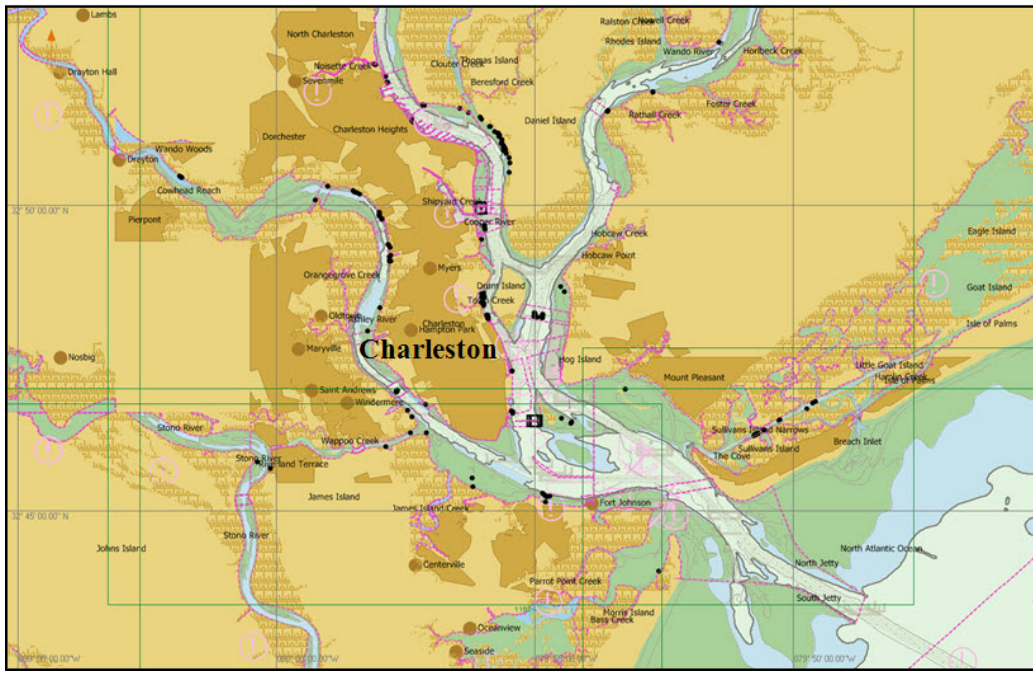


Ports and Waterways Safety Assessment

Workshop Report

Charleston, South Carolina

13 - 14 July, 2010



United States Coast Guard Marine Transportation Systems Management



Providing Navigation Safety Information
for America's Waterways

Ports and Waterways Safety Assessment - Workshop Report

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Introduction

The United States Coast Guard (USCG), Marine Transportation Systems Management, 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. To accomplish this objective, the Coast Guard utilizes the Ports and Waterways Safety Assessment (PAWSA) process. The long-term goals of the PAWSA process are to:

- 1) Provide input when planning for future Vessel Traffic Management (VTM) projects, including establishing or expanding existing Vessel Traffic Services (VTS),
- 2) Further the Marine Transportation System (MTS) 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 (HSC) within each port, and
- 4) Support and reinforce the role of Coast Guard Captains of the Port (COTP) in waterway and vessel traffic management within their assigned geographic areas of responsibility.

Section I: History of the Ports and Waterways Safety Assessment Process

The PAWSA process grew out of the tremendous changes that took place during the 1990s in the Coast Guard VTS acquisition program. In September 1996, at the direction of the U.S. Congress, the Coast Guard began work to identify minimum user requirements for new VTS systems in consultation with local officials, waterways users and port authorities, and also to review private / public partnership opportunities in VTS operations. As a result of this Congressional direction, the Coast Guard established the PAWSA risk assessment process to address waterway user needs and place a greater emphasis on partnerships with maritime industry experts to reduce risk in the marine environment.

The PAWSA risk assessment process is a disciplined approach to identify major waterway safety hazards, estimate risk levels, evaluate potential mitigation measures, and set the stage for implementation of selected risk reduction measures. The process involves convening a select group of waterway users and stakeholders and conducting a structured workshop to meet these objectives. The risk assessment process is a joint effort involving waterway users, stakeholders, and agencies responsible for implementing risk mitigation measures.

Section II: How PAWSA Workshops are conducted

The PAWSA process uses a structured approach for obtaining expert judgments on the level of maritime safety risk in a port complex. The process also addresses the effectiveness of existing and possible future intervention actions for reducing risk in the specified port and waterways. The **first step** in the PAWSA process is for the participants to discuss and then numerically evaluate the baseline risk levels in the geographic area being analyzed using pre-defined qualitative risk descriptions for 24 pre-defined risk factors. The **second step** is for the 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 process. In the **third step**, the participants discuss and then evaluate the risk reducing effectiveness of existing mitigation strategies. Next, the participants offer new ideas for further reducing risk, for those factors where risk is judged to be not well balanced with existing mitigations. **Finally**, the potential effectiveness of those new intervention ideas is evaluated. The PAWSA process produces a consensus view of risks in the port and waterways and has proven to be an excellent tool for focusing follow-on risk mitigation efforts.

Section III: 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

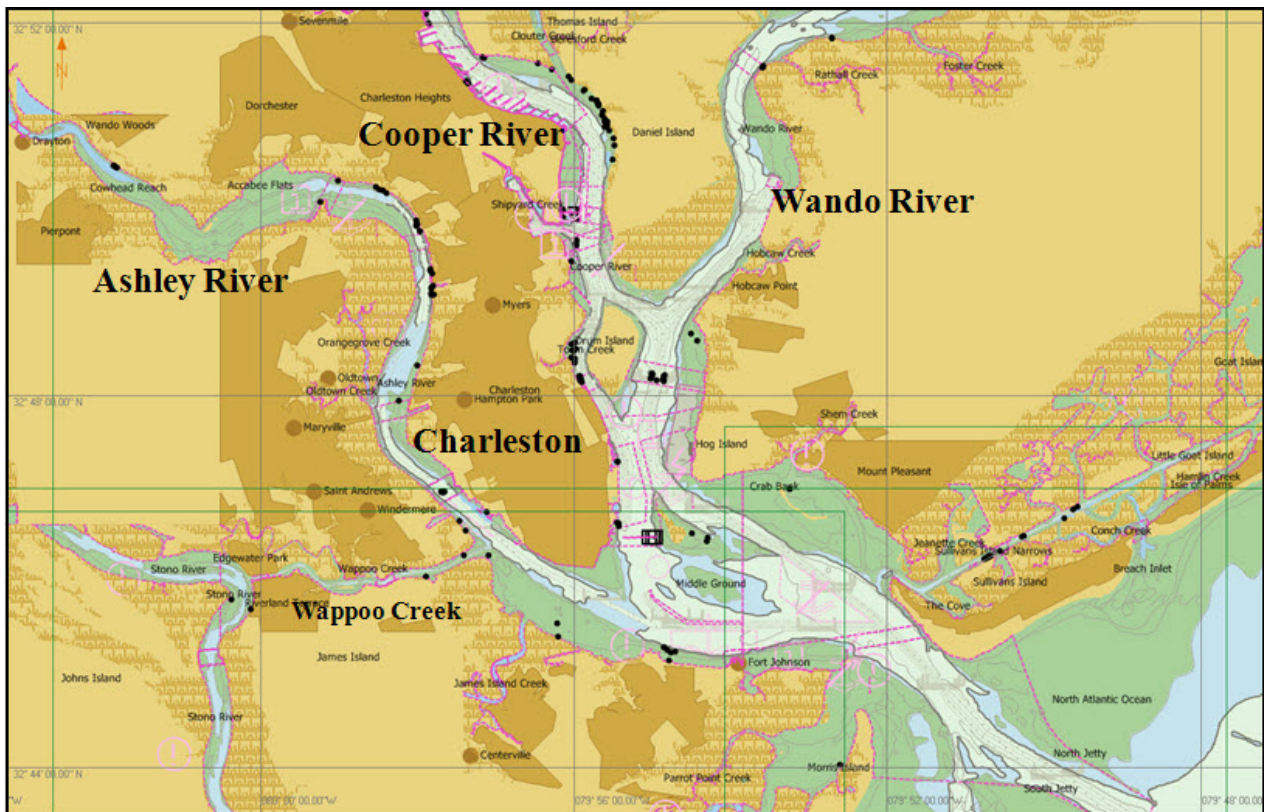
Section IV: Charleston PAWSA – Geographic Areas Assessed

In support of overall safety improvement activities, a formal PAWSA for Charleston Harbor and the adjacent waters 20 miles offshore was conducted in Charleston, South Carolina on 13-14 July 2010. The workshop was attended by 22 participants representing waterway users, regulatory authorities, stakeholders, and organizations with an interest in the safe and efficient use of Charleston Harbor, from both a commercial and recreational perspective. A list of the workshop participants and the workshop facilitation team is included as Appendix A to this report.

This report outlines the baseline risk levels within each specific geographic area, captures workshop participant provided input regarding current operations and trends, and describes existing mitigation strategies that serve to “balance” the risks associated with each of the 24 risk factors in the Waterways Risk Model. For those waterway risk factors where risk is judged to be not well balanced with existing mitigations, this report also contains new ideas for further reducing risks.

The geographic area assessed included Charleston Harbor, the Cooper River, the Wando River, and the offshore areas out to 20 nautical miles.

Figure 2:



Section V: Book 1 – Establishing Baseline Risk Levels

Book 1 was used to determine a risk level value for every factor in the Waterway Risk Model. To establish baseline risks in the port, the workshop participants discussed each of the 24 risk factors in the Waterways Risk Model.

As the workshop participants discussed and identified specific locations associated with a particular risk factor, an Electronic Charting System (ECS) was utilized by the workshop facilitation staff to identify the specific geographic area(s) associated with the risk(s), and annotate the ECS with the location. Appendix C includes ECS information / chart extracts showing the risk factor types / locations identified by the workshop participants

The following are significant observations and comments made by the workshop participants. Additional participant observations, trends, and comments are included as Appendix B to this report.

Deep Draft Vessel Quality: The majority of the vessels calling on the Port of Charleston are newer than ten years. The tankers and container ships tend to be newer. The military chartered vessels tend to be older. Dry bulk vessels tend to be older than ten years.

Overall the crews are of good quality. Ship size is increasing dramatically.

In the previous five years, the average gross tonnage of piloted vessels has grown from 35,968 GT per vessel in July 2005 to 45,192 GT per vessel in July 2010.

Shallow Draft Vessel Quality: Most shallow draft vessels are of good quality and this is due to strong industry standards and vetting programs imposed on by the petro / chemical / deep draft industry. Crews are very experienced throughout the entire shallow draft fleet.

Commercial Fishing Vessel Quality: The fishing vessel fleet is primarily shrimpers and crabbers with some transient long liners. This local fleet typically operates during day light hours and tends to remain out of the main deep draft channel. Quality of the material condition of the fleet is driven by small profit margins and the economy. Due to the tight economy and profit margins the material condition of the fleet is of lower quality.

Small Craft Quality: The Port of Charleston has a large small craft population. The fleet has grown and more non-local operators have entered the fleet. The knowledge of rules of the road and general boating safety is lacking.

The sailboat community that is actively involved in yacht and regatta clubs has better boating safety knowledge. Special events draw in large crowds from around the region and further dilute the boating safety knowledge for these events.

Congestion: Congestion is highest on weekends and during special events surrounding the major holidays. These special events bring in large out of town small craft vessels. Bridges on the intra-coastal waterway create significant congestion especially near Wappoo cut.

Dimensions: Wando Reach channel is narrow, and deep draft vessels are limited to one way traffic on this portion of the waterway. The largest container ships using this channel take up so much of the channel that the bridge management team often cannot see the buoys along the channel's perimeter. The turning basin is also too narrow to accommodate proposed larger container ships that would not otherwise be restricted within the port.

Dimensions: Town Creek Lower Reach serves as the access to the Columbus Street Terminal, one of only three container terminals in the port, and also the terminal proposed to handle the port's RoRo trade once the passenger ship terminal is relocated. Ships entering and leaving the Columbus Street Terminal have encountered increasingly restrictive navigational constraints at the entrance to Town Creek Lower Reach. Due to the narrow width of the entrance to the reach in way of active container ship berths, the possibility of ships and tug boats running aground is high. Working increasingly larger ships into the terminal is particularly challenging during flood tide. The flood tide tends to set vessels toward the east edge of the channel; in order to compensate, inbound ships pass extremely close to ships already at the terminal. In some cases, the existing configuration of the entrance to this reach is cause to exclude ships from calling on the terminal unless certain berths are empty at the terminal. The relatively narrow width of this channel entrance reduces margins of safety, adds time and expense to vessel operations, and limits the productivity of one of Charleston's three container terminals.

The Port of Charleston includes an inner anchorage (Commercial Anchorage A). Soundings of the anchorage indicate various water depths (28 - 53 FT). The anchorage can only accommodate some twenty percent of ocean going freight traffic due to typical ship drafts and limited water depth in much of the anchorage. As a consequence, the larger, deep draft fleet does not have an anchorage that can be utilized for bunkering, taking-on stores, or quarantine for safety and security issues. Of the ships that can use the anchorage, many do so to bunker. The lack of adequate anchorage grounds not only eliminates a potential site for managing security and safety incidents, but it also curtails the potential for commerce in the anchorage. Extrapolating the bunkering activity that currently occurs in the anchorage to the larger population of vessels that could use the anchorage could be as much as \$100 million more fuel sales annually.

The intra-coastal waterway is not maintained to the authorized depth, and numerous boat docks are nearly encroaching on the channel.

Configuration: Charleston Harbor waterway has numerous turns that are greater than 45 degrees, which justifies the need for ranges and other critical navigational infrastructure especially as ships continue to get larger.

Obstructions: Offshore submerged jetties are a hazard to unaware recreational boats and other shallow draft vessels.

Environmental: Charleston Harbor and joining waterways have and are critical bird sanctuaries, sensitive areas, and essential natural resources.

Economic: Grounding in the main channel near the off shore jetties would have significant economic impact. Charleston Harbor accounts for approximately \$62 billion annual and \$172 million daily trade.

The participants evaluated baseline risk levels by selecting a qualitative description for each risk factor that best described conditions for Charleston Harbor. Those qualitative descriptions were converted to discrete values using numerical scales that were developed during earlier PAWSAs. 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:

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
2.1	3.1	4.8	6.9	7.4	6.4
Shallow Draft Vessel Quality	Volume of Small Craft Traffic	Water Movement	Dimensions	Petroleum Discharge	Environmental
5.2	7.3	5.7	6.0	8.3	7.6
Commercial Fishing Vessel Quality	Traffic Mix	Visibility Restrictions	Bottom Type	Hazardous Materials Release	Aquatic Resources
7.8	5.7	1.7	4.7	8.2	7.8
Small Craft Quality	Congestion	Obstructions	Configuration	Mobility	Economic
7.2	6.6	3.5	7.8	8.1	6.9

In the Charleston PAWSA, 18 of the 24 risk factors were scored at or above the mid-risk value. Risk values highlighted red (values at or above 7.7) denote very high baseline risk levels; risk values highlighted green (values at or below 2.3) denote very low baseline risk levels.

- Petroleum Discharge (8.3)
- Hazardous Materials Release (8.2)
- Mobility (8.1)
- Aquatic Resources (7.8)
- Configuration (7.8)
- Commercial Fishing Vessel Quality (7.8)
- Environmental (7.6)
- Personnel Injuries (7.4)
- Volume of Small Craft Traffic (7.3)
- Small Craft Quality (7.2)
- Economic (6.9)
- Visibility Impediments (6.9)
- Congestion (7.2)
- Health and Safety (6.4)
- Dimensions (6.0)
- Water Movement (5.7)
- Traffic Mix (5.7)
- Shallow Draft Vessel Quality (5.2)
- Winds (4.8)
- Bottom Type (4.7)
- Obstructions (3.5)
- Volume of Commercial Traffic (3.1)
- Deep Draft Vessel Quality (2.1)
- Visibility Restrictions (1.7)

Section VI: Book 2 – Participant / Team Expertise Cross-assessment

Book 2 is used to capture the expertise level of each team relative to one another. PAWSA workshop participants are expected to have varying expertise with respect to the risk categories in the Waterway Risk Model. Book 2, *Team Expertise*, is used early in the session to weigh the relative strengths of each team with respect to the six risk categories. After being presented with the concepts underlying the model, each participant team is asked to discuss (among themselves) how their background and experience aligns with the model. They then verbally present their conclusions to the larger group. This presentation gives all teams a sense of where everyone thinks they are strong – or perhaps not so strong. After all teams have spoken, each team evaluates whether they think they are in the top, middle, or lower third of all teams present in knowledge about the six risk category areas. Throughout the workshop, these preliminary expertise evaluations are used to produce preliminary results for all other Books.

The workshop 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, 42% of the participant teams were placed in the upper third, 34% in the middle third, and 24% 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 expertise ranking for each team was used to weight the inputs that each team provided in the other three books used during the PAWSA workshop. The following table further breaks down the participants’ expertise per risk category.

Figure 4:

Team Expertise – Distribution

Risk Category	Top 1/3	Mid 1/3	Lower 1/3
Vessel Conditions	40%	36%	24%
Traffic Conditions	44%	37%	19%
Navigational Conditions	58%	30%	13%
Waterway Conditions	54%	31%	15%
Immediate Consequences	30%	39%	31%
Subsequent Consequences	26%	32%	42%

All Categories Average	42%	34%	24%
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Section VII: Book 3 – Evaluating the Effectiveness of Existing Risk Mitigation Strategies

Book 3 was used to evaluate the effectiveness of existing mitigation strategies in reducing the risk level for each factor in the model. In Book 3, the workshop participants reviewed the effectiveness of existing risk mitigations with respect to all risk factors in the Waterway Risk Model. For 16 risk factors, there was consensus that risks were well balanced by existing mitigations; for 3 risk factors there was consensus that risks were NOT adequately balanced by existing mitigations; and for the other 5 risk factors there was no consensus on whether existing mitigations adequately reduced risk. Consensus is defined as 2/3 of the workshop participants 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	
2.1	1.8	3.1	2.8	4.8	4.4	6.9	5.9	7.4	6.7	6.4	5.7
Balanced		Balanced		Balanced		Balanced		Rising		Rising	
Shallow Draft Vessel Quality		Volume of Small Craft Traffic		Water Movement		Dimensions		Petroleum Discharge		Environmental	
5.2	4.1	7.3	6.4	5.7	4.8	6.0	5.3	8.3	6.5	7.6	6.5
Balanced		Balanced		Balanced		Maybe		Rising		Maybe	
Commercial Fishing Vessel Quality		Traffic Mix		Visibility Restrictions		Bottom Type		Hazardous Materials Release		Aquatic Resources	
7.8	6.2	5.7	4.7	1.7	1.7	4.7	4.1	8.2	6.8	7.8	6.8
NO		Balanced		Balanced		Balanced		Rising		Rising	
Small Craft Quality		Congestion		Obstructions		Configuration		Mobility		Economic	
7.2	6.1	6.6	5.3	3.5	3.4	7.8	6.5	8.1	7.1	6.9	6.4
Maybe		Maybe		Balanced		NO		Maybe		NO	

KEY	
Risk Factor	
Book 1	Book 3
Consensus	

EXPLANATION	
Book 3	Baseline 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
Rising	No consensus that risks are adequately balanced by existing mitigations and the mitigated risk level either is higher than the result from a previous PAWSA or is higher than the baseline risk level from this PAWSA
NO	Consensus that existing mitigations do NOT adequately balance risk

Section VIII: Book 4 – Identifying Additional Risk Mitigation Strategies

The workshop participants next completed book 4, which evaluated how successfully a proposed risk mitigation / intervention strategy would be at lowering risk levels for each of the eight waterways risk factors that were determined to require additional intervention actions. The below table shows the expected reduction in risk when taking the actions specified by the participants. A green **Balanced** indicates that no intervention is needed because risk in the waterway was judged to be well balanced by existing mitigations. A yellow **Caution** indicates that there was a difference between the most effective general strategy and the general strategy most selected by the participants for additional action(s).

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	Balanced	Coordination / Planning	Coordination / Planning
				3.6	2.2 Caution
Shallow Draft Vessel Quality	Volume of Small Craft Traffic	Water Movement	Dimensions	Petroleum Discharge	Environmental
Balanced	Balanced	Balanced	Waterway Changes	Coordination / Planning	Voluntary Training
			3.1	4.6	1.9
Commercial Fishing Vessel Quality	Traffic Mix	Visibility Restrictions	Bottom Type	Hazardous Materials Release	Aquatic Resources
Enforcement	Balanced	Balanced	Balanced	Coordination / Planning	Coordination / Planning
3.9 Caution				3.5	6.6
Small Craft Quality	Congestion	Obstructions	Configuration	Mobility	Economic
Rules & Procedures	Rules & Procedures	Balanced	Coordination / Planning	Coordination / Planning	Coordination / Planning
5.9	3.1 Caution		4.1 Caution	3.6	2.9

KEY		EXPLANATION	
Risk Factor		Intervention	Intervention general strategy that most participants selected for further risk mitigating actions
Intervention		Risk Improvement	The amount that present risk levels might be reduced if new mitigation measures were implemented
Risk Improvement	Caution	Caution	No consensus alert

The participants judged that additional risk reduction actions were needed with respect to 13 of the 24 risk factors in the Waterway Risk Model. The table below summarizes that information and is arranged from highest to lowest possible risk improvement. A description of each risk mitigation general strategy is included in Appendix D.

Risk Factor	General Strategy	Specific Action(s)
Commercial Fishing Vessel Quality	Enforcement	Stricter enforcement by Department of Natural Resources and Coast Guard for current regulations and more underway boardings.
Small Craft Quality	Rules and Procedures	Establish several different licensing / boating safety requirements for small craft operators. These include boating safety education; boating under the influence convictions would be tied to driver's license; license for operating a small craft at night; and insurance required for all registered small craft.
Congestion	Rules and Procedures	Create waterfront zoning in order to segregate recreational and industrial facilities.
Dimensions	Waterway Changes	Encourage Congress to pass the Harbor Maintenance trust fund bill (HR 4844). This would allow for full access to fund for maintenance dredging. Evaluate Wando turning basin, Wando Reach, and Town Creek Reach entrance to facilitate safer operations in these areas.
Configuration	Coordination/Planning	Coordinating with the Coast Guard to reconfigure existing ranges in terms of color for visibility as well as spread of visibility.
Personnel Injuries	Coordination/Planning	Use communication avenues during a mass casualty that allow first responders to communicate more easily with the public. Ensure communication avenues are explained and incorporated into the mass rescue plan.
Petroleum Discharge	Waterway Changes	Commence feasibility study to consider an increase of authorized channel depth, width, and alignment to improve navigational safety.
Hazardous Materials Release	Waterway Changes	Establish a controlled refuge area for quarantine on vessels. Restore anchorage to a depth comparable to the shipping channel's authorized depth to create an alternative location to handle these incidents whether accidental or resulting from an attack.
Mobility	Coordination/Planning	Establish a port Emergency Operations Center (EOC) for the marine industry.
Health and Safety	Coordination/Planning	Implement recommendations of the strategic risk management plan.
Environmental	Voluntary Training	Increase awareness and response training for post emergency responders.
Aquatic Resources	Coordination/Planning	Conduct natural resource damage assessment and restoration planning and implementation.

The specific actions listed are the ones recommended within the general strategy recommended by the most participant teams. Appendix E is the complete list of all additional risk mitigations strategies identified by the workshop participants. The number listed in parentheses for each mitigation strategy represents the number of votes that mitigation strategy received from the workshop participants.

Conclusion:

The ultimate goal of a PAWSA is not only to establish a baseline of waterways for VTS consideration, but to provide the Coast Guard Sector Commander 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. This report supports this goal, and should be viewed as a starting point for continuing dialogue within the local maritime community.

The United States Coast Guard, Marine Transportation Systems Management, extends a sincere appreciation to the workshop participants for their contributions to the 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 Charleston, South Carolina.

Appendix A

Charleston PAWSA Workshop – Attendee List

Participant	Organization	Email Address
Mr. Jon Archer	Moran Charleston	jarcher@morantug.com
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Mr. Ken Kromer	South Carolina State Ports Authority	
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Ms. Diane Duncan	U.S. Fish & Wildlife	diane_duncan@fws.gov
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Mr. Greg Johnson	U.S. Coast Guard	Gregory.E.Johnson@uscg.mil
Mr. Steve Kicklighter	McAllister Towing	skicklig@mcallistertowing.com
Mr. Billy Lempesis	South Carolina State Ports Authority	blempeis@scspa.com
Mr. Steve Little	Tow Boat US Charleston	maritimeservices@hotmail.com
CDR Chris Marcy	U.S. Coast Guard	Chris.K.Marcy@uscg.mil
Mr. Craig Mitchum	McAllister Towing	
Mr. Thomas Payne	Marinex Construction, Inc.	marinextp@aol.com
Mr. Greg Sams	South Carolina Department of Health and Environmental Control	
Mr. Whit Smith	Charleston Pilots Association	wsmith@charlestonpilots.com
Mr. Bos Smith	Stevens Towing	b.smith@Stevens-Towing.com
Mr. Henry Stackhouse	South Carolina Department of Natural Resources	stackhouseh@dnr.sc.gov
Mr. Warren Tawes	Moran Charleston	
Mr. Brian Wells	U.S. Army Corps of Engineers	Brian.R.Wells@usace.army.mil
Ms. Priscilla Wendt	South Carolina Department of Natural Resources	wendtp@dnr.sc.gov
Mr. Phil Wolf	U.S. Army Corps of Engineers	Philip.M.Wolf@usace.army.mil
Mr. Terry Yarborough	South Carolina Department of Health and Environmental Control	yarborwt@dhec.sc.gov

Facilitation Team	Organization	Email Address
Mr. Burt Lahn	USCG Headquarters (CG-553)	Burt.A.Lahn@uscg.mil
Mr. Bob Hennessy	ATS Corporation	rhennessy@atsc.com
Ms. Chrissie Foster	ATS Corporation	cfoster@atsc.com
Mr. Nathan Peirce	ATS Corporation	Nathan.T.Peirce@uscg.mil
Ms. Stephanie Muska	ATS Corporation	smuska@atsc.com

Appendix B

Participant Observations- Trends in the Port and Existing Risk Mitigations

Deep Draft Vessel Quality

Trends / Observations:

- Significant percentage of newer ships
- Container ships are mostly ten years old or less
- Bulkers mostly carry steel, aluminum, liquids, diesel, jet fuel
- Private contract / foreign tankers are newer
- U.S. Charter / Jones Act American Flag fleet is older
- Vessels are getting larger while improvements to the channel, such as deepening or widening have not occurred
- Vessel quality is good, but will degrade as the commercial fleet ages
- Dry-bulk cargo vessels are typically older than ten years
- The tank ship fleet is relatively new
- Conditions of vessels are trending better in recent years
- Foreign crew officers are excellent, respectful, courteous crews
- Mix of nationalities on foreign-flag vessels
- Vessels are getting bigger
- Cruise ships/passenger vessels, high quality with little to no problems

Existing Mitigations:

- Fleet is not old and therefore requires less maintenance
- High volume terminals that contract ships have strong vetting programs and procedures
- Strong regulations in place (e.g. double hull requirement & IMO regulations)
- Industry vetting programs exceed regulatory standards

Shallow Draft Vessel Quality

Trends / Observations:

- Soft bottom groundings are more frequent than the Coast Guard data suggests. They are likely not reported unless a crewmember is injured or the vessel sustains significant damage.
- Passenger vessel casualties are low; only one a year

- Profit margin is low for dinner cruises which has effect on maintenance and crew quality
- It's difficult to schedule a Coast Guard voluntary towboat inspection due to Coast Guard's other operational commitments.
- Towing vessels are in better condition than the past 30 years
- Rotation of inspectors forces operators to maintain vessels above par
- Maintenance of licensing credentials and required sea time / man hours is expensive and difficult to track
- Dredge operators cannot get a license due to strict Coast Guard requirements, even though they are highly qualified and experienced
- Steady decline of small towboat companies; they are either going out of business or being consolidated into larger companies

Existing Mitigations:

- Coast Guard safety inspections and voluntary towing vessel inspections help to increase quality of vessels
- ABS class towboats are of high standard
- Individual towboat company standards are effective and exceed current standards
- Petroleum industry's vetting program is very effective for insuring a high quality of towboats
- Large and small passenger boat fleets are being inspected regularly by Coast Guard
- Dredges are being held to regulations from OSHA, insurance companies, Coast Guard, etc.
- Dredging Inspectors onboard four days/week due to being a government contractor
- Dredge Operators follow the Army Corps of Engineers (ACOE) EM 385-1-1 Safety and Health Requirements Manual which is a very detailed inspection requirements for dredges under contract by the ACOE
- Tugs / towing vessels have highly experienced Captains operating their vessels

Commercial Fishing Vessel Quality

Trends / Observations:

- The fishing fleet is mostly comprised of shrimpers. They usually work during the day (9am-5pm).
- Fishing fleet maintenance is inadequate due to economic restraints
- Smaller operations (Mom & Pop) are being driven out of business because of the economy
- Long liner fishing fleet is transient in nature and has minimal impact on the quality of the local fleet
- Snapper / grouper boats are mostly small vessels
- Pilots don't have issues with fishing fleets blocking the channel or communicating bridge to bridge
- Crabbers at times will go up into the Cooper River and very infrequently decide to crab in channel. This is usually handled promptly by the proper authority.
- A small portion of the fleet is comprised of a tight-knit Vietnamese community. There is a slight language barrier; however, they tend to stay out of the way and keep to themselves.

- Lack of profit for shrimp industry in last few years, January thru May season is closed, fuel cost is higher, shrimp costs less, so people are “running their boats into the ground” instead of going into dry dock
- Owners are getting bottom of barrel crews due to money. “Economy has driven fleet quality down.” Vessels have been stretching their dry dock schedules to seven or eight years.
- If more regulations are imposed, it will eliminate the commercial fishing industry
- Lack of credentialing for the fishing boat operators impacts the quality of crews
- Less fishing vessels

Existing Mitigations:

- Coast Guard Commercial Fishing Vessel examiner voluntary program to teach commercial fisherman about safety
- Coast Guard regulations safety and navigation regulations
- Small, tight community within the fishing vessel fleet helps to ensure that vessel safety or maintenance issues are resolved quickly
- Life vests and safety equipment are on board

Small Craft Quality

Trends / Observations:

- More people moving to area, knowledge of boating is severely lacking; operators not as familiar with waterway hazards such as tides, currents, and hazards
- Poor state of economy has resulted in poorer quality powered small craft
- North Carolina started boating licensing program for certain ages
- Seeing more personal watercraft / jet ski collisions due to operator not having proper boating knowledge
- Large east coast sailing event this summer went well, no collisions
- Large events bring people from all areas that are not knowledgeable of the local Charleston waterways, and create more nighttime traffic on the waterways
- Charleston is a major port for transient traffic (known as “snow birds”), mostly in the intra-coastal waterway
- Isle of Palms was dredged this past year
- There are a few hot spots in the Fall and Spring (e.g., Ben Sawyer Swing Bridge, Isle of Palms, and Sullivans Island) that are dangerous areas where many small crafts run aground
- Cove Inlet and Wappoo Bridge has a lot of congestion on weekends making it hard for tugs to maneuver
- There is an increasing number of abandoned small craft
- Radio communication between commercial traffic and sailboats is not always effective due to the sailboat not answering
- Sailboats rush to get to open bridge ahead of larger vessels – very dangerous

- Small craft operators' abilities are decreasing
- Inshore craft quality trending down
- Offshore small craft quality is up
- More second / third hand boats are being purchased in proportion to new vessels being purchased, than in the past
- Sailboat quality is trending up, more sailing clubs, organized regattas, has resulted in better coordinated events and informed vessel operators; sailing community works well with port community
- Decrease in law enforcement

Existing Mitigations:

- Organized sailing community is a good process due to training and strong yacht club education
- Strong state and federal enforcement of boating safety regulations
- Power Squadron and Coast Guard Auxiliary Boating Safety courses and boating safety exams help in educating small craft operators

Volume of Commercial Traffic

Trends / Observations:

- From U.S. Coast Guard arrival data, approximately 2,300 ship calls per year on the Port of Charleston
- Georgetown has draft restriction due to lack of funding for the Army Corps of Engineers to dredge
- Tug and towing vessel data is not accurate within Coast Guard arrival data; arrival data doesn't capture all vessels transiting within the local port area. (Data provided on chart is based on advanced notice of arrival. Recommend getting up-to-date data from the area pilots as they have exact numbers on commercial traffic.)
- ACOE decisions are made on two year old commercial cargo data (based on old trends)
- South Carolina Port Authority is developing additional terminals, which will create greater vessel traffic
- Anchorage basin hasn't been dredged in 17 years, could see significant increase in bunker traffic worth millions of dollars
- Due to the increase in commercial vessel size pilots must coordinate traffic to minimize meeting situations
- Traffic on the intra-coastal waterway is day dependent on traffic conditions, isolated events cause waterway congestion
- Arrivals of vessel traffic may have decreased but the overall size / tonnage has increased due to larger hulls
- Water taxis and such will not be included in the USCG Ship Arrival and Notification System (SANS) data. Harbor cruise vessels will not be included in the SANS data. Often Federally-collected data such as transits is inaccurate. There is a perception that funding decisions are made based on this data.
- Commercial hulls are getting larger
- Charleston waterway traffic has trended down from 2008

Existing Mitigations:

- Vessel berths are scheduled through the harbor master
- Private terminals have pilot association that require 3 hr notification
- Constant communication and coordination between industry dispatchers and pilots association
- Well marked channels aids in managing vessel volume

Volume of Small Craft Traffic**Trends / Observations:**

- Fifth in nation per capita for registered small vessels, which does not included expired, unregistered, out of town vessels
- Overwhelmed with special events, holidays, weekend traffic – very busy year round
- Most transient traffic occurs in October and November due to “snow bird” migration.
- Moderate volume

Existing Mitigations:

- Well marked channel
- Marina events are well coordinated with port community and law enforcement
- Coast Guard marine event permitting process helps to manage volume of small craft
- Good communication with event planners for special events with port community
- No wake zone enforcement
- Boater education through yacht clubs and Coast Guard Auxiliary helps to manage volume

Traffic Mix**Trends / Observations:**

- Department of Defense / military, commercial, and recreational use
- Pilots generally co-exist with recreational traffic, not unmanageable. Won't get better until marinas require safe boating.
- Problem with ICW barge movement with jet skis, if a jet ski has a mechanical failure, casualties may occur
- Larger volume of summer traffic; busier due to school being out
- Highest trafficked areas include: where the ICW crosses through the harbor and Ashley River, Shem Creek, Mount Pleasant, Shutes Folly, Charleston Harbor, and between the bridge and the Y
- Towers – biggest issue is boat landing and bridge at Wappoo Cut, and marinas at Sawyer. Boats don't look where they are going.
- Won't dredge on weekend because of the high volume of traffic
- Recreation population generally stays out of the way in the channel

Existing Mitigations:

- Naturally zoned harbor. Ashley River – recreational, upper Cooper River – commercial traffic, Wando River – mix, Shem Creek – residential. Charleston would be a good place to do a case study for waterway zoning.
- Boating education
- Technology – cartography, VHF radios, depth finders
- Pilots for larger vessels

Congestion**Trends / Observations:**

- Day of week dependent; more recreational traffic on weekends and holidays and more commercial traffic from Monday through Friday
- Regattas take place in south channel where commercial ships don't navigate
- Special events increase each year, and not enough advance notice is given to agencies to have enough staff for the day of event
- Cruise lines intend to bring in casino boats, Carnival cruises – no more than two vessels per week. Gambling boat multiple times a day, seven days/week. These limits are based on SPA commitment with community.
- Special events can cause congestion
- Smaller casino boats may be coming. Limited cruise ship arrivals due to passenger terminal limitations and relatively small market. Usually two vessels per week will call on the port. Gambling boat (small passenger vessel) has the potential to operate every day.

Existing Mitigations:

- Events coordinated and scoped by boundaries
- Congestion is managed and coordinated by cooperation from port service providers at the berthing terminals
- Pilot dispatch process provides deep draft congestion management
- Regulations in place for security calls
- Professional mariners / pilots have open communication with other captains and vessels
- Commercial traffic is aware of congestion and tries to avoid it

Winds**Trends / Observations:**

- Data on NOAA website provides information on wind speed and directions over the period of a year
- Winter time fronts cause high risk
- Winds + narrowness of channel + ship speed = risk
- Occasional pop up squalls have strong winds

- Small craft vessels aren't adept to deal with the wind change, which causes issues

Existing Mitigations:

- If high winds are present, most commercial traffic will not move through channel after doing self risk assessment
- Monitoring devices
- Weather forecast
- Weather radio
- Pilot and berthing policy – shut down at 40 knots
- Small craft advisories

Water Movement

Trends / Observations:

- Strong tidal range from 5.5 to 7 feet
- Problems with structures within the Port of Charleston, around Charleston Harbor Resort Marina
- Wappoo Cut, Wappoo bridge risks
- NOAA is going to install a monitor for currents in Wappoo Cut
- One hour & 15 minute time delay difference from one side of harbor to other
- Meteorological and hydrological tools out there that would be beneficial to Charleston area
- Cooper River mid-stream facility moorage balls – two breakaways in last two years due to ebb current, winds & size of vessel
- Routinely, larger vessel movements are tide-dependent. Water current is a strong factor in the region.
- Departures based on high tide and drafts
- Water movement is fairly predictable
- Small craft operators don't have the knowledge of Charleston water movement creating issues

Existing Mitigations:

- Monitoring devices – tide sensor at Union Pier
- Coast pilot regulations
- Current and tide dependent movements
- Pilot policies in place
- Experienced mariners operating commercial vessels
- Publications of tides
- Mariner training and knowledge

Visibility Restriction

Trends / Observations:

- North of 526 bridge, more prominent to fog than other areas, but is not frequent within the COTP
- Past year, the port has not been shut down for more than four hours at a time due to visibility restriction
- Quick hit rain squalls with strong winds causes issues. Once a squall is noticed on radar, proper arrangements are made to avoid, however, many small boats do not have radar ability.
- Have had fatalities in Wappoo due to visibility

Existing Mitigations:

- Monitor in advance
- Radar
- Strong port experience
- Larger vessels don't move when shut in fog is present

Obstructions

Trends / Observations:

- Offshore submerged jetties are a hazard to unaware recreational boats
- Washout debris on big tides
- On average, 10-12 foot pilings pulled from the Cooper River every two weeks
- Abandoned vessels become debris issue

Existing Mitigations:

- Active recovery process
- Maritime Safety bulletins

Visibility Impediments

Trends / Observations:

- Recent collision investigation around harbor entrance during after hours on in bound track inside the jetties, significant amount of background lighting
- Background lighting has gotten better, but to untrained eye, hard to navigate. Putting lights on the old Naval base on the Cooper River has helped.
- Recreational traffic is lower in the water and doesn't have it laid out as well. People need to stop, slow down.
- South channel toward Ashley River – range off bridges is drowned out by backlighting
- Entering Charleston from offshore, much easier now with red, green, white lights that line up
- Wappoo Cut entrance to the bridge – blind turn for tugs and recreational vessels

- Lighting the jetty is usually brought up after someone hits it. Coast Guard policy is that there is a well marked entrance and jetties are not lit, charts are to be read and used to navigate the waterways.
- Siltwall is now lit
- “Red Ball” buoy in Ashley River is more of a hazard to small craft than the mooring facility up the Cooper

Existing Mitigations:

- Existing ATON structure
- Experience and chart reading
- Pilot to pilot and bridge to bridge communication
- Working to change colors of light to minimize background clutter
- Navigation Operations Committee, Harbor Safety Committee meetings discuss navigational aid issues

Dimensions

Trends / Observations:

- Custom House Reach first spot to turn a vessel around after Mt. Pleasant
- Wando channel has constraint issues and is a one way channel for 1.5 miles, 400 feet wide, narrower than ACOE standards, can see buoys from bridge of large ships
- Maintenance issue with keeping the channel at 800 feet
- Columbus St. Terminal, width of channel too narrow by a few hundred feet, ACOE has process to look for solutions
- Maintenance dredging of anchorage causes ships to sit offshore for a few days when they could be lightered in the anchorage
- Turning basin will be right near the new terminal
- Coast Pilot in process of being edited
- Air drafts are an issue in North Charleston and on the ICW swing bridge
- James Island Bridge on ICW (67') was not found anywhere in Coast Pilot, needs to be added. Bridge needs to be re-measured.
- Town Creek had report of scraping 63' mast, even though bridge is measured as 65'
- ACOE dredged Georgetown's high areas in 2008, no dredge funding for 2010, 2011
- Harbor Maintenance Trust Fund bill is currently in House, could provide an increase in dredging funds
- Main problem with ICW is it went from commercial use to pleasure use
- Georgetown Harbor maintenance is \$8 million/year project
- Other sources (i.e., port authority) are willing to provide money for dredging, but has to go through ACOE to complete dredging
- Width to beam ratio on larger vessels is a risk factor affecting the channel dimensions
- There may be funding for construction dredging. ICW is 90 feet, which doesn't leave much room for passing. Created for commercial traffic but houses have been put on it, converting it partially to

pleasure use. A larger waterway would be good in ICW. Not going to happen. Funding would be difficult.

- Georgetown Harbor is \$8 million dollar project to maintain it properly. The Port Authority hasn't moved forward with contributing \$5 million.
- There is a perception that commercial cargo transit numbers are the only ones that are taken into account by the Office of Management and Budget when making funding decisions, which is two years old when published and omits all of the other important factors and types of vessels
- The anchorage basin hasn't been dredged in seven years
- Anchorage dimensions aren't optimal
- ICW is supposed to have 60 foot clearance, but that is not correct
- Wando Reach – one way
- Navigation for tugs and tows through the ICW especially in the Wappoo Cut area is high risk due to extreme tidal currents
- State DOD hasn't had the funding to replace the bridge on the Wappoo Cut
- ICW is narrower and shallower than most commercial waterways; no longer funded by feds, more dock allisions
- Too many private docks, shallow draft vessels will inevitably cause a mistake and hit one
- Lights on bridges not being maintained by DOT
- The LaFayette Bridge hasn't been lit in years
- If groundings in shallow areas of ICW don't get reported, the numbers won't be large enough to get funding
- There is a disconnect with towing operators and waterway enforcement
- Issues at and between bridges on ICW
- Charleston Harbor has low tonnage, so funding for dredging is difficult to procure; had a stimulus project last year; does not have dredge funding for 2010, 2011, 2012 is trending the same

Existing Mitigations:

- Between the harbor master, terminals, pilots, and towing vessels the port manages the dimensions issues to reduce risk
- Bridge to bridge coordination between vessels is good
- Dock scheduling minimizes risk of dimensions
- Security calls help with giving notification to traffic of vessels entering the waterway

Bottom Type

Trends / Observations:

- Soft mud and sand
- Shoaling is an issue, constant dredging
- Actively collecting samples and compare to what is charted to determine if they are the same

Existing Mitigations:

- Under keel policy for pilots – based on 10% draft based on IMO and ACOE standards which tide tables are built around

Configuration**Trends / Observations:**

- Major turns greater than 45 degrees north of Cooper Bridge, Wando River, ICW, the Cove, and Shem Creek
- Sailboats not paying attention to ICW make NW turn
- North of bridge turn is 72 degrees, Shipyard creek has 90 degree turn
- Crossing traffic in ICW
- Many turns above Midstream Facility on the Cooper River
- ICW 90 feet wide; doesn't leave much room for passing. ACOE doesn't think an authorization to widen would happen.
- 20% of arriving vessels cannot use anchorage due to configuration and shoaling

Existing Mitigations:

- Internal industry knowledge
- Preplanning and coordination
- Coordination with bridge tenders
- Transfer people and equipment from anchorage via tug / towboat
- List of standards for tugs at Columbus Terminal in Coast Pilot
- Port Authority has requirements for tugs at their terminals as a part of the Federal tariff
- Manipulation of vessels schedules and departures
- Recommendation: Cove / Mt. Pleasant / Shem Creek should be looked at during next WAMS

Personnel Injuries:**Trends / Observations:**

- Approximately 1,600-1,800 passengers on cruise ships
- Significant potential for injury and casualty with cruise ships
- Mostly six pack fishing charters
- No whale watching boats; whales are generally too far out
- Marina events and near shore events – Breach Inlet sandbar, Sullivans Island, Morris Island – places with large public presence and partying
- Head boats moved out of the area

- Understaffed response capability within Coast Guard, all on-call service
- Transfer from anchorage is difficult in the ocean conditions, would be easier to transfer people in Charleston Harbor

Existing Mitigations:

- Mass rescue plan
- Coordinated effort with hospitals for triage
- State, Federal, local coordination
- Facility plans, health and safety plans, and notification lists for facilities
- Inspection protocol – life saving systems, fire rescue systems inspected annually
- Resources in place to remove people from a vessel in distress
- Shore side has good medical facilities

Petroleum Discharge

Trends / Observations:

- Vessel in transit more likely to have discharge in collision or allision
- Vessel could explode or light on fire
- 2002 a commercial deep draft ripped a gash on starboard side of ship while rounding a bend, vessel was outside of channel and couldn't see a piece of dredge equipment left in the channel, and spilled over 10,000 gallons of oil
- No pipelines
- Largest tankers 80,000 tons, product carriers
- Barges, mainly bunkering
- 500,000 barrels is current most probable worst case scenario for Charleston
- If vessel left the channel, vessel would run aground before it could strike a bridge
- Maximum worst case scenario 14 million gallons, maximum most probable scenario 10,000 gallons, average most probable scenario 2,000 gallons – these numbers may need to be revised
- In the event of a maximum worst case scenario spill, the port would shut down and traffic would stop
- 50,000-100,000 barrels is the most probable worst case scenario for Charleston
- 250,000 barrels is the average tank size of ships in Charleston
- Recommend broaden Area Committee to include on-water individuals / members of industry
- Boom strategy in South Harbor needs to be developed

Existing Mitigations:

- Double hulled vessels to help reduce spillage if hull is punctured
- Response resources in place: Area Contingency Plan boom strategies, maps, Incident Command System, Area Committee, Wildlife Contingency Plan

- Local industries have response people on retainer
- PREP exercises and scheduled drills
- OSRO resources available in the Charleston area
- All vessels have response plans
- Upcoming salvage, lightering, and firefighting regulations

Hazardous Materials Release

Trends / Observations:

- Containerized hazmat most frequently enters the port, some in bulk
- Para-xylene shipment every 14 days
- Some hazmat ships come in, maybe 100 per year or more
- Revise the definition of hazardous: there are materials that may not qualify as “hazmat,” but are still hazardous

Existing Mitigations:

- Response resources in place
- Fire Department, local government, and federal government = strong hazmat team
- ICS, tri-county emergency response training

Mobility

Trends / Observations:

- Ship ran aground in channel, entire harbor was shut down for 12 hours
- An event in the Midstream Facility area will have different effects from an event in lower Charleston Harbor
- Mobility is a serious issue
- If an accident occurs in-between the jetties, the harbor will be shut down immediately and have major repercussions for the port
- ACOE is to remove obstructions from channel
- Terminal shut down means vessels waiting offshore
- A port shut down is very costly
- No written port salvage plan in place for mobility issues
- No salvage / dive crew resources in place, but money is available for contracting within a day
- Do not have resources to salvage a container ship
- Properly insured and qualified dive teams are needed for teams to respond due to liability issues.
Recommendation: working out teams in advance so they can be mobilized in time.

Existing Mitigations:

- One crane that can be used in tug salvage
- Continuity / internal plans with the ACOE and Coast Guard
- Side scanning to ensure wreckage is completely cleaned up

Health and Safety**Trends / Observations:**

- Chemical plant doesn't transport by water, but if an issue were to occur at the plant, the plume would affect the community
- Significant population evacuations would be necessary in the case of a spill or release
- Don't have large quantities of chemicals / hazmat on the Charleston port, it is transported by individual small packets
- Drinking water comes from the North from the Edisto River
- Tourist driven state increase population and neighborhoods are next to refineries and port facilities
- Many superfund sites

Existing Mitigations:

- Hospital system is very capable to handle health and safety
- Mass evacuations
- Educational awareness of the port from EPA website
- Strong emergency operation center (EOC)
- Interagency cooperation and communication is strong

Environmental**Trends / Observations:**

- Pelican sanctuary in Shem Creek / Charleston Harbor
- Entire Charleston Harbor is bird sanctuary, sensitive area, and essential resource
- Northern National Refuge and a Southern National Refuge
- Many bird nesting areas, sea turtles, manatees, short nosed sturgeon-endangered, wetlands, ocean reefs
- Primary nursery areas in marsh for fish
- General population is very sensitive to environmental issues
- Case by case for dispersants and in-situ burning

Existing Mitigations:

- Area Contingency Plan (ACP)
- Environmental sensitivity index maps provide strong natural resource information for responders

- State EOC structure is well coordinated with Coast Guard and state
- Regional Response Team

Aquatic Resources

Trends / Observations:

- Shellfish harvesting, shrimp, clams, mussels, crabs, oysters
- Large recreational fishing everywhere, charter vessels, artificial reefs
- There is a big push in Charleston to use local resources
- Recreation is everywhere, including commercial recreation
- Large communities that require aquatic resources

Existing Mitigations:

- Limit season
- Response plans in place

Economic

Trends / Observations:

- Military supply loading would be affected and would have to be rerouted
- The port generates \$62 billion dollars per year or \$172 million per day
- A lot of people make their living from the water, between fishing and recreation, and many people would be out of business if the port were shut down
- ATON boats should be ready to go after disaster / hurricane to check navigational aids, ICW

Existing Mitigations:

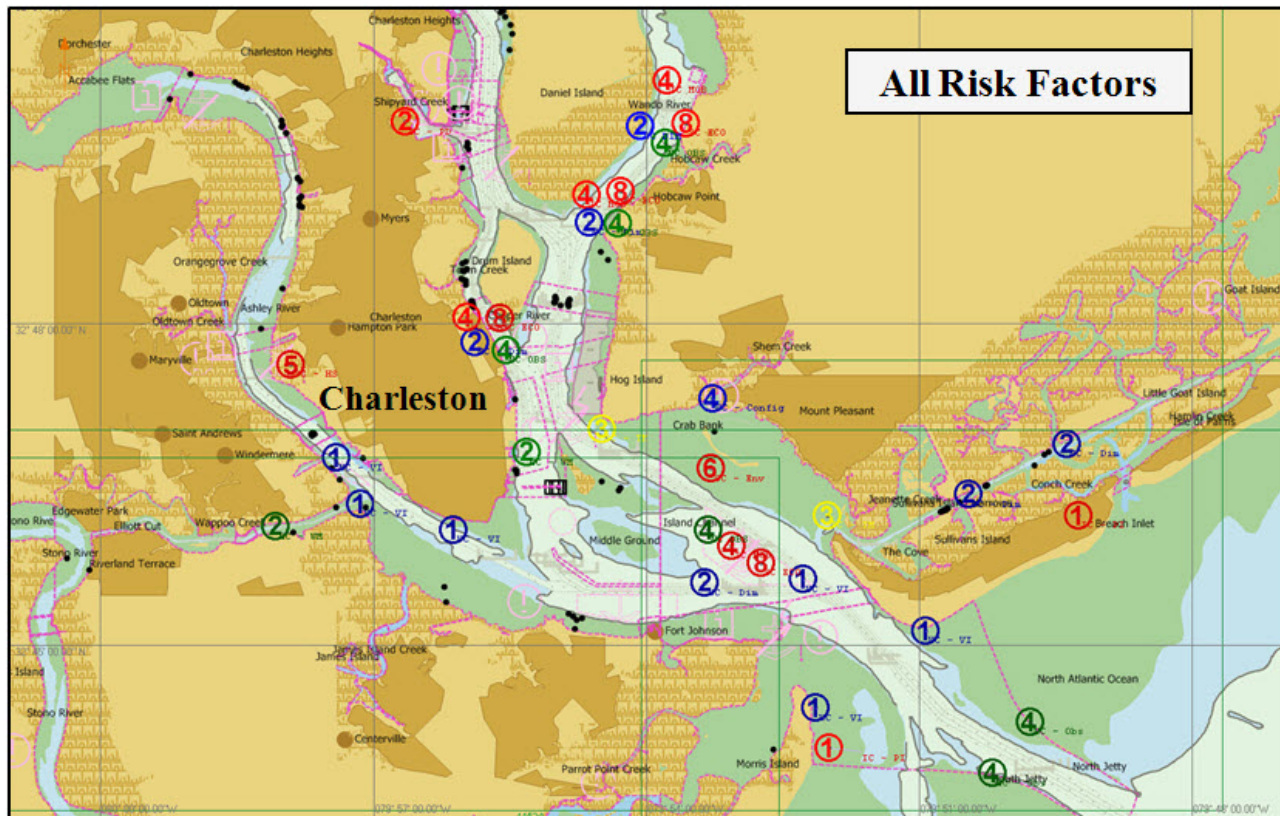
- Ship will self reroute if port is shut down
- Use tug boats as back up to ATON boats if needed
- Use pilots to verify ATON positioning after an event

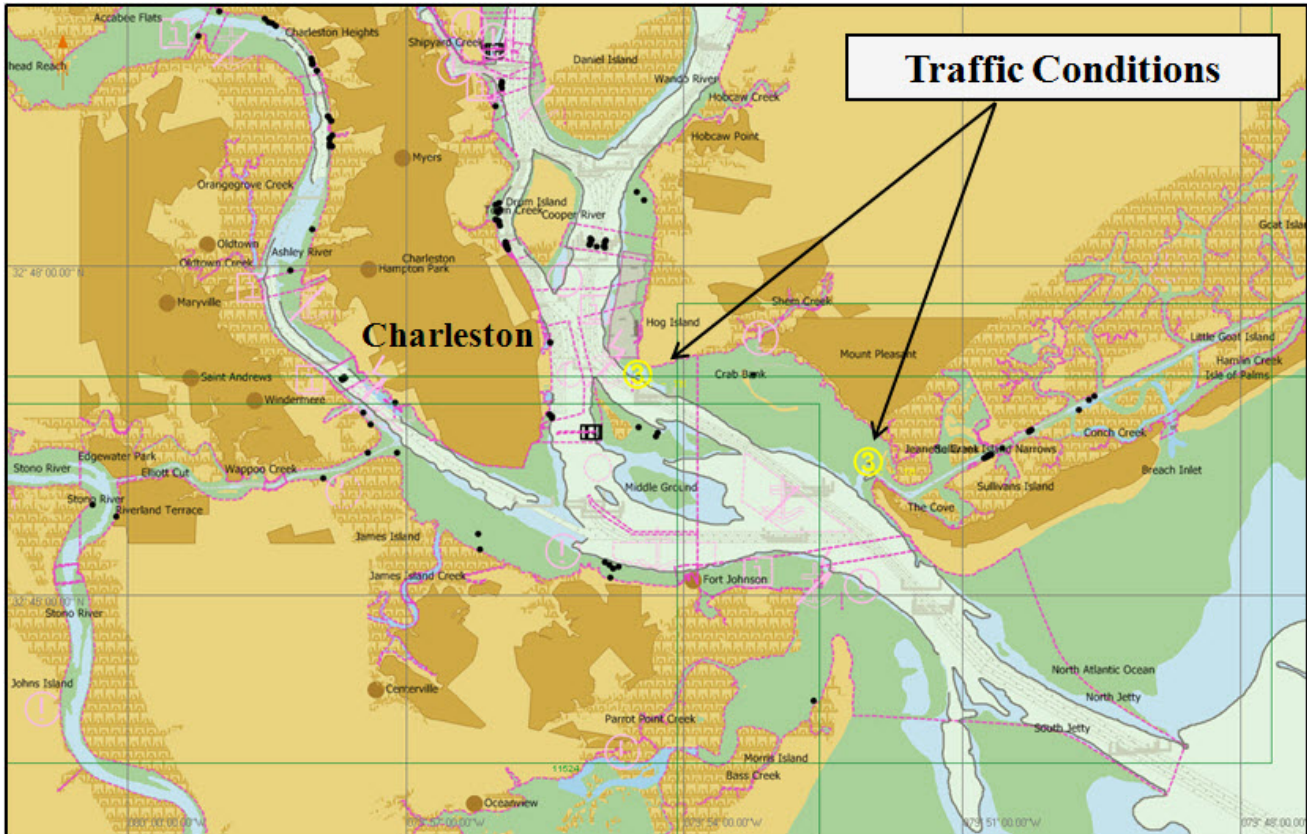
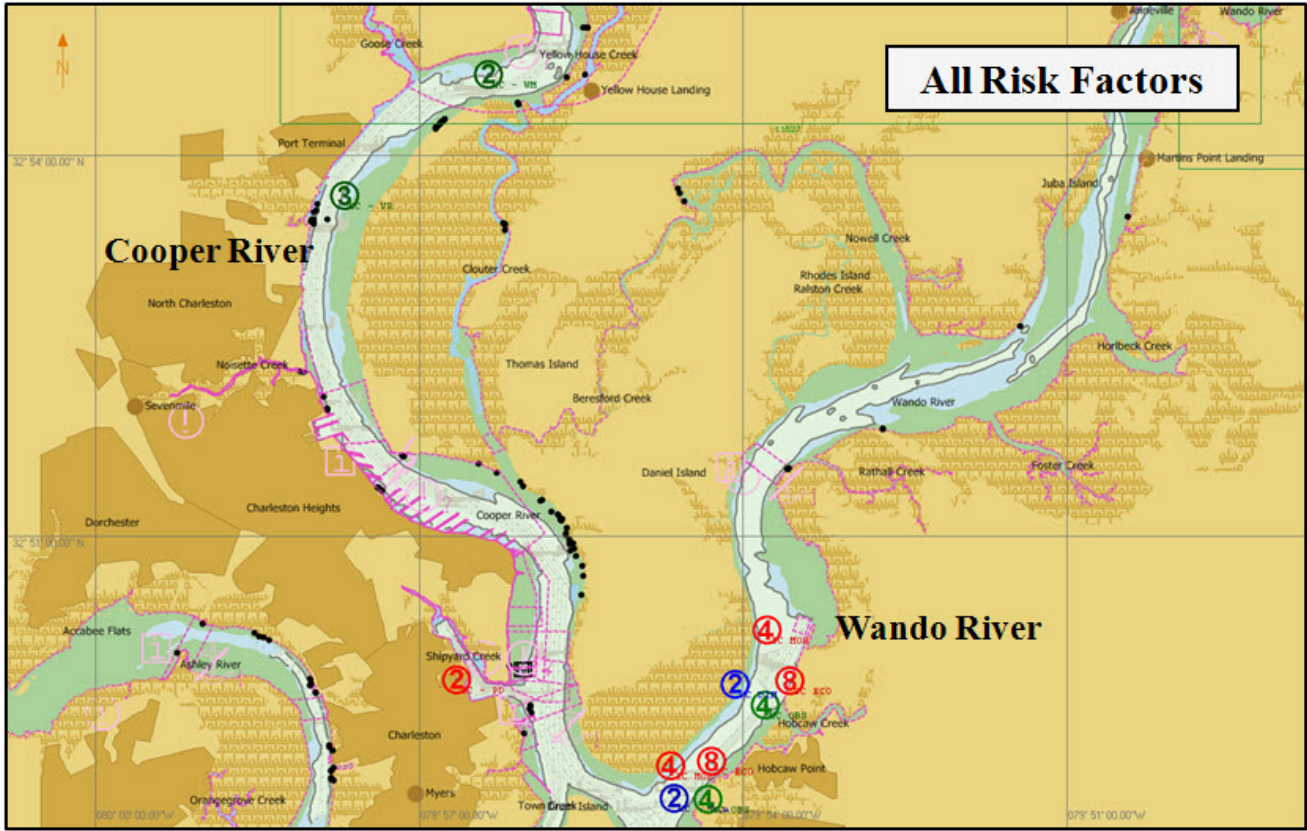
Appendix C

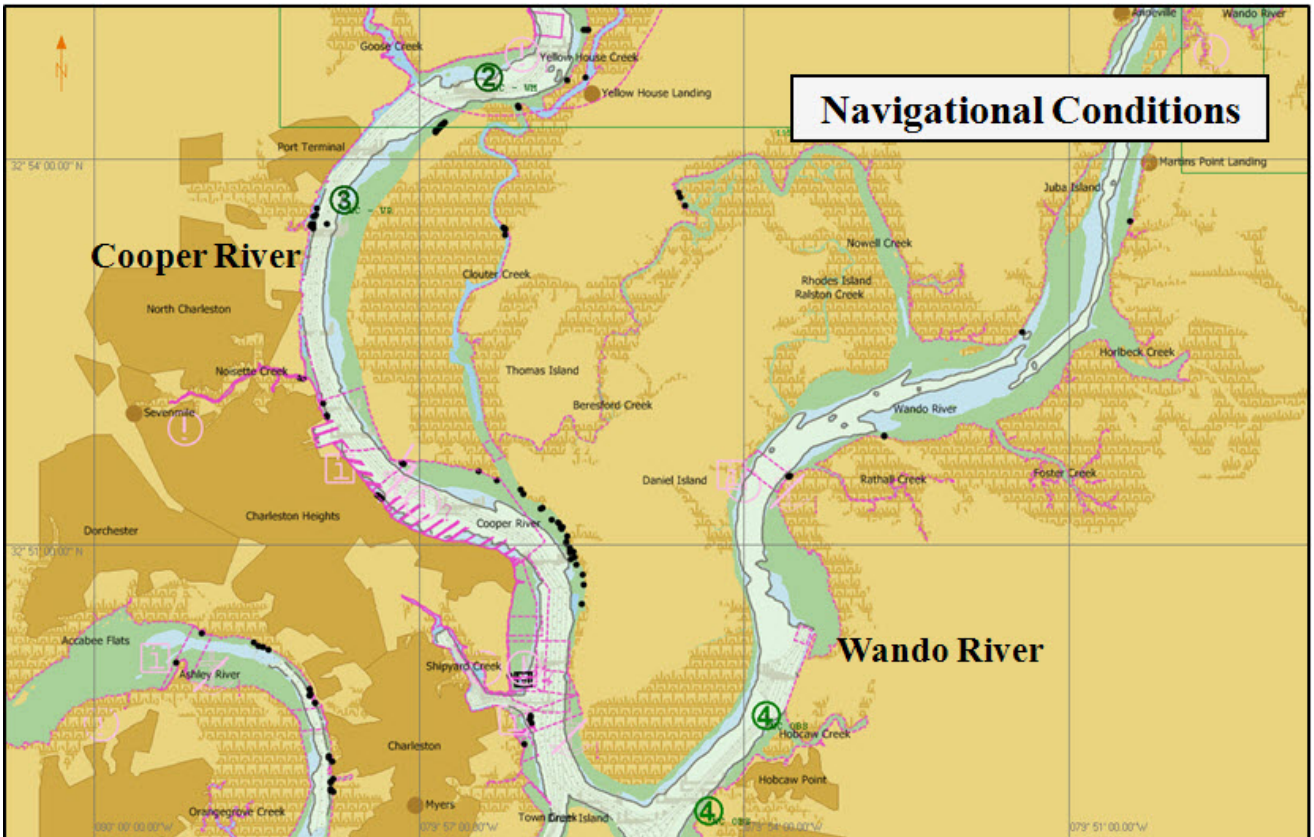
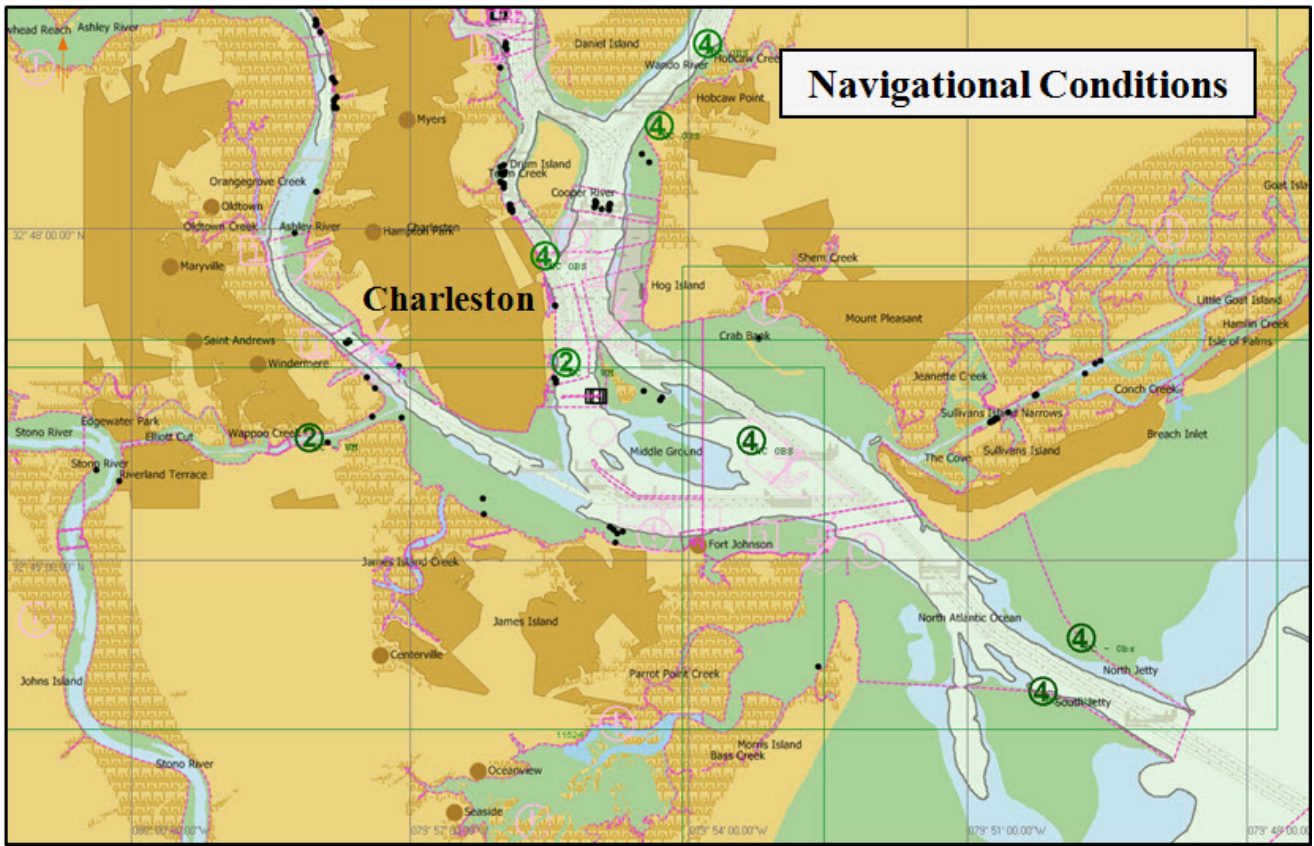
Waterways Risk Model – Risk Factor locations

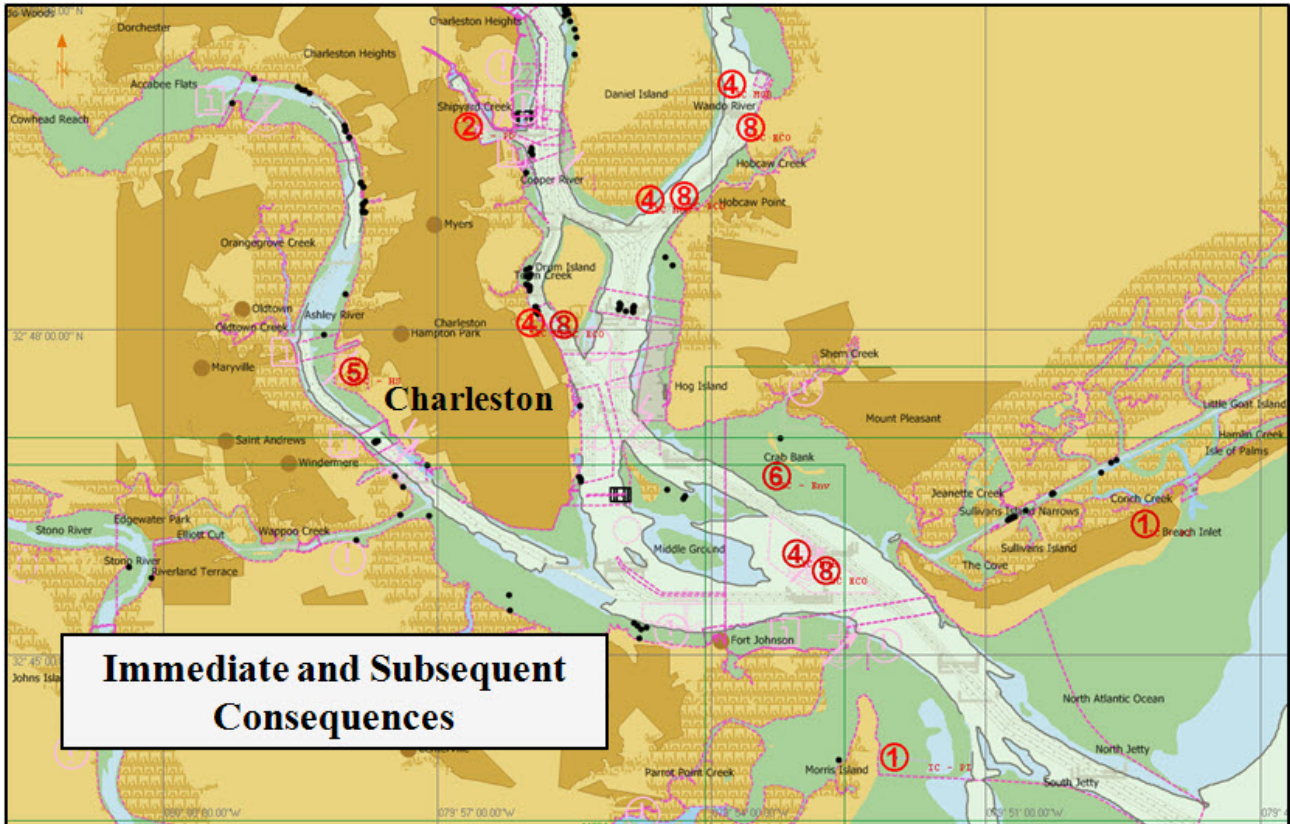
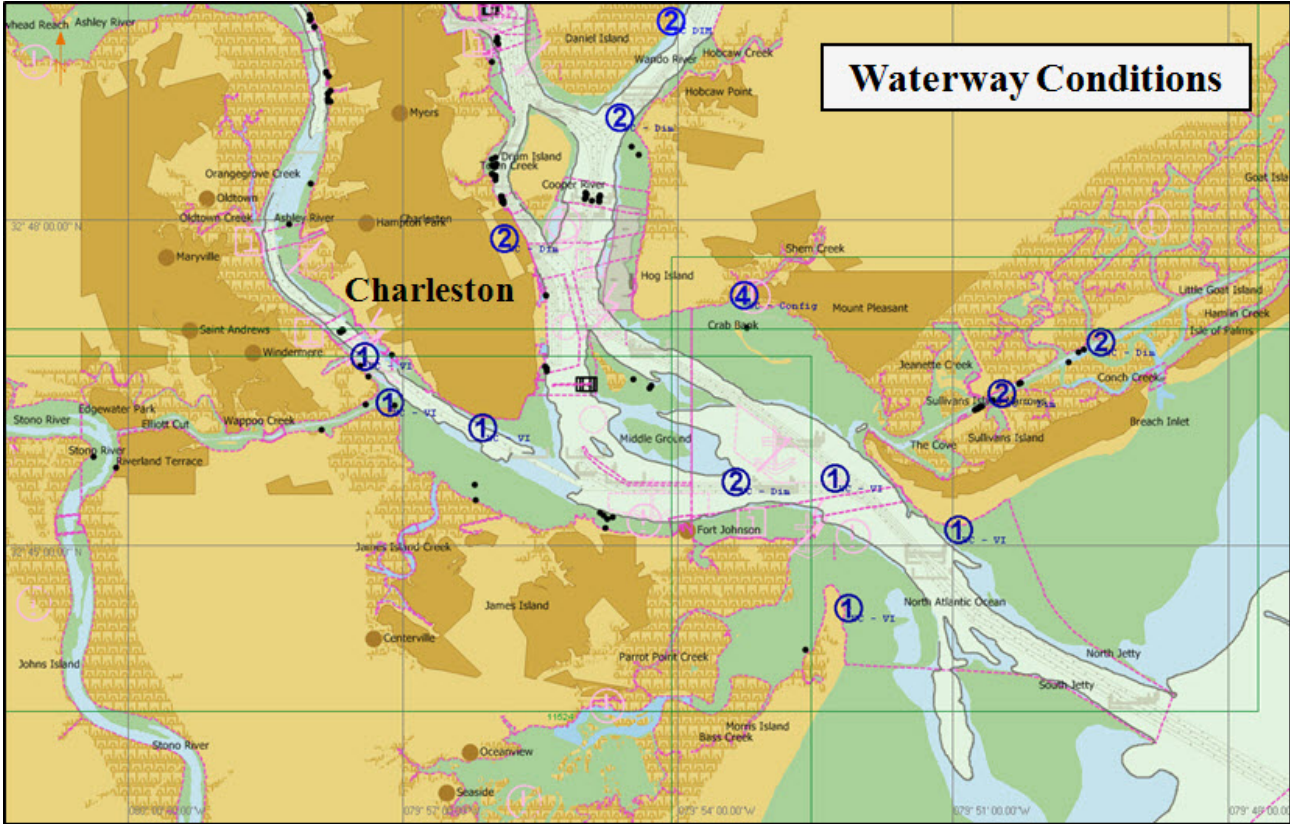
As participants discussed the Waterways Risk Model factors, an Electronic Charting System (ECS) was utilized to identify the specific geographic locations associated with the risk factors. The following legend explains the risk factor locations on the ECS chart excerpts.

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









Appendix D

Risk Mitigation Strategy Descriptions

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

Appendix E

Additional Risk Intervention Strategies

Commercial Fishing Vessel Quality

Voluntary Training:

- Educate the public on where product is coming from (9)

Rules & Procedures:

- Increase import tax on seafood (8)

Enforcement:

- Stricter enforcement by DNR and CG for current regulations / more at sea boardings (10)
- Basic vessel safety requirements (1)

Radio Communications:

- Better SSB radio communications (6)
- Satellite telephones (1)

Other Actions:

- Support local seafood to increase profitability (10)

Small Craft Quality

Rules & Procedures:

- Require boating license via education (4)
- Require insurance for boaters (2)
- Attach BUI penalties to state vehicle driver's license (1)
- Obtain a night operating license (1)
- Personal watercraft bucket brake (0)

Radio Communications:

- Media communications / public service (7)

Congestion

Rules & Procedures:

- Waterway zoning segregating recreational and industrial facilities through permitting (10)

Waterway Changes:

- Initiate study to reconfigure entrance to Columbus St. Terminal (3)
- Commence study to consider Wando Reach be widened to ACOE standards for beams of ships, needs to be able to accommodate 2 way traffic (3)
- Commence study to consider Wando basin widened to more clearly see aids to navigation (0)

Dimensions

Waterway Changes:

- Encourage Congress to pass the Harbor Maintenance trust fund bill (HR 4844). This would allow for full access to fund for maintenance dredging (7)
- Seek additional funds to have entrance to channel maintained at authorized width of 1,000 ft (1)
- Initiate study to reconfigure entrance to Columbus St. Terminal (1)
- Commence study to consider Wando Reach be widened to ACOE standards for beams of ships, needs to be able to accommodate 2 way traffic (1)
- Commence feasibility study to consider an increase of authorized channel depth, width, and alignment to improve navigational safety (1)
- Seek additional funds to have the anchorage maintained to project depth to provide refuge for ships under security incident and provide economic benefit (0)
- Commence study to consider Wando basin widened to more clearly see aids to navigation (0)
- Seek funds to maintain ICW width and depth (0)

Configuration

Coordination/Planning:

- Coordinating with USCG to reconfigure existing ranges in terms of color for visibility as well as spread of visibility (11)

Enforcement:

- Enforce bridge permit requirements for RACON on fixed bridges. SCDOT (0)
- Enforce bridge permit requirements for lighting and fender systems. SCDOT (3)
- Zoning (1)

Waterway Changes:

- Get Harbor Maintenance trust fund passed (6)
- Seek additional funds to have entrance to channel maintained at authorized width of 1,000 ft (1)
- Initiate study to reconfigure entrance to Columbus St. Terminal (0)
- Seek additional funds to have the anchorage maintained to project depth to provide refuge for ships under security incident and provide economic benefit (1)
- Commence study to consider Wando Reach be widened to ACOE standards for beams of ships, needs to be able to accommodate 2 way traffic (1)

- Commence study to consider Wando basin widened to more clearly see aids to navigation (0)
- Commence feasibility study to consider an increase of authorized channel depth, width, and alignment to improve navigational safety (0)
- Seek funds to maintain ICW width and depth (0)
- Establish light on Cooper River wharf Alpha (0)
- More deterrence measures to decrease Osprey nests on existing ranges (0)

Personnel Injuries

Coordination/Planning:

- Implement a mass rescue plan for Charleston Harbor that includes a local resource list, contact numbers, and procedures. Complete exercises / drills for the proposed mass rescue plan. (9)

Radio Communications:

- Use communication avenues during a mass casualty that the average person has so that the first responders can communicate more easily with the public. Ensure it is incorporated into the mass rescue plan. (10)

Petroleum Discharge

Coordination/Planning:

- Ensure contingency plan is updated annually and responders are adequately aware of the plan (10)

Rules & Procedures:

- Double hull (5)

Enforcement:

- Ensure current regulations are being enforced and are adequate (7)

Waterway Changes:

- Commence feasibility study to consider an increase of authorized channel depth, width, and alignment to improve navigational safety (11)

Other Actions:

- Improve technology for containment and clean up for petroleum spills (4)

Hazardous Materials Release

Coordination/Planning:

- Ensure hazmat annex of contingency plan is updated and exercised (9)

Waterway Changes:

- Established a controlled refuge area for quarantine on vessels (10)

Other Actions:

- Improve technology for containment and clean up for petroleum spills (5)

Mobility**Coordination/Planning:**

- Establish port EOC for marine industry (6)
- Salvage expert within the USCG in Charleston to oversee / coordinate salvage efforts (4)

Health and Safety**Coordination/Planning:**

- Implement recommendations of strategic risk management plan (11)

Radio Communications:

- Increase education to public in the event of a port incident (10)

Environmental**Voluntary Training:**

- Increase awareness and response training for post emergency responders (9)
- Promote awareness to CERT (3)

Aquatic Resources**Coordination/Planning:**

- Conduct natural resource damage assessment and restoration planning and implementation (11)

Voluntary Training:

- Response training (2)

Economic**Coordination / Planning:**

- Establish port Emergency Operations center (EOC) for marine industry (7)
- Salvage expert within the USCG in Charleston to oversee / coordinate salvage efforts (4)
- Ensure an enhanced plan is in place to re-coop port after incident (1)

Enforcement:

- Enforce current safety regulations to the fullest to prevent future incidents (11)