

Ports and Waterways Safety Assessment

Workshop Report

New York, New York



**United States Coast Guard
Marine Transportation Systems Directorate**



**Providing Navigation Safety Information
for America's Waterways Users**

Background

The United States Coast Guard (USCG), Marine Transportation Systems 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 with the goal of making 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 ***Ports and Waterways Safety Assessment (PAWSA) Waterways Risk Model***, and the ***PAWSA workshop process***. 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 facilitating a structured workshop agenda to meet the risk assessment objectives. A successful workshop 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 identified and evaluated.

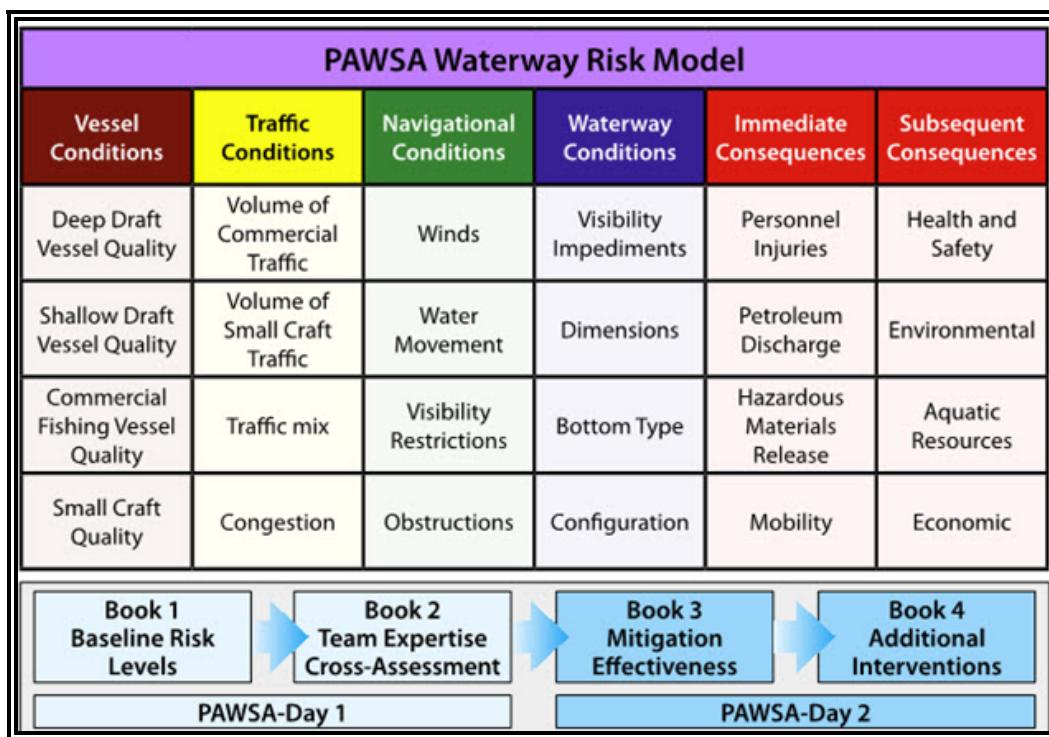
The long-term goals of the PAWSA process are to:

- 1) Provide input when planning for projects to improve the safety of navigation,
- 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/or strengthen the roles of Harbor Safety Committees within each port, and
- 4) Support and reinforce the role of Coast Guard Sector Commanders/Captains of the Port (COTP) in promoting waterway and vessel traffic management activities within their geographic areas of responsibility.

54 ports/waterways have been assessed using the PAWSA process. The risk assessment process represents a significant part of joint public-private sector planning for mitigating risk in waterways. When applied consistently and uniformly in a number of waterways, the process is expected to provide a basis for making best value decisions for risk mitigation investments, both on the local and national level. The goal is to find solutions that are cost effective and meet the needs of waterway users and stakeholders.

PAWSA Waterway Risk Model and Workshop process

The PAWSA 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 diagram below shows the six general risk categories, and corresponding risk factors, that make up the Waterway Risk Model.



- **Vessel Conditions** – The quality of vessels and their crews that operate on a waterway.
- **Traffic Conditions** – The number of vessels that use a waterway and how they interact with each other.
- **Navigational Conditions** – The environmental conditions that vessels must deal with in a waterway.
- **Waterway Conditions** – The physical properties of the waterway that affects vessel maneuverability.
- **Immediate Consequences** – The instantaneous impacts to the port as a result of a vessel casualty.
- **Subsequent Consequences** – The longer-term impacts felt days, months, and even years afterwards.

Workshop activities include a series of discussions about the port/waterway attributes and the vessels that use the waterway, followed by completion of survey books 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. Survey book 1 is used to numerically evaluate the baseline risk levels using pre-defined qualitative risk descriptions for pre-defined risk factors. Survey book 2 is used 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. Survey book 3 is used to evaluate how effective the mitigation strategies are at reducing risks, and to determine if the risks are well balanced or not. For those risk factors where risk is judged to be not well balanced by existing mitigations, participants use survey book 4 to identify additional risk intervention strategies and then evaluate how effective those new strategies could be at reducing risks.

Executive Summary

A PAWSA workshop for the Port of New York was held in New York, New York on 26-27 October, 2016. The workshop was attended by 25 participants, representing waterway users, regulatory authorities and stakeholders with an interest in the safe and efficient use of New York waterways from both a commercial and recreational perspective. Over the course of the 2-day workshop, participants discussed and evaluated each of the 24 risk factors that make up the Waterways Risk Model.

Participants discussed the challenges encountered by deep draft commercial vessels when entering the port of New York and navigating safely within the confines of New York harbor, the Kill Van Kull, Newark Bay and the East River.

For each of the 24 risk factors evaluated, participants discussed and then numerically evaluated the baseline risk levels using pre-defined qualitative risk descriptions for each risk factor. Participants then discussed existing risk mitigation strategies, evaluated how effective the mitigation strategies were at reducing risk, and then determined if the risks are well balanced.

For 16 of the 24 risk factors evaluated, there was consensus (defined as 2/3 of the workshop participant teams being in agreement) that risks were well balanced by existing mitigations.

For 5 risk factors (Small Craft Quality, Volume of Small Craft Traffic, Dimensions, Health and Safety, and Economic), there was consensus that risks were NOT well balanced by existing mitigations.

For the remaining 3 risk factors (Traffic Mix, Congestion, and Configuration), there was no consensus among the participants that the risks were well balanced by existing mitigations. For the seven risk factors not balanced by existing mitigations, the participants engaged in further discussions to identify additional risk intervention strategies, and then evaluated how effective those new strategies could be at reducing risk.

To further reduce risks relating to Small Craft Quality, participant recommendations included implementing mandatory boating safety certificate requirements, working with the USCG Auxiliary and US Power Squadron to include mixed use waterways discussion and sharing of local knowledge in boating safety courses, and securing additional funding for education and outreach programs.

To reduce risks associated with the Volume of Small Craft Traffic, recommendations included increased education and outreach efforts targeted at the small craft traffic community and increasing regulatory oversight of new water access projects like marina construction or local attractions. To reduce risks related to Traffic Mix, it was recommended that a nationwide training and education be developed to enhance awareness of participation in diverse waterways. Better managing anchorages to ensure availability for commercial mariners, and examining ferry routing and scheduling, were mitigation factors recommended to address a growing ferry fleet and waterway Congestion risks.

To further reduce risks for the Dimensions risk factor, additional mitigations included developing new operational guidelines for larger vessels accessing existing channels and installing additional sensors (tide, current, winds, air draft, etc.) to monitor waterways. Install additional hydrographic sensors and update hydrographic modeling and surveys were identified as additional mitigation factors to reduce Configuration risks.

Additional mitigations to reduce Health and Safety risks included having emergency response personnel as members of the New York Harbor Operations Committee, and improve coordination between stakeholders. The most effective strategy to reduce the risk of Economic impacts was for increased dialogue at a regional and national level to discuss mitigation strategies.

The results of the baseline risk level survey, existing risk mitigation strategies, additional risk intervention strategies, and participant comments and observations in the Port of New York, are outlined in this report.

Conclusion

The goal of a PAWSA workshop is not only to further the Marine Transportation System 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 the New York maritime community.

The United States Coast Guard, Marine Transportation Systems Directorate, extends a sincere appreciation to the workshop participants for their contributions to the New York 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 New York, New York.

United States Coast Guard Marine Transportation Systems Directorate



**Providing Navigation Safety Information
for America's Waterways Users**

Table of Contents

	Page
Section 1: New York PAWSA – Assessment Area	7
Section 2: Baseline Risk Levels.....	8
Section 3: Team Expertise Cross-Assessment	9
Section 4: Existing Risk Mitigations	10
Section 5: Additional Risk Intervention Strategies.....	11
Appendix A Workshop Participants - Facilitation Team	
Appendix B Participant Observations - Trends in the Port and Existing Risk Mitigations	
Appendix C Definitions - Risk Mitigation Strategies	
Appendix D Participant Recommendations – Additional Risk Mitigation Strategies	
Appendix E Electronic Charting System (ECS) diagrams	
Appendix F References - Best Practices	

Section 1: New York PAWSA - Assessment Area

The area assessed included the Kill Van Kull, Newark Bay, the approaches to the Verrazano Narrows Bridge, New York Harbor Upper Bay, the Hudson River to the Lincoln Tunnel Ventilators, and the East River to Hell Gate.

Figure 2



Section 2: Baseline Risk Levels

The first step in the New York PAWSA workshop was the completion of survey book 1 to determine a baseline risk level value for each risk factor in the Waterway Risk Model. To establish the baseline risks level, participants discussed each of risk 24 applicable 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 7 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

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
	2.4	7.7	2.6	7.5	8.4
Shallow Draft Vessel Quality	Volume of Small Craft Traffic	Water Movement	Dimensions	Petroleum Discharge	Environmental
	4.6	5.9	6.3	7.4	9.0
Commercial Fishing Vessel Quality	Traffic Mix	Visibility Restrictions	Bottom Type	Hazardous Materials Release	Aquatic Resources
	7.0	7.3	2.9	5.4	7.5
Small Craft Quality	Congestion	Obstructions	Configuration	Mobility	Economic
	8.6	7.2	4.8	8.8	8.8

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. Appendix B is a summary of participant comments and observations on trends in the port and existing risk mitigations.

An Electronic Charting System (ECS) was used to displayed nautical charts of the assessment area and to plot the charted locations associated with participant comments and observations. Appendix E includes ECS chart extracts with the plotted locations associated with the comments/observations.

Section 3: Team Expertise Cross-assessment

The next step in the New York PAWSA workshop was the completion of a team expertise cross-assessment. 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 weigh 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 (amongst 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, 53% of the participant teams were placed in the upper third, 30% in the middle third, and 17% in the lower third of all teams.

Appendix A is a list of the PAWSA workshop participants and the workshop facilitation team.

The below 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	42%	38%	21%
Traffic Conditions	59%	35%	6%
Navigational Conditions	75%	20%	5%
Waterway Conditions	65%	28%	8%
Immediate Consequences	49%	25%	26%
Subsequent Consequences	30%	33%	37%
All Categories Average		53%	30%
			17%

Section 4: Existing Risk Mitigations

The third step in the New York PAWSA workshop was 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 evaluated how effective they thought the mitigations were at reducing risks.

For 16 risk factors (green), there was consensus that risks were well balanced by existing mitigations.

For 3 risk factors (yellow), there was no consensus that risks were well balanced by existing mitigations.

For 5 risk factors (red), there was consensus that risks were not balanced by existing mitigations.

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		
2.4 2.0	7.7 6.2	2.6 2.1	7.5 6.5	8.4 7.1	9.0 8.2		
Balanced	Balanced	Balanced	Balanced	Balanced	NO		
Shallow Draft Vessel Quality	Volume of Small Craft Traffic	Water Movement	Dimensions	Petroleum Discharge	Environmental		
4.6 4.1	5.9 5.9	6.3 5.3	7.4 7.0	9.0 6.9	3.5 3.9		
Balanced	Rising	Balanced	NO	Balanced	Balanced		
Commercial Fishing Vessel Quality	Traffic Mix	Visibility Restrictions	Bottom Type	Hazardous Materials Release	Aquatic Resources		
7.0 6.2	7.3 6.1	2.9 2.7	5.4 5.2	7.5 6.6	3.5 3.5		
Balanced	Maybe	Balanced	Balanced	Balanced	Balanced		
Small Craft Quality	Congestion	Obstructions	Configuration	Mobility	Economic		
8.6 8.1	7.2 6.5	4.8 4.0	8.8 7.4	8.4 7.1	8.8 8.2		
NO	Maybe	Balanced	Maybe	Balanced	NO		

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 5: Additional Risk Intervention Strategies

The workshop participants finally completed survey book 4 for those risk factors that were still not balanced by existing mitigations. Participants suggested additional risk intervention strategies to further reduce risk, and then evaluated how successful a proposed risk intervention strategy could be at lowering risk levels for each of these risk factors.

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

Appendix D describes all risk intervention strategies proposed and evaluated by the participants.

The table below shows the expected reduction in risk when taking the actions specified 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	Balanced	Balanced	Coordination / Planning 7.6
Shallow Draft Vessel Quality	Volume of Small Craft Traffic	Water Movement	Dimensions	Petroleum Discharge	
Balanced	Coordination / Planning	Balanced	Coordination / Planning	Balanced	Balanced
	4.6		6.8		
Commercial Fishing Vessel Quality	Traffic Mix	Visibility Restrictions	Bottom Type	Hazardous Materials Release	Aquatic Resources
Balanced	Voluntary Training	Balanced	Balanced	Balanced	Balanced
	5.7				
Small Craft Quality	Congestion	Obstructions	Configuration	Mobility	Economic
Voluntary Training	Coordination / Planning	Balanced	Nav / Hydro Info	Balanced	Coordination / Planning
7.1	4.9	Caution	7.0	Caution	5.5

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

Caution – No Consensus Alert

When Caution is displayed, an intervention strategy other than the one displayed was judged to provide more risk reduction than the one displayed. This is an indicator that the teams were divided in their opinions about what actions should be taken to further reduce risk for that factor. It indicates there is a possibility of more than "one" best mitigation measure to achieve further risk reduction!

Appendix A**Workshop Participants**

Frank Csulak	NOAA Scientific Support Coordinator
Ed Kelly	Maritime Association- Port of New York
Rich Thorsen	USACE, Chief Physical Support Branch
LCDR Meghan McGovern	NOAA Regional Navigation Manager
Felix Ceballas	New York City Economic Development Corporation
Steven Pisani	New York City Economical Development Corporation
Matt McClave	Sea Tow New Jersey
Ray Fusco	Harbor Education Subcommittee Chairman
LCDR Kevin Saunders	USCG Sector New York - Contingency Planning
BMCS Matthew Draper	USCG Sector New York - Aids to Navigation Team
Genevieve Clifton	NJDOT Office of Maritime Resources
Beth Rooney	Port Authority of New York & New Jersey
Joe Coccia	Port Authority of New York & New Jersey
Dan Foley	Sandy Hook pilots
Robert Flannery	Metro pilots
LCDR Jacob Hobson	USCG Sector New York - Waterways Management
Greg Hitchen	USCG Sector New York - VTS Operations Director
Robert Matticola	New York Waterway Ferry, Director HL Security & Safety
Allen Warren	New York Waterway Ferry, V.P. of Operations
Pat Kinnier	McAllister Towing
David Barra	New York Open Water (Swim Event Organizer)
Rob Bucannan	New York City - Water Trail Association
Willis Elkins	New York City - Water Trail Association

Facilitation team

LCDR Jamie Rickerson – lead facilitator	LT Ben Earling
Mr. Andrew Haley	Mr. Burt Lahn

Appendix B

Participant Observations- Trends in the Port and Existing Risk Mitigations

Deep Draft Vessel Quality

Trends / Observations:

- Deep draft vessels defined as commercial vessels 1600 tons and above. Must use channels to navigate harbor.
- Quality of vessels varies greatly. Depends on flag and ownership. Nationality of crews plays into quality/expertise of the crew. Overall quality is likely in the middle, due to average of best and worst vessels.
- Container ships appear to be getting newer. Similarly, the newer ships are getting more experienced crews.
- Mechanical quality of vessels is generally high. There are few vessels or crews that do not meet international standards. Instances of mechanical issues are very rare. Very few COTP actions are taken. Typically, there is only one “problem vessel”.
- Communications are satisfactory.

Existing Mitigations:

- Companies have adopted ISO 9000 standards.
- Full inspection program / Port State Control.
- Safety Management System standards, mandatory pilotage.
- Vessel Traffic Service.
- Improved technology.
- Tug assist available.
- Good communication between stakeholders.
- Market competition and insurance prices lead to improved vessel and crew quality.

Shallow Draft Vessel Quality

Trends / Observations:

- Defined as; coastal or inland trade vessels, mostly subchapters T and K.
- Very large shallow draft vessel community. Significant number of ferries, dinner cruises, tour boats, tow boats, dredges, DEP/USACE vessels, municipal vessels (NYPD, FDNY, US Park police, State Police), USCG vessels, etc. Ferries are getting newer, while tour vessels are aging. The shallow draft community varies greatly and makes it difficult to assess.
- Subchapter M regulations for towing vessels are leading to increased quality of towing vessels. Smaller uninspected tugs do have some quality issues, but they are very infrequent. Larger container ships are requiring larger/more powerful tugs.
- Construction is common throughout the port and there are a large number of barges or other construction vessels.
- Competitive market leads to generally high quality of shallow draft vessels. Anticipate trend in high quality vessels to continue.

Existing Mitigations:

- Improved training for crews. Includes both required training and company specific policies. Expanding industry training also available.
- Kings Point, SUNY Maritime, Kingsborough, and MITAGS all provided training to mariners in the area.
- Quality safety management programs.
- Licensing for operators.
- Coast Guard enforcement activities.
- High competition improves vessel and crew quality.
- AIS helps identify vessels and situational awareness.
- Improved technology.
- Drills and exercises.
- Inspection of commercial towing vessels required by 46 CFR, Subchapter M.

Commercial Fishing Vessel Quality

Trends / Observations:

- Very little commercial fishing in the designated area. Belford area does have a small family owned aging commercial fishing fleet. They do not generally fish in the designated area but there is some crabbing in the upper harbor. Charter boats do fish just outside of the designated area. Private groups are attempting to install oyster beds. There have been incidents of fishing boats violating security zones. Quality is declining due to lack of revenue. Quality is also somewhat linked to seasonal changes.
- Slight increase in 6-pack commercial fishing vessels in Newark Bay, Pier Head, and anchorage areas.

Existing Mitigations:

- High local knowledge of the area.
- Mandatory commercial fishing vessel exams, crew requirements, licensing requirements.

Small Craft Quality

Trends / Observations:

- Material quality of small craft is generally high, but the operation of the small craft is a safety concern. There is a very large disparity between some of the small craft operators. There are established boat houses that operate without incident, but there are also sailing schools that are less skilled in navigation. There is significant variation in quality among small crafts.
- Jet ski excursion trips are expanding up the East River. One experienced jet ski operator leads a large group of unexperienced people. The jet skis have created a safety concern for commercial vessels operating in the area.
- New Jersey requires a boater safety certification for power driven craft, although it does not specifically cover harbor operations or mixed use waterways. The national curriculum for boater safety, which guides state courses, is not adequate. NY does not have boater safety certifications, but there have been efforts to implement a program similar to NJ through education and outreach.
- There is a lack of understanding/situational awareness within the small craft community of their responsibilities operating in a mixed use waterway. In some cases, the small craft user is struggling with the natural conditions (wind/current) and may appear to lack situational awareness.
- Many small craft groups or organizations do provide users with safety courses or instruction.
- There is a population of waterway users that are from outside the area and may not have local knowledge. Pleasure crafts (including kayaks and trailerable boats) visiting the area are not familiar with the traffic or security/safety zones in the area. The participants anticipate an increase in small craft users that lack local knowledge.
- Consensus is that small craft quality is increasing.

Existing Mitigations:

- Equipment used in local area is newer.
- Operation Clear Channel.
- Captain and Paddlers event planned through Harbor Safety Community. Created an opportunity for commercial mariners to open a dialogue with the paddling community.
- Large community of experienced personnel to assist with oversight of recreational mariners.
- Marine permitting program provides awareness for mariners.
- Boathouse standards often go beyond requirements. Often-times includes emphasis on communication and radio operation.
- Harbor Education Subcommittee provides forum for improved communication.
- Free vessel safety checks and safety classes by CG Auxiliary. Mandatory training requirements in NJ exist for small craft operators (just power boats). NJ has also released a video to educate mariners about risks in the port. NY and the US Power Squadron also provide free training to mariners.
- The Coast Guard Auxiliary provides training/informational fliers/documents for human powered vessel operators. Primary means of outreach is boat shows, boat docks, festivals, etc. or other public outreach avenues.
- Mariner community, sailing clubs, and boating clubs are very tight knit. They provide a network for effective communication of risks and local knowledge.

Volume of Commercial Traffic

Trends / Observations:

- 2015 – 2251 vessels calls, down 7.4% from 2014. Approximately 4800 deep draft arrivals in entire harbor yearly. Equates to roughly 9600 total deep draft transits. There is approximately 1000 fewer transits from last PAWSA in 2008. VTS reports there are 550,000 vessel transits a year between deep draft and passenger vessels.
- Majority of vessel concentration is around the Battery, transiting up Hudson and East River. Mostly cruise ships, passenger ferries, and tug/tows. There are some break bulk transits heading up the river to Albany.
- The Lower Bay and Kills have fewer passenger vessels, but more commercial traffic. Large quantity of container ships, tankers, Ro-Ro's, fast ferries transit the area. Anticipate increase in ferry traffic with the start of city-wide ferry service.
- There have been terminal scheduling issues that lead to vessels waiting for berths. With growing ship sizes, the frequency of ships waiting will likely increase. There will need to be a change in planning and processes when the significantly larger vessels begin entering the port (Summer 2017).
- There is a concern that increase in passenger ferries will decrease commercial traffic safety.

Existing Mitigations:

- VTS coordinates traffic throughout port.
- Pilots guide larger commercial vessels.
- Technology, specifically AIS, improve situational awareness for mariners.
- Ferry Routes are established (Staten Island Ferries).
- Harbor OPS committee / Deep Draft Subcommittee provide rules for problem areas in port. Other subcommittees include tug and barge and passenger vessels. Committees meet multiple times per year and have open communications. Overall committees provide strong leadership for port.

Volume of Small Craft Traffic

Trends / Observations:

- Small craft was defined to include non-Commercial, human powered craft.
- There are large seasonal fluctuations with small craft traffic. Recreational traffic peaks over the summer, but there is small craft traffic all year. Traffic is concentrated during daylight hours. Traffic is spread over entire designated area.
- Marine Event Permit requests are increasing, specifically for on-water events. The increase in events leads to an increase in small craft traffic.
- Improving water quality has led to increase in waterway users. Local government has also made the waterways more accessible to users. There are also multiple new marinas in various stages of construction.

Existing Mitigations:

- Marine event permitting, post internally/externally through LNM, email, relevant parties, harbor ops subcommittees, targeted outreach, etc.
- VTS shares information with commercial traffic on marine events, broadcasts for larger events.
- Tight knit boating community creates very effective communication and creates an open line of communication among small craft operators.

Traffic Mix

Trends / Observations:

- New York is a multiple use waterway. Major areas of conflict include the Battery and Hell's Gate. Both areas are a convergence of commercial and recreational traffic.
- The Arthur Kill is mainly an industrial area and there is not a large volume of recreational traffic. However, there are frequent violations of security zones by fisherman and other boaters. The Statue of Liberty is a very popular area for recreational boaters, but also in the vicinity of the convergence of traffic transiting the rivers. The area around the Battery is also the best area for marine regattas or events.
- Newtown Creek is an area of dense commercial traffic. There is also growing populations in the area and anticipate increased conflict.
- The waters around Coney Island are popular fishing grounds and sailing and swimming areas in the summer.
- Despite large mix, there have been few incidents. Close calls are very common, but marine accidents are uncommon.

Existing Mitigations:

- Captain and Paddler Event improve communication.
- Harbor Subcommittees coordinate between user groups.
- Harbor OPS provides guidelines to commercial traffic, specifically newer large ships.
- Education and outreach efforts de-conflict navigational impacts between commercial and recreational traffic.
- Swimmer events employ jet skis to reduce risk to participants.

Congestion**Trends / Observations:**

- Congestion varies on the day of the week. Recreational traffic increases over the weekends, while commercial traffic is concentrated in the Kills during the week. Passenger traffic is frequent throughout the week. The Battery and proceeding up the East River is the area of greatest congestion. Commercial traffic, passenger ferries, and sailing regattas transit the area.
- Anticipated changes in vessel traffic patterns may lead to increases in congestion. With larger vessels there will be no passing in the Kills, which will lead to greater congestion and a need for timed transits.
- Hell's Gate and Bergen Point are areas of congestion during slack water.

Existing Mitigations:

- VTS guides traffic in the port.
- Operation Clear Channel.
- Harbor Education Subcommittee created shared harbor map to identify where all the boathouses are located.
- Channels are adequately marked with ATON.
- Safety and Security zones.
- Time limits in the anchorages.
- Broadcast Notice to Mariners (BNM), Local Notice to Mariners (LNM), and the Alert Warning System provide information to mariners.
- Mariners utilize cell phone apps to assist with navigation and access navigational information. This may also increase risk while operating a vessel.
- NOAA charts are readily available in hard copy or electronic.

Winds**Trends / Observations:**

- Seasonal periods of high winds (20kts+).
- During the spring and fall winds blow down the Hudson River.
- Winds are generally predictable. Winds blow cross channel in the upper bay. Specifically, at the passenger, container, and auto terminal in Bayonne NJ.

Existing Mitigations:

- Meteorological data is readily available to plan/prepare for changes in water movement, including a National Ocean Service Physical Oceanographic Real-Time System (PORTS).
- Procedures for port closures due to high winds.

Water Movement**Trends / Observations:**

- Standard currents are well known and predictable.
- Hell's Gate is the area of highest current, often 4-6kts. The East River also experiences high currents.
- The Battery has a circular current, which can pose a hazard.
- The Upper Bay and Bergen Point have moderate seasonal currents which can impact maneuverability of commercial traffic.
- Currents impact anchoring in the vicinity of the Verrazano Narrows. Wind and currents impact anchoring and holding in the Bay Ridge anchorage. Ships will commonly drag anchor in the winter when winds are from the north and exceed 15kts.
- Water in East and Hudson rivers develop significant chop from ferry traffic. Water is constrained by bulkheads and is rough.

Existing Mitigations:

- Meteorological data is readily available to plan/prepare for changes in water movement, including a National Ocean Service Physical Oceanographic Real-Time System (PORTS).
- Very high local knowledge due to relative predictability.
- VTS provides guidelines and communication for navigating high current areas (Kills and Hell's Gate).

Visibility Restriction

Trends / Observations:

- Visibility restrictions are uncommon. There is some seasonable variation in restricted visibility.
- VTS does establish temporary reporting points less than 24 times per year. The restrictions are generally less than 6 hours and spike in spring and winter.
- The entire waterway experiences restricted visibility, but Bergen Point is the area where it would have deep draft traffic impacts.

Existing Mitigations:

- Established procedures for periods of reduced visibility. Including planning anchorage bail-out spots.
- Good communication between vessels in restricted visibility.
- Improving forecasts for fog/extreme weather.

Obstructions

Trends / Observations:

- There is some floating debris, but U.S. Army Corps of Engineers (USACE) vessels move through the harbor daily collecting debris which is mostly manmade. Bay Ridge and Bergen point are areas of concentration for debris. There is a concentration of derelict vessels in Staten Island, but they are out of the channel.
- Four major bridges (Bayonne, Goethals, Tappan Zee, and Kosciusko) are under construction. Construction equipment does frequently impact traffic.
- General marine construction impedes some waterways.
- Maintenance dredging is common.
- The harbor does not completely ice over, but there are some ice flows coming down the Hudson. Ice breaking capacity is reduced due to vessel maintenance. Ice will impact passenger traffic during the winter months. Ice impacts vary greatly year to year. Limited commercial ice breaking services are available.

Existing Mitigations:

- USACE provides coverage from Holland Tunnel vents, to Brooklyn Bridge, to Gravesend Bay, and Bergen point for daily debris removal. They utilized 7 total boats that operate weekdays, with one on weekends.
- Broadcast Notice to Mariners reduces risk by alerting mariners of obstructions.
- Good communication between USACE and VTS.
- VTS provides reports on location of dredging or construction projects. Good coordination with Harbor Safety Committee.
- USCG has harbor ice breakers stationed in the area.

Visibility Impediments

Trends / Observations:

- Background lighting is a huge concern throughout the region. The St. George area is a particular concern due to baseball stadium and new ferris wheel.
- Ferry terminals stick into waterway and are difficult to see around.
- Lights around sports complexes (Piers 4-6, Pier 40, the Battery, Chelsea Pier) all impact mariners.
- Hell's Gate is a blind turn.

Existing Mitigations:

- Harbor OPS has intervened to reduce background lighting.
- Open communication between stakeholders throughout port.
- Navigational technology improvements reduce risks to mariners.

Dimensions

Trends / Observations:

- The Kill Van Kull – vessels are getting larger and the channel is constrained. Areas around the entrance and Newark harbor are known problem areas for narrow channels.
- The Arthur Kill- Pilots avoid passing in the entire Arthur Kill. There may be a shift to one-way traffic as ships grow. The 90 degree turn at the entrance to the Arthur Kills will accommodate larger vessels, but future classes of ships will be limited by air draft.
- Tugs and barges avoid meeting in Hell's Gate.
- Growing concern over surge effect caused by larger ships passing moored vessels.

Existing Mitigations:

- VTS provides information on changes to channel dimensions.
- Air draft sensors on bridges provide information to mariners.
- ATON adequately marks channel. CG is upgrading lighting equipment to LEDs and increasing the use of E-ATON.

Bottom Type

Trends / Observations:

- Majority of focus area is fine grain mud and soft bottom.
- Hard granite bottom at Bergen Point and in portions of the Arthur Kill.
- East River and Hudson River are mostly soft bottom.
- Shoaling is a concern around the Brooklyn and Manhattan Cruise Terminal. The entire harbor requires maintenance dredging throughout the year.

Existing Mitigations:

- Under keel clearance guidelines.
- USACE conducts continual maintenance dredging.
- NYPD/USCG/DoD are working together to conduct sonar study throughout the port.
- Navigational charts for the port provide good coverage. Annual Surveys are conducted to ensure charted depths are accurate.

Configuration

Trends / Observations:

- Sharp bends in Kill Van Kull, the Battery, Bergen Point, Ward Point, and Hell's Gate. These are also areas of major convergence. Newtown Creek is also an area of convergence.
- Crossing traffic very common throughout entire harbor. Ferry traffic and recreational traffic transits across nearly all channels.

Existing Mitigations:

- VTS oversees traffic in the port.
- Established no meeting/passing zones.
- Effort to build newer and more capable tugs.
- Good communications between port and waterways user. Very active Harbor OPS committee.
- Experienced pilots operating in port.
- Adequate NOAA charts available.

Personnel Injuries

Trends / Observations:

- Risk for personal injury is very high due to abundance of ferries and cruise ships. For example, the Staten Island ferry carries 4,000-6,000 people per transit and transits frequently, up to departures every 20 minutes. Cruise ships are roughly the same size and transit 2-3 times per week. Dinner and tour cruises are generally under 500 persons. There are plans to expand ferry and cruise services and build new larger ferries/cruise ships. There are approximately 1.5 million cruise passengers per year.

Existing Mitigations:

- Abundance of experienced response assets available. NYPD, FDNY, CG, State Police, etc.
- Regular exercises conducted to practice for large scale incidents.
- Most agencies have plans in place to respond to incidents.
- Established communication between all partners.
- Adequate medical facilities.

Petroleum Discharge**Trends / Observations:**

- NY is largest petroleum consumption port in the United States. Approximately 83% of home heating oil for New England transits through NY. Largest vessels can carry upwards of 1 million barrels.
- There is adequate oil spill response organization/availability.
- Group notes downturn in amount of petroleum entering the port, likely due to falling oil prices. If the price of oil increases, there could be an increase in transits. Oils are transported from Canada to Albany, which is sometimes moved down the Hudson.

Existing Mitigations:

- Close proximity to CG strike team.
- Gear is prepositioned throughout port.
- Global response companies based out of NJ.
- Coordinated incidence response teams and the Area Contingency Plan help to balance the risk.
- Local responders are very experienced.

Hazardous Materials Release**Trends / Observations:**

- There are very few chemical tank ships. Common hazardous materials include MTBE and gasoline additives. Container ships also carry some hazmat. Leaking containers are common, some cases require pollution response.
- Tank barges are common, generally more than once per week.
- No anticipated change amount of hazmat entering port.

Existing Mitigations:

- Close proximity to CG strike team.
- Gear is prepositioned throughout port.
- Global response companies based out of NJ.
- Coordinated incidence response teams and the Area Contingency Plan help to balance the risk.
- Local responders are very experienced.

Mobility**Trends / Observations:**

- The largest concern to mobility impact is Bergen Point. If either pollution or a vessel were to restrict mobility in that region, commerce would grind to a halt. If there were a major incident in the Kills, there would be regional or national impacts. Hurricane Sandy and 9/11 are good examples of major incidents that crippled mobility in the port.
- The passenger transit system has many redundancies.
- Concerns about pollution release up river and then flowing down into the Battery.

Existing Mitigations:

- Good communication between all port partners and stakeholders.
- VTS monitors entire port.
- Heavy lift, dive teams, and salvage assets available.
- Large USACE presence in port.

Health and Safety

Trends / Observations:

- Incredibly dense population centers around the entire area. There are approximately 8,000,000 people living in the NYC area. Population centers are in very close proximity to the waterways. Drinking water comes from upstate. Major power plants and manufacturing centers have intakes on waterways.

Existing Mitigations:

- Coordinated incident response team, robust medical and response infrastructure, and response planning and exercises reduce the risk to health and safety.
- Established communication channels for major incidents.
- Office of Emergency Management received a federal grant and is conducting a study to determine what assets are available and define best practices to respond in major incidents.
- Established models (air and oil spills) are readily available.

Environmental

Trends / Observations:

- There are numerous sensitive environmental areas throughout the area. Arthur Kill, Jamaica Bay, Hoffman, Swinberg, and Shooter's Island are examples of bird habitats. There are not large swaths of environmentally sensitive areas, but there are many smaller pockets of environmentally sensitive areas. The areas that are sensitive are especially valuable because they are small and isolated.
- Endangered species include sturgeon, piping plovers, and right whales. Some of these do have associated critical habitat. There are also restrictions on dredging. Whale strikes have occurred in the region.
- There are some water quality and pollution issues.

Existing Mitigations:

- Area Contingency Plans ID sensitive areas.
- Robust environmental response resources, both commercial and government.
- DEP balances environmental concerns with economic impacts.
- IMO part 6 reduced air emissions.
- Speed restrictions for Right Whales.
- Ballast water management programs are expanding.
- Port stakeholders make concerted effort to reduce environmental impacts. NJ Port Authority has conducted studies on vessel/storm water runoff and pollution. Port Authority is conducting replacement programs for older more harmful equipment.

Aquatic Resources

Trends / Observations:

- Light harvesting of aquatic resources. There is some commercial and subsistence fishing in the area, but very limited. Majority is recreational fishing.
- There are some spawning cycles for striped bass in the area.
- Some ecological resilience projects (oyster beds) planned on south side of Staten Island.

Existing Mitigations:

- Speed restrictions for right whales.
- Species tracking on some aquatic resources.
- Restrictions on dredging and other environmental regulations (ESA, CWA, etc.).
- Vast federal and state coordination for environmental permitting or approval.
- Environmentally sensitive areas maps are available for the region.
- Risk to aquatic resources is reduced due to the community awareness, education, and academic research.

Economic

Trends / Observations:

- \$312 billion in cargo yearly.
- 336,000 total jobs directly and indirectly associated to maritime shipping.
- 190,000 jobs directly support the port.
- \$60 billion in federal, state, and local taxes generated by the port.
- Port accounts for approximately \$1 billion per day.
- National impacts if any incidents occur in the port.

Existing Mitigations:

- New shore-side construction focuses on building resiliency.
- MTSRU and other response resources are very experienced in responding to events.
- Salvage resources are readily available.

Appendix C

Definitions – Additional 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.).
Navigation / 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 risk mitigation strategies.

Appendix D

Additional Risk Intervention Strategies

Small Craft Quality

- New York should implement mandatory boating safety certificate requirements similar to New Jersey.
- Work with the US Coast Guard Auxiliary and US Power Squadron to include mixed use waterways discussion and sharing of local knowledge in boating safety courses.
- Secure additional funding for education and outreach programs.
- Link educational requirements to new state or local projects increasing water access to general public.
- Improve and place standard signage at boat ramps discussing common traffic in waterways.
- Increase state or local oversight of boat or sailing clubs.
- Formalize current education and outreach efforts. For example, setting schedules for captain and paddler events or assigning commercial vessel captains to individual boathouses.
- Leverage technology to give recreational waterway users more situational awareness tools. Ideas included an app that provides waterway information and safety concerns.

Volume of Small Craft Traffic

- Increase education and outreach targeted at small craft traffic.
- Increase regulatory oversight of new water access projects like marina construction or local attractions.
- Focus on forecasting waterway impacts and educating future users of new facility.
- Emphasize cumulative effects for waterway projects.
- Examine projects on a regional scale instead of local. Potential means to do that is through existing Coastal and Marine Spatial Planning bodies or permitting agencies.

Traffic Mix

- Continue nationwide training and education through US Power Squadron and US Coast Guard Auxiliary to enhance awareness of participation in diverse waterways.
- Develop boating safety applications, improved signage, etc
- Continue use of vessel separation schemes during major marine events.
- Market campaigns for the use of human powered craft in areas where there is lower commercial traffic to separate recreational boating activities away from high traffic areas.
- Standardize markings for escort vessels used during swimming events.

Congestion

- Better manage anchorages to ensure availability for commercial mariners.
- Create new anchorages or dredge existing anchorages deeper to accommodate growing vessel sizes/drafts.
- Examine ferry routing and scheduling to address growing ferry fleet.
- Increase outreach to various waterway users (paddlers, sailing clubs, rowing clubs, etc.) through tours of the waterway that identify areas of concern.
- Film and make available interactions between commercial vessel and small craft (recreational boat, kayak and paddleboard) operators to increase the understanding of risks encountered when operating within the confines of a busy mixed-use waterway.

Dimensions

- Improve recruitment efforts for port and waterway professionals for key positions on the harbor OPS committee.
- Develop new operational guidelines for larger vessels accessing existing channels.
- Install additional sensors (tide, current, winds, air draft, etc.) to monitor waterways.
- Hire a new harbormaster for Port Newark and Port Elizabeth to help manage the movement of ships.

Configuration

- Install additional hydrographic sensors and update hydrographic modeling and surveys.

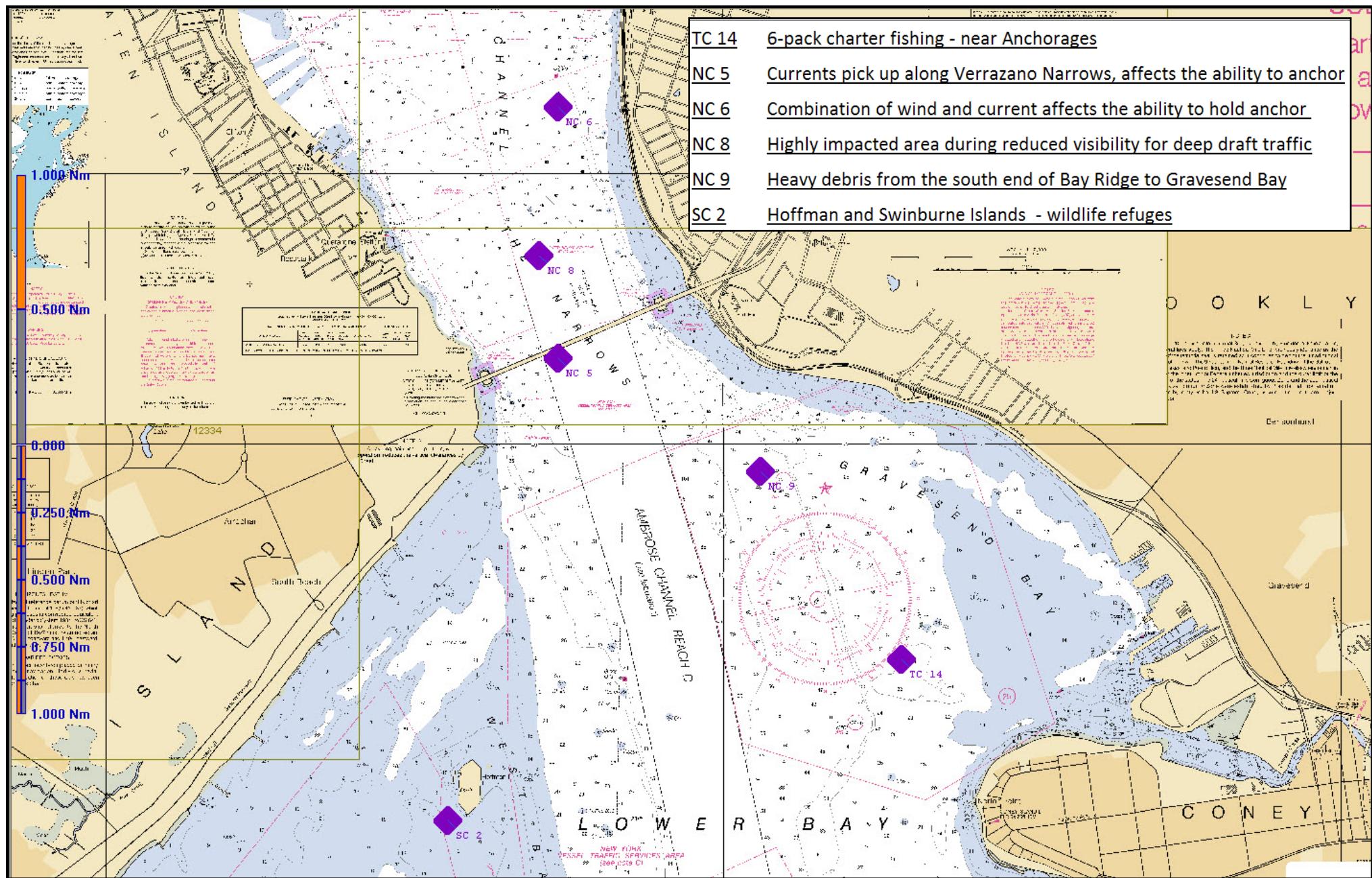
Health and Safety

- Incorporate emergency response personnel in to the Harbor OPS committee.
- Host joint meetings or conference calls with Area Maritime Security Committee, Area Committees, and Harbor OPS to improve coordination between stakeholders.
- Update ferry evacuation plans and infrastructure.

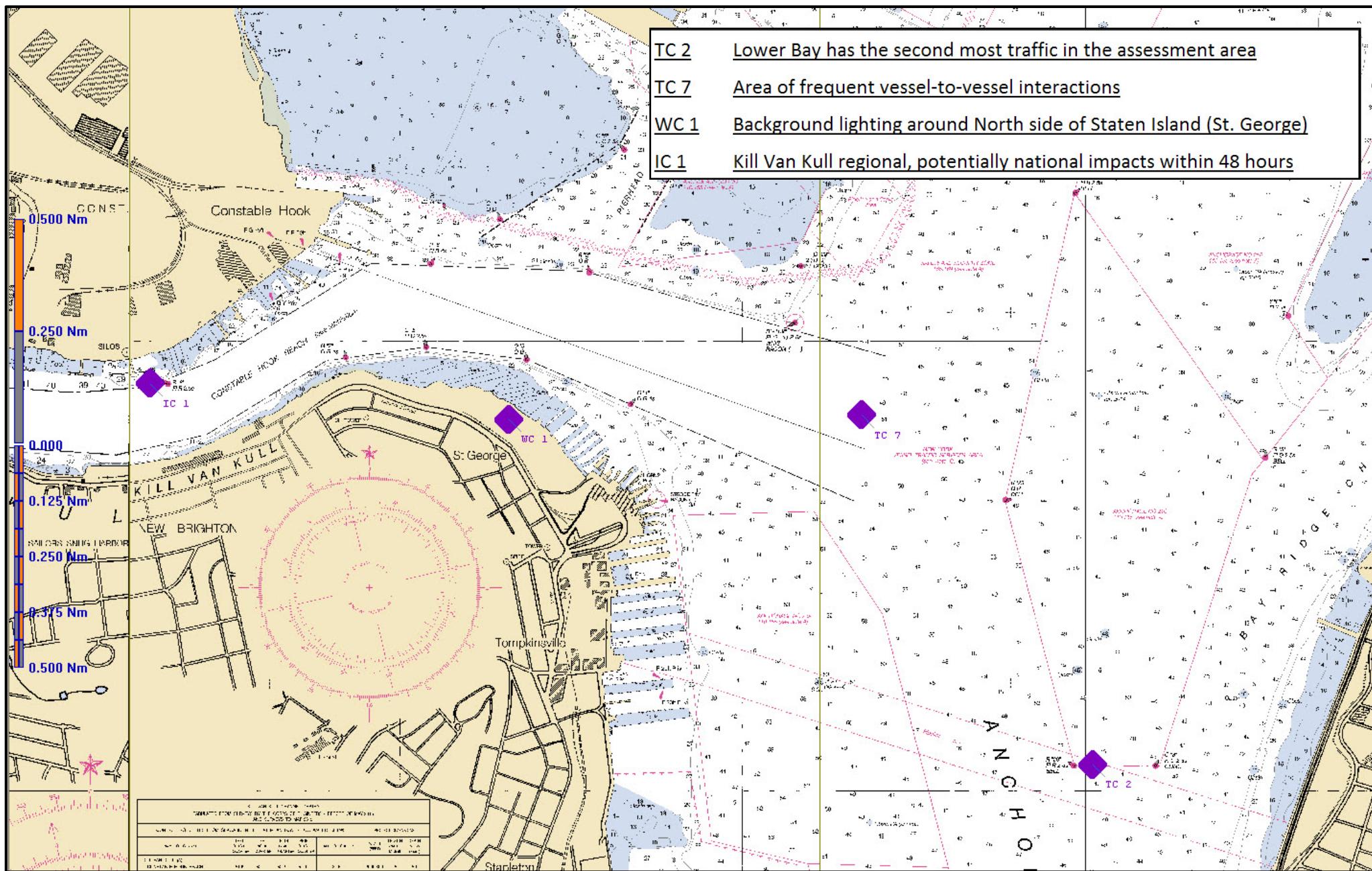
Economic

- Increase dialogue at a regional or national level to discuss mitigation of economic impacts caused by major incidents.

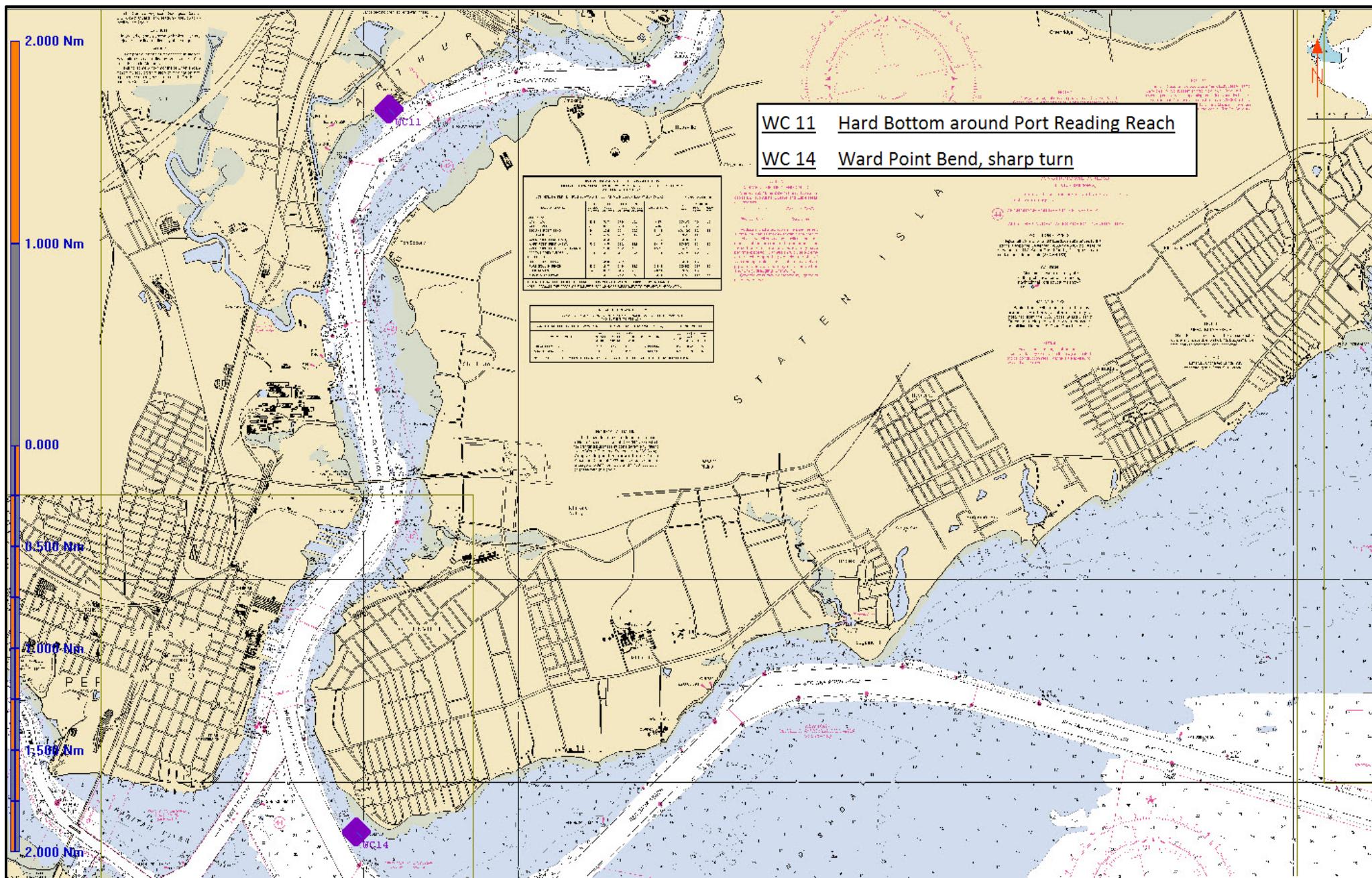
Appendix E - Figure 1 – Verrazano Narrows



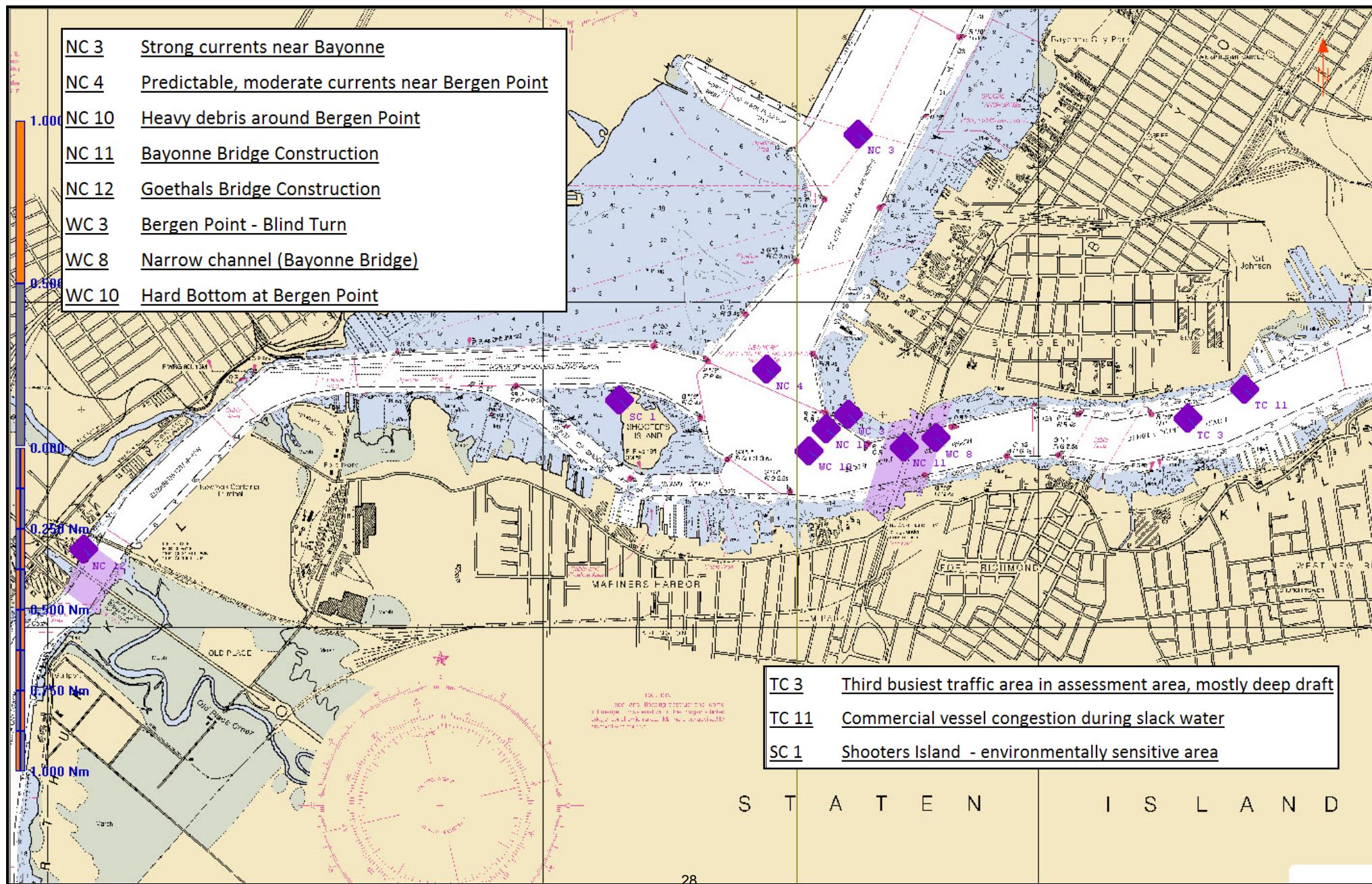
Appendix E - Figure 2 – Constable Hook



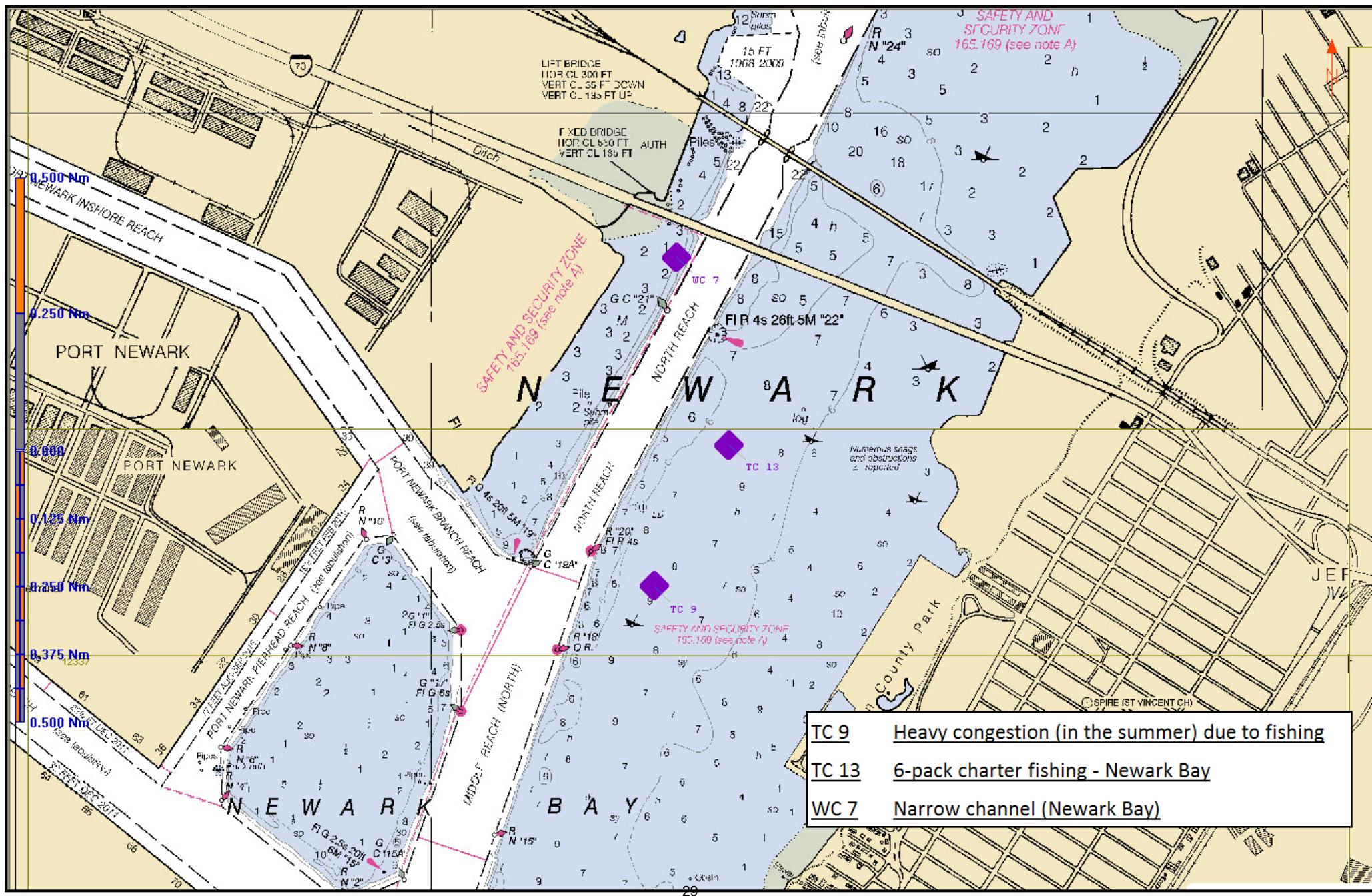
Appendix E - Figure 3 – Lower Kill Van Kull



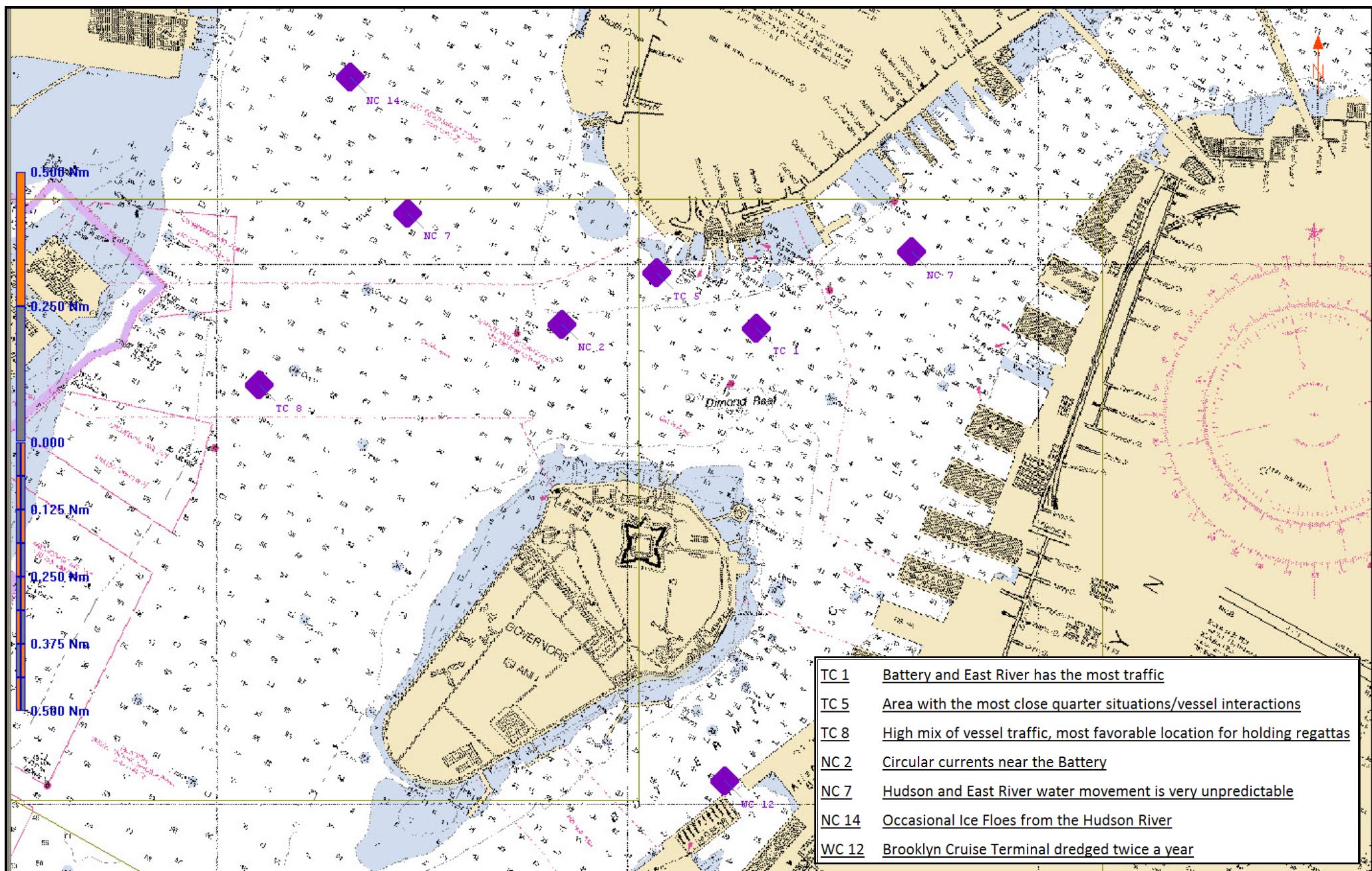
Appendix E - Figure 4 – Upper Kill Van Kull



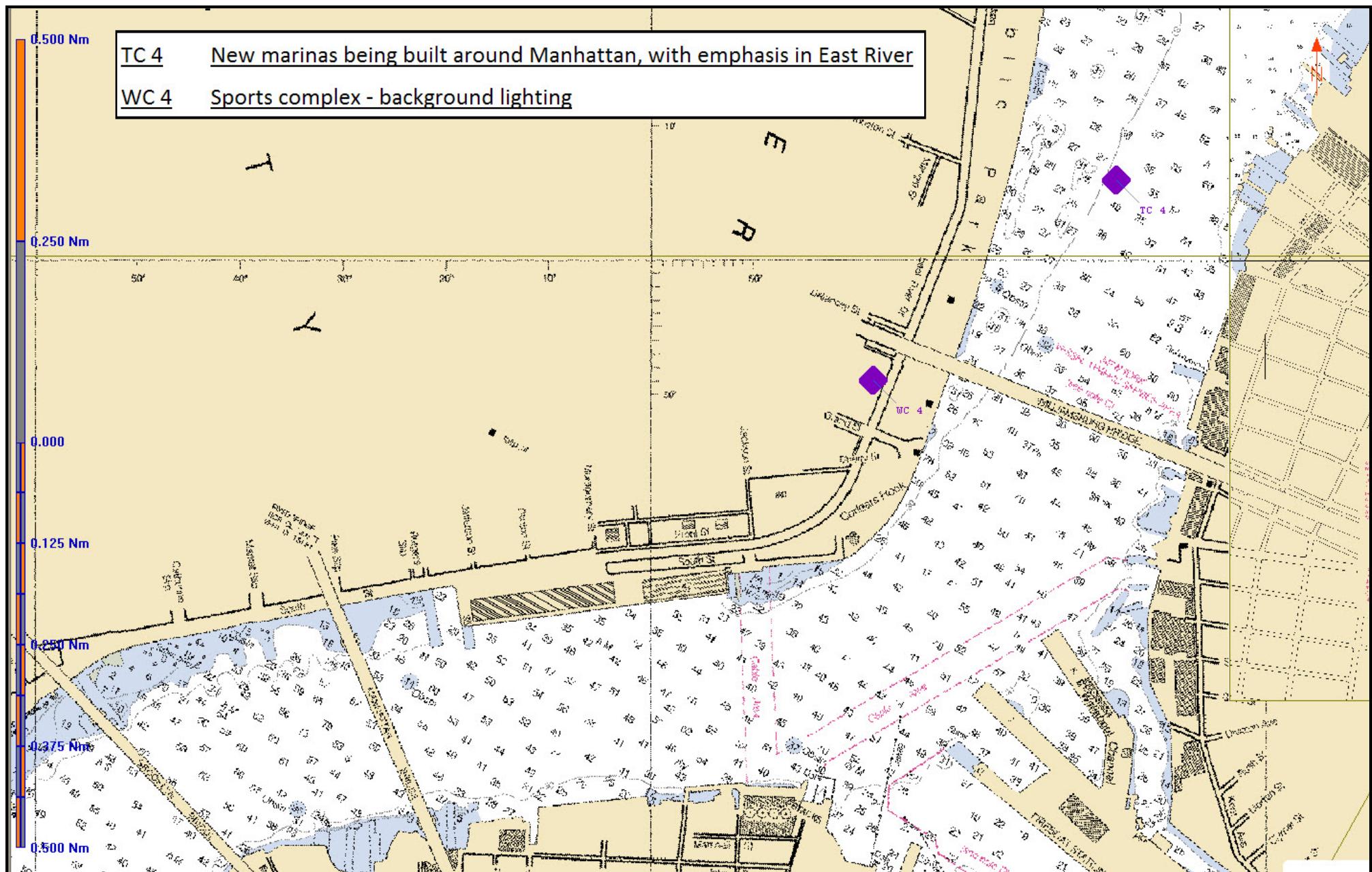
Appendix E - Figure 5 – Newark Bay



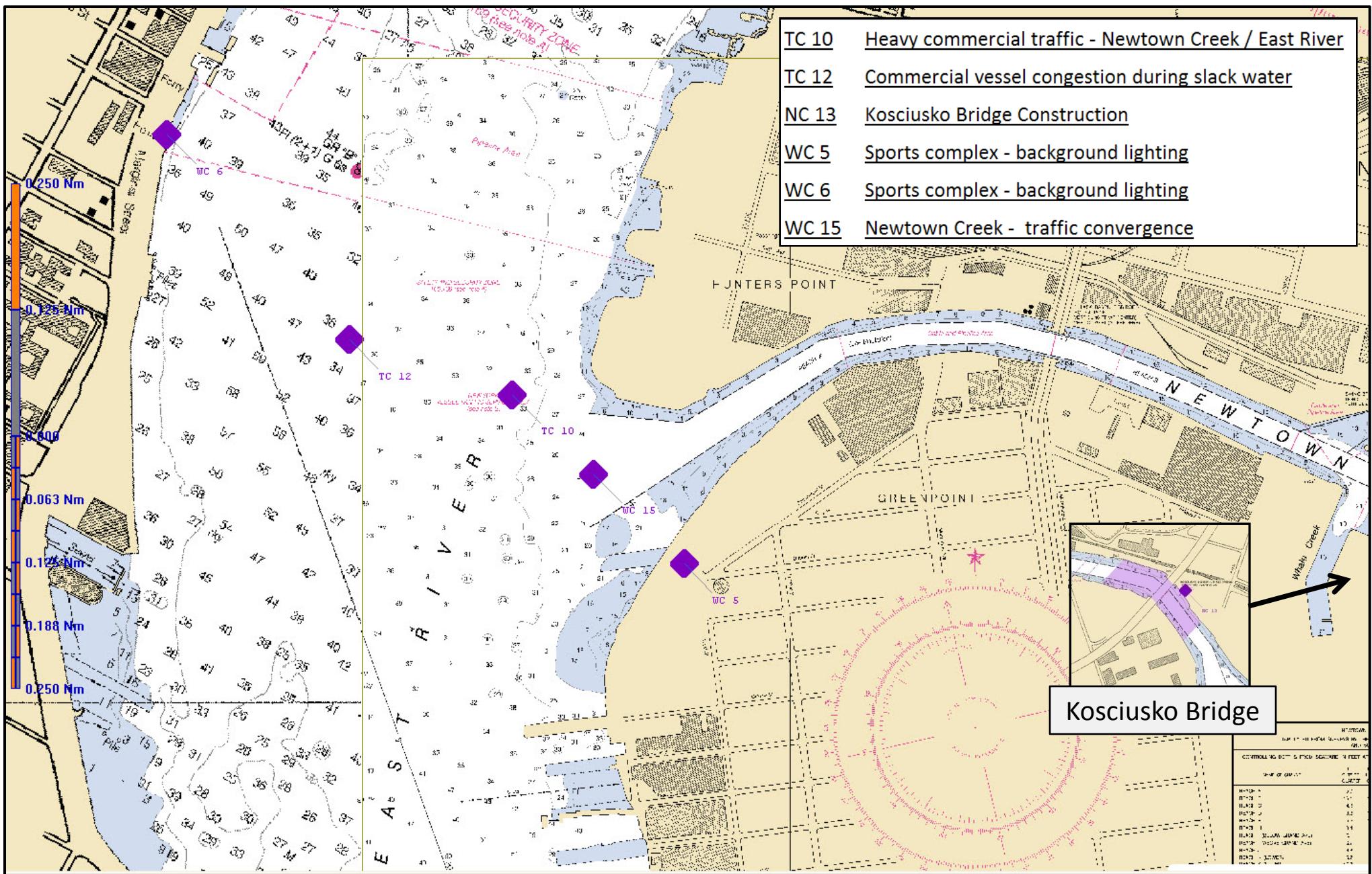
Appendix E - Figure 6 – The Battery



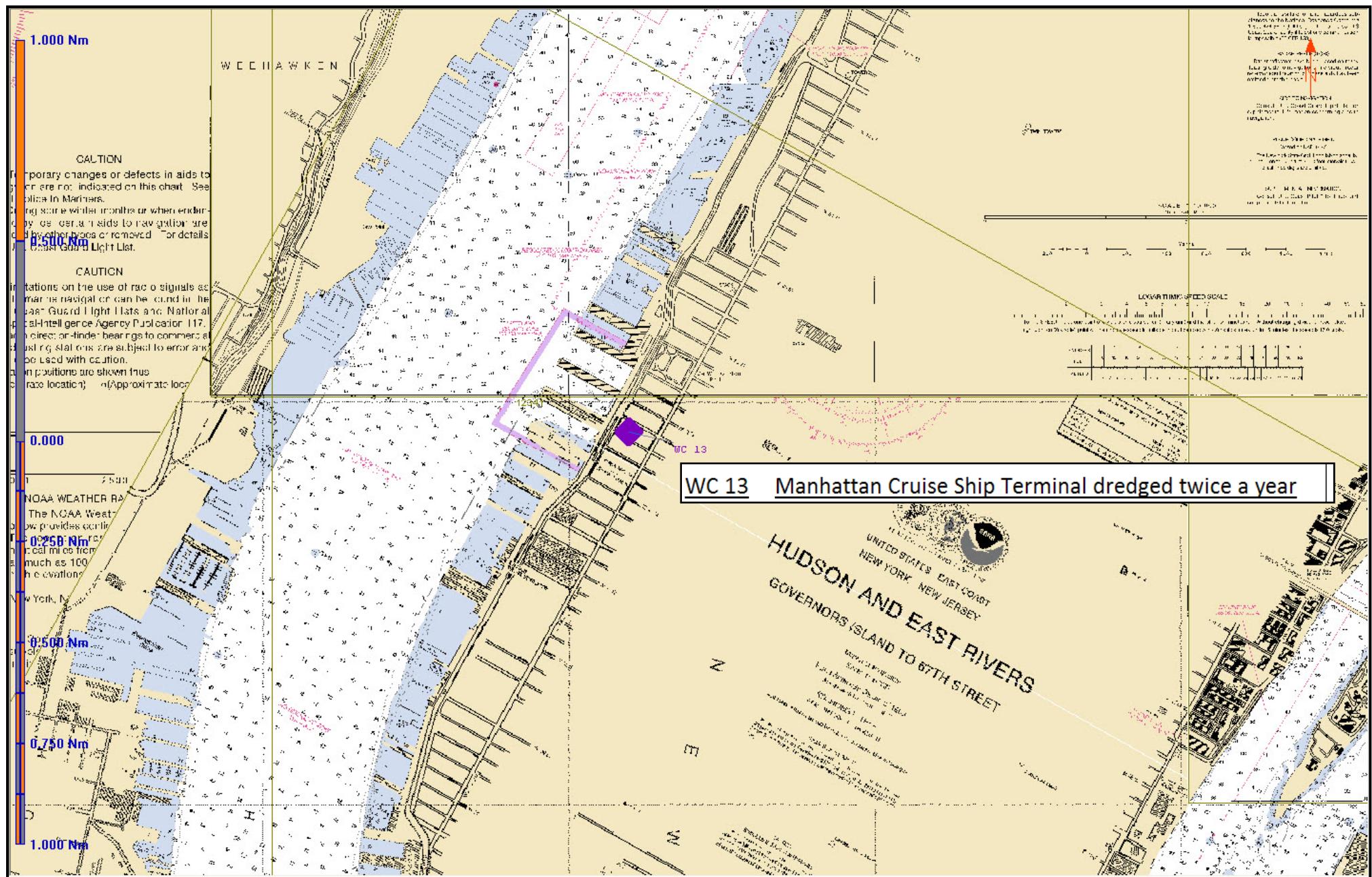
Appendix E - Figure 7 – East River – Corlears Hook



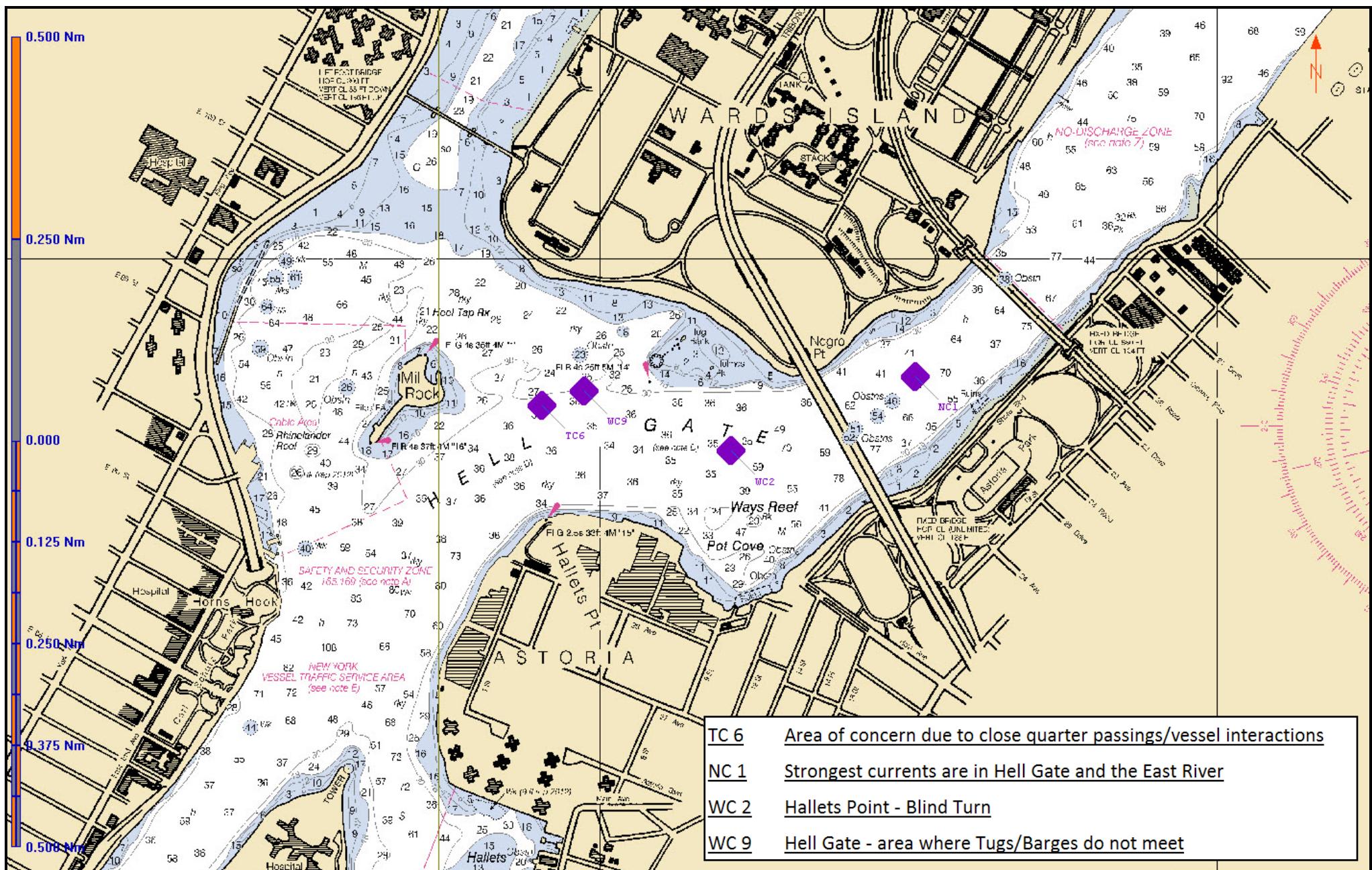
Appendix E - Figure 8 – East River – Newtown Creek



Appendix E - Figure 9 – Hudson River



Appendix E - Figure 10 – East River - Hell Gate



Appendix F

References / Best Practices

Vessel Operations	Navigation Safety	Statistics
New York State Office of Parks Recreation www.nysparks.com/recreation/boating	U.S. Navigation Rules http://www.navcen.uscg.gov/?pageName=navRuleChanges	Recreational Boating Safety - Accident Statistics http://www.uscdboating.org/statistics/accident_statistics.php
American Canoe Association http://www.americancanoe.org/	USCG Auxiliary -Requirements -Recreational Boats http://www.cgaux.org/boatinged/classes/2011/bss.php	U.S. Army Corps of Engineers - Vessel Transit Statics http://www.navigationdatacenter.us/
US Coast Guard - Vessel Inspection Regulations http://www.ecfr.gov/cgi-bin/ECFR?page=browse	State-Specific Boating Safety Requirements http://www.americasboatingcourse.com/lawsbystate.cfm	The American Waterways Operators http://www.americanwaterways.com/
U.S. Army Corps of Engineers General Regulatory Policies - Permitting http://www.usace.army.mil/Missions/Civil-Works/Regulatory-Program-and-Permits/Federal-Regulation/	National Oceanic and Atmospheric Administration □ Safe Boating Weather Tips http://www.nws.noaa.gov/om/brochures/safeboat.htm	New York State Department of Environmental Conservation http://www.dec.ny.gov/outdoor/349.html
	Life Lines Brochure - Safety Tips That Could Save Your Life http://www.americanwaterways.com/commitment_safety/lifelines.pdf	