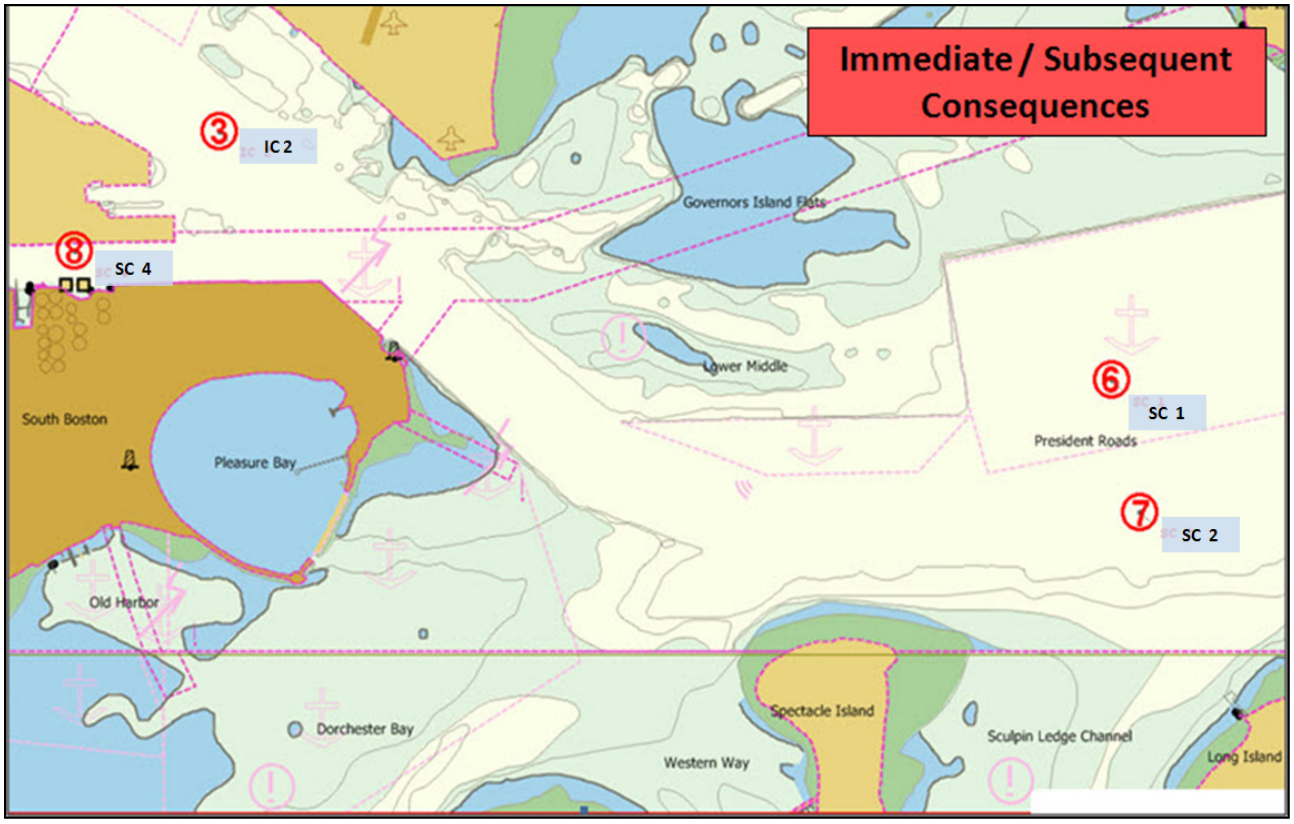

Waterway Conditions
Chelsea
WC 19
Mystic River
WC 4
WC 5
WC 12
WC 20
WC 6
WC 7
WC 8
WC 14
WC 15
WC 21
Condor
Mystic Channel
East Boston

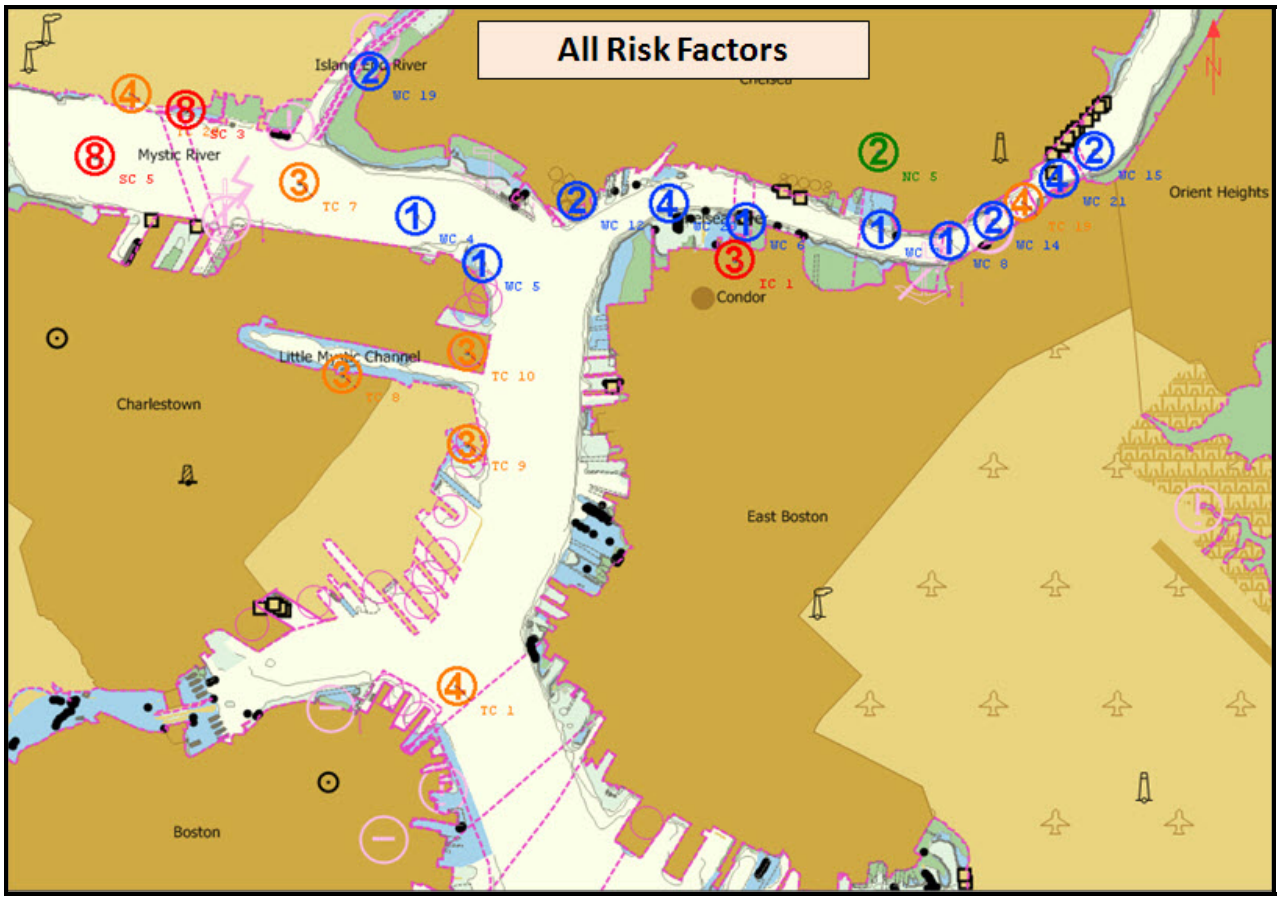

Waterway Conditions
WC 13
WC 18
WC 3
Governors Island Flats
Lower Middle
South Boston
Pleasure Bay
President Roads
WC 16
WC 17
Old Harbor

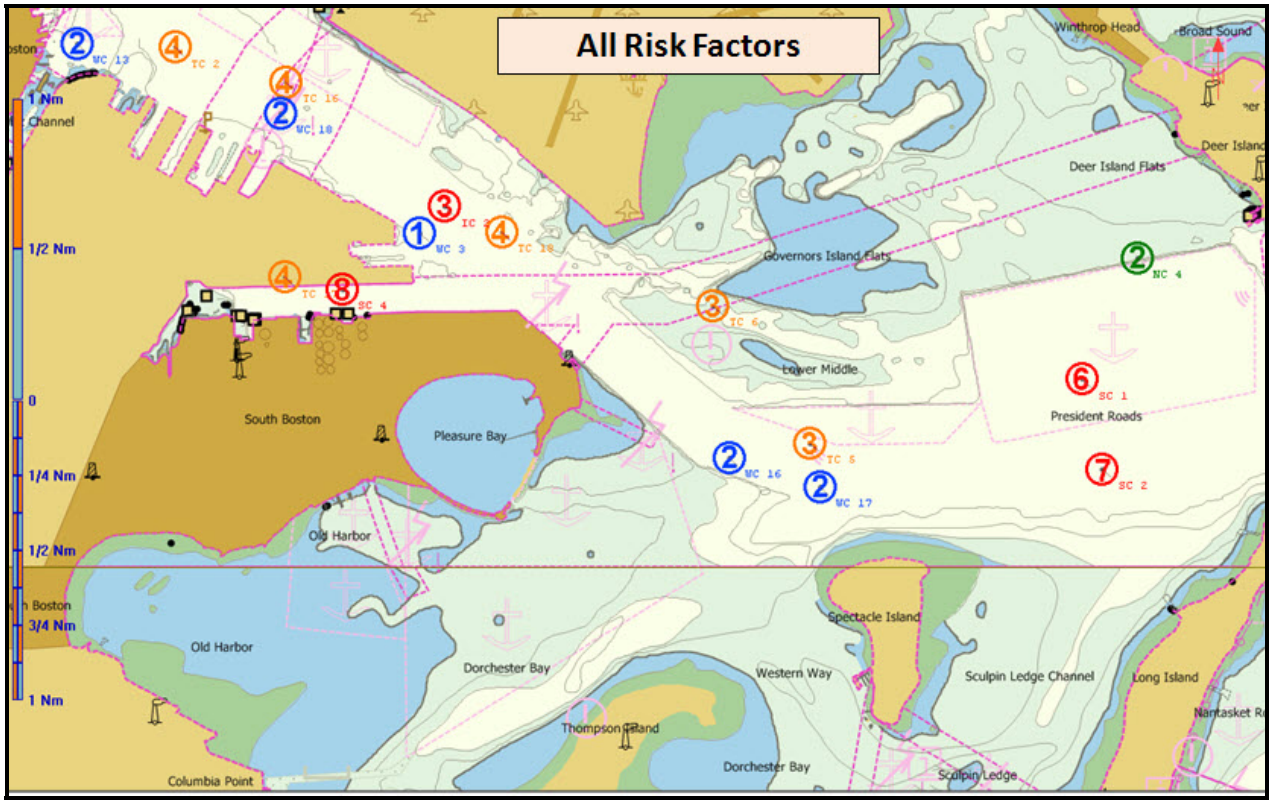

Waterway Conditions
Hospital Shoal
Nantasket Roads
2
WC 11
Pemberton
Windmill Point
Hull Gut
Hull
Peddocks Island
Perry Cove
Hingham Bay
Portuguese Cove

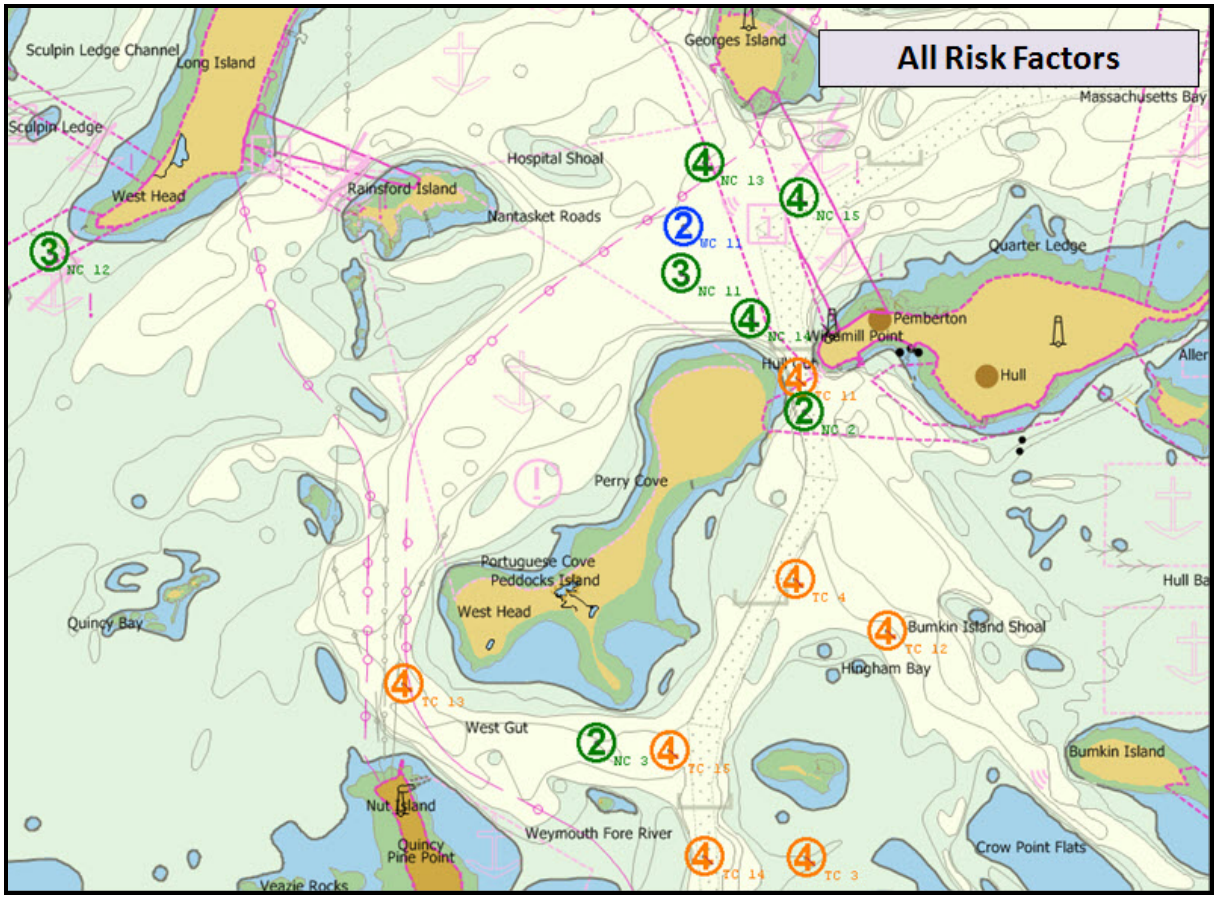

Waterway Conditions
Houghs Neck
Manet Beach
Rock Island
Pine Point
Rock Island Head
Rock Island Cove
Weymouth Fore River
Jackknife Ledge
4
WC 22
Lower Neck Cove
Upper Neck
Upper Neck Cove
Eastern Neck
Quincy
Gull Point
Town River Bay
2
WC 10
Germantown
2
WC 9
Stodder Neck
1
WC 2
Quincy Point
Kings Cove
North Weymouth
1
WC 1

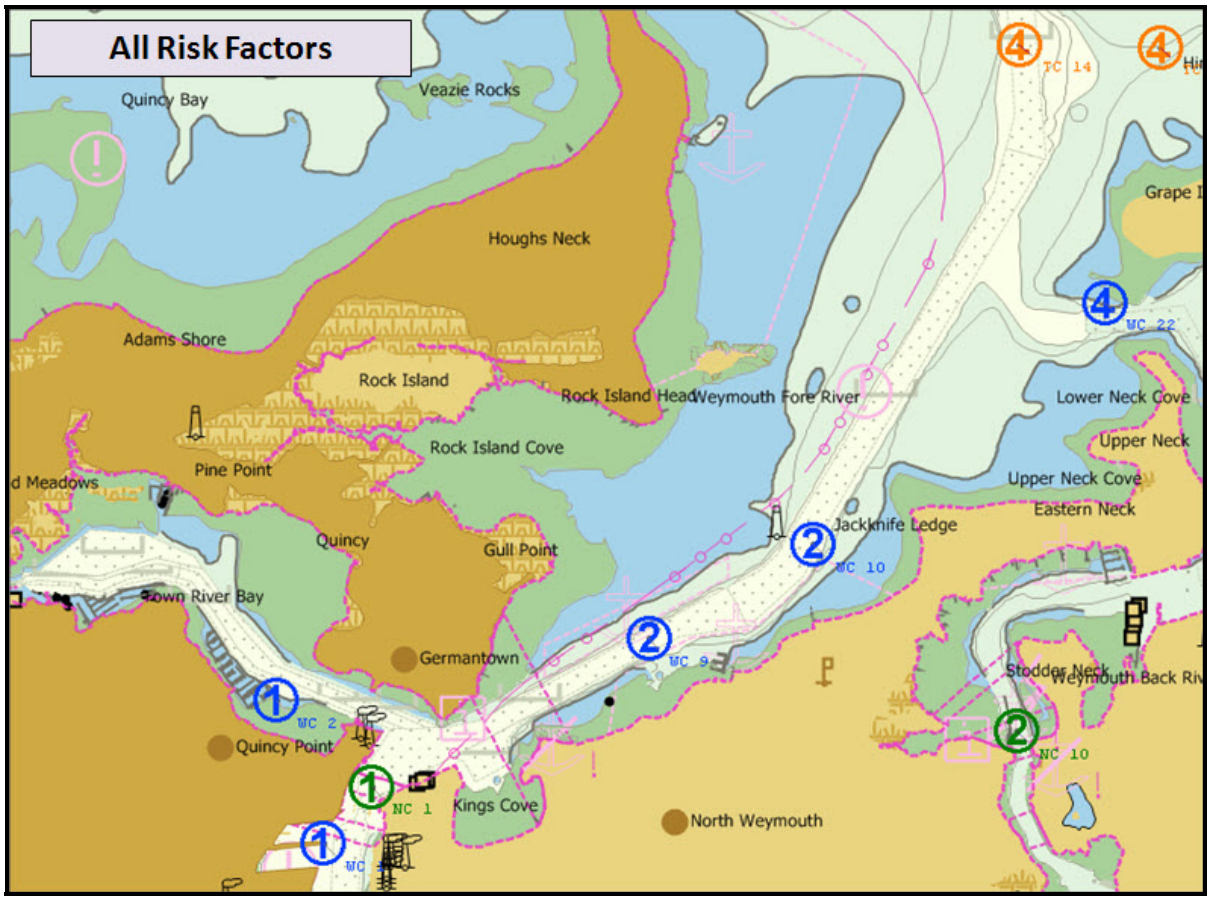

Immediate / Subsequent Consequences
Island End River
8
SC 3
8
SC 5
Mystic River
Chelsea River
3
IC 1
Condor
Little Mystic Channel
Charlestown
East Boston


Immediate / Subsequent Consequences
3
IC 2
Governors Island Flats
8
SC 4
Lower Middle
6
SC 1
President Roads
South Boston
Pleasure Bay
7
SC 2
Old Harbor
Dorchester Bay
Spectacle Island
Sculpin Ledge Channel
Western Way
Long Island


All Risk Factors
Mystic River
Little Mystic Channel
Charlestown
Boston
East Boston
Condor
Orient Heights


All Risk Factors
1 Nm
Channel
1/2 Nm
0
1/4 Nm
1/2 Nm
3/4 Nm
1 Nm
South Boston
Pleasure Bay
Old Harbor
Old Harbor
Dorchester Bay
Columbia Point
Thompson Island
Dorchester Bay
Governors Island Flats
Lower Middle
President Roads
Deer Island Flats
Winthrop Head
Broad Sound
Spectacle Island
Western Way
Sculpin Ledge Channel
Long Island
Sculpin Ledge


All Risk Factors
Sculpin Ledge Channel
Long Island
Sculpin Ledge
West Head
Rainsford Island
Hospital Shoal
Nantasket Roads
Georges Island
Massachusetts Bay
Quarter Ledge
Pemberton
Windmill Point
Hull
Perry Cove
Portuguese Cove
Peddocks Island
West Head
Quincy Bay
Bumkin Island Shoal
Hingham Bay
West Gut
Nut Island
Quincy
Pine Point
Weymouth Fore River
Crow Point Flats
Bumkin Island
Veazie Rocks


All Risk Factors
Quincy Bay
Veazie Rocks
Houghs Neck
Adams Shore
Rock Island
Rock Island Head
Weymouth Fore River
Rock Island Cove
Pine Point
Quincy
Gull Point
Jackknife Ledge
Lower Neck Cove
Upper Neck
Upper Neck Cove
Eastern Neck
Germantown
Quincy Point
Kings Cove
North Weymouth
Stoddor Neck

Appendix D

Definitions – Risk Mitigation Strategies

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 (navigation rules, pilot rules, standard operating procedures, licensing, required 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 (Notice to Mariners, charts, Coast Pilots, Light Lists, Automatic Identification System (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, DGPS, etc.).
Other Actions	Risk mitigation measures needed that do not fall under any of the above strategy categories.

Appendix E

Additional Risk Intervention Strategies

The numbers listed next to each risk intervention strategy represent the number of participant teams who voted for that particular risk mitigation strategy.

Small Craft Quality

Voluntary Training/Education

- Require recreational boaters to have a certificate of successful completion of boater safety training when registering their boat(s). (8)
- Utilize online boating safety course(s). (2)

Rules & Procedures

- Require mandatory boater safety licensing/refresher courses. (6)
- Offer financial incentives to boaters who complete licensing requirements. This may involve working with the insurance industry or State department responsible for registering vessels. (3)

Enforcement

- Increase law enforcement presence at boat launch facilities. Simply providing a larger presence will remind boaters of their responsibilities to operate safely when on the water. (4)
- Require Marine Event permit applicants to provide waterside safety assets. Although there are patrols present for some events, the total number of safety assets may not be enough to adequately handle the total volume or number of vessels in the waterway. (6)

Communications

- Send boating safety information bi-annually with Federal/State vessel documentation and registration renewal applications. (5)
- Require small boat operators operating within the Boston Inner Harbor to monitor Channel 13 VHF. Monitoring Channel 13 will permit the larger commercial vessels and smaller craft to better communicate their operating intentions when in a potential meeting or crossing situation. (1)
- Require recreational boat operators to utilize VHF Channel 9 for small boat to small boat communications and when requesting bridge openings. This will relieve the amount of radio traffic on Channel 13. (3)

Active Traffic Management

- Implement a new requirement restricting small craft vessel operation in the Chelsea Creek and Fore River. The narrowness of these rivers restrict transit to one-way commercial traffic, and the presence of small recreational vessel activities (skiing, racing, fishing, etc) impedes the safe transit of large commercial vessels that have no recourse but to stay in a confined channel and navigate through narrow bridges. (9)

Configuration

Coordination/Planning

- Increase dialogue with bridge owners and vessel operators in order to convey the navigation limitations placed on large commercial vessels when approaching a bridge opening. Bridges must be opened fully to allow sufficient room for the vessels air draft and design features. (10)

Voluntary Training/Education

- Implement outreach and educational training programs for lift bridge operators so that they better understand the operating characteristics of large commercial vessels in restricted waters. (9)

Rules & Procedures

- Coast Guard and other entities review landside permits regarding new construction on the Chelsea Creek so that the newly built structures do not pose visibility or navigational obstructions. (9)

Enforcement

- Increase the enforcement of the regulation prohibiting water sports in the harbor. Sections of local rivers have rules prohibiting certain activities and authorities should ramp up enforcement in these areas. (10)

Active Traffic Management

- Designate Chelsea Creek for the exclusive use of commercial traffic (RNA). (10)

Waterway Changes

- Widen the channel to 220'. (7)
- Widen the bends in the Chelsea Creek. (1)
- Replace McArdle Bridge with 275' lift bridge. (1)
- Require periodic surveys of the waterway including adjacent bulkheads, and designate an entity responsible for ensuring the structural integrity of the bulkheads. (0)
- Create a turning basin to the east of the Hess dock. Frequently, large commercial vessels must back out of the Chelsea River creating additional navigation risk. Commercial vessels are easier to control when operated in forward propulsion.(0)
- Dredge the main shipping channel to 40'. (1)

Other Actions

- Relocate the water pipeline in Chelsea Creek. The pipeline's current position restricts the potential for dredging to the desired width of the channel.(9)

Dimensions

Enforcement

- Ensure that waterways used for commercial transit are not disrupted by recreational vessel water activities. (9)

Waterway Changes

- Dredge the red side of the main shipping channel to 40' to coincide with the project depth of the "green" side. (7)
- Widen the navigational channel around buoys #4 and #6. (0)
- Create a turning basin in the Fore River channel to allow optimum vessel maneuverability. (0)

- Dredge and widen the Fore River channel to 40'. (1)
- Remove the rock outcropping located outside of Hull Gut. (0)
- Create a "bail out" berth to be used in the event of a malfunction of the Fore River Bridge. (0)
- Dredge outside of the Federal Channel east of buoy #3. (0)
- Expand the size of Anchorage #2. (1)
- Remove the Coast Guard buoy from Anchorage #1. Buoys marking a secure area around the airport intrude into the anchorage. (0)
- Ease airport security restrictions in order to fully utilize the area around Anchorage #1. (0)
- Expand the size of Anchorage #1 to accommodate more than one unit at a time. The proposal provides greater opportunity for access to more commercial towing and deep draft vessels. It allows vessel operators to have more latitude in keeping ships with high air draft from locating near the end of Logan Airport runways. (0)
- Prioritize the usage of the waterway area around President Roads for larger vessels. (0)
- Establish a Federal anchorage(s) in Broad Sound. (0)
- Perform maintenance dredging for spots measuring less than project depth. (1)

Visibility Impediments

Coordination/Planning

- Require more interaction with Designated Port Area. Port operators should be made aware of bright lighting and structures that impede visibility from the wheelhouse of commercial vessels. (10)

Rules & Procedures

- Coast Guard and other entities review building construction plans to ensure that they do not interfere with vessel navigation. Incorporate process whereby new construction or renovations to existing structures along the waterway are reviewed by waterways stakeholders. (7)

Waterway Changes

- Widen the Fore River Bridge opening to improve visibility of outbound ships. The current construction presents a visibility obstruction to commercial vessels entering the Fore River. (10)

Other Actions

- Request that light shields be added to parking lot lights adjacent to Chelsea Creek. The lights are of such an intensity and directed in a way that they create problems for pilots and operators on inbound ships to see beyond them.(10)

Traffic Mix

Voluntary Training

- Re-emphasize the "rules of the road" for small craft operators. Specifically, the rules pertaining to meeting, crossing, and overtaking commercial vessels. (10)

Enforcement

- Increase law enforcement assets in order to control and oversee vessel operations. The presence of law enforcement promotes greater safety awareness among smaller craft. (10)

Communications

- Display poster(s) at marinas advising of wide berth areas. In an effort to promote a higher level of safety in areas frequented by large commercial vessels and small boats, published safety information should be displayed at the marinas to advise operators they should give large commercial vessels a wide berth. (7)
- Communicate locations of no wake zone areas to boaters. (3)

Mobility

Coordination/Planning

- Exercise the Marine Transportation Recovery Unit (MTSRU) plan regularly. When an event occurs that closes the waterway to commerce, an MTSRU will provide the experience needed to reopen the waterway in the most efficient manner, as well as provide advice to incoming and outgoing vessels when the waterway is partially restricted to traffic. (10)

Rules & Procedures

- Explore inspection possibilities for construction barges. Some construction barges are not required to be inspected by the Coast Guard and present a greater risk of sinking and obstructing the waterway, thereby limiting vessel transits. (10)

Waterway Changes

- Perform dredging to widen the channel so that an obstruction would not have as great an impact on Port activities. This would allow for a vessel to skirt around a sunken vessel that might be located in the right or left side of the channel. (8)

Other Actions

- Foster the growth of the marine industry within the Port of Boston. (2)
- Create access points for emergency vehicles from the land to the waterways. Access points are particularly needed on the Chelsea River where emergency vehicles have no clear access to the rivers' edge. (1)
- Identify single points of failure in the energy supply system. Fossil fuels that arrive by ship provide energy for electric generation, heating for businesses and homes, and transportation for a large part of greater New England. Disruption to maritime transportation infrastructure that extends for a protracted period of time could deplete available supplies. (7)

Health & Safety

Coordination/Planning

- Hold more frequent mass casualty drills, port planning meetings, and exercises. (10)

Communications

- Improve public education for self-preservation. Identify the hazards of cargoes that arrive by water and review evacuation procedures with local and State Emergency Management. (10)

Other Actions

- Create incentives for deep water port activities. (9)