

Ports and Waterways Safety Assessment

Workshop Report

Chicago, Illinois

27 - 28 March, 2012



United States Coast Guard Marine Transportation Systems Directorate



Providing Navigation Safety Information
for America's Waterways Users

Executive Summary

The United States Coast Guard (USCG), Marine Transportation System Management Directorate, is responsible for developing and implementing policies and procedures that facilitate commerce, improve safety and efficiency, and inspire dialogue with port and waterways users 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) Waterway 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 selected.

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 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 in promoting waterway and vessel traffic management activities within their geographic areas of responsibility.

Over 49 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 / PAWSA 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.

PAWSA 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

- ***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 existing 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 complete survey book 4 to identify additional risk intervention strategies, and then evaluate how effective those new strategies could be at reducing risks.

Chicago PAWSA Workshop

A PAWSA workshop for the Port of Chicago was held in Chicago, Illinois on 27 – 28 March, 2012. The workshop was attended by 29 participants, representing waterway users, regulatory authorities and stakeholders with an interest in the safe and efficient use of Chicago Harbor from both a commercial and recreational perspective. Participants discussed and evaluated 22 of the 24 risk factors that make up the Waterways Risk Model. The Deep Draft Vessel Quality and Commercial Fishing Vessel Quality risk factors were not discussed during the workshop, as these classes of vessel did not operate within the defined geographic area that was assessed during the workshop. Participants discussed the various types of vessels operating on the Chicago River system, challenges vessel operators faced when navigating within the narrow confines of the Chicago River, and the risks associated with navigation through the numerous highway and railroad bridges (73 were located within the Chicago PAWSA assessment area).

For each of the 22 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 were well balanced. For 19 of the 22 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 3 risk factors (Small Craft Quality, Volume of Small Craft Traffic, and Traffic Mix), there was consensus that risks were NOT well balanced by existing mitigations.

For these three risk factors, the participants engaged in further discussions to identify additional risk intervention strategies, and then evaluated how effective those new strategies could be at reducing risks. To further reduce risks relating to Small Craft Quality, 12 of 15 participant teams recommended mandatory education for pleasure craft operators. To reduce risks associated with the Volume of Small Craft Traffic using the Chicago waterway, 12 of 15 participant teams agreed that a formalized harbor/port safety committee should be established. To further reduce risks for the Traffic Mix risk factor, 13 of 15 participant teams agreed that vessel transit statistics should be obtained and analyzed to help determine usage rates and the frequency of near-miss incidents.

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

Chicago PAWSA - Special Assessment

An additional, important objective of the Chicago PAWSA workshop was for the participants to review proposed changes to the waterside and shore side infrastructure along the Chicago River, discuss the risks to navigation safety these proposals could introduce (increased traffic, background lighting, waterway configuration restrictions due to new docks, etc.), and evaluate if existing risk mitigations would be sufficient to reduce the anticipated risks to an acceptable level. Projects discussed included an ongoing, active initiative by the City of Chicago to increase recreational vessel/human powered craft (paddle/rower/kayak) access to the Chicago River by either expanding operations at existing boat launches, or establishing new launches. Other projects discussed included a proposal to expand the Chicago River waterfront walk in the vicinity of the junction of the North and South Branches of the Chicago River, establishing additional water-taxi embarkation points, and increasing mooring spaces along the main branch of the Chicago River for commercial passenger vessels.

Participants then conducted a separate, baseline risk survey for the Volume of Small Craft Traffic, Traffic Mix, Dimensions and Configuration risk factor categories, and evaluated how effective existing mitigations could be for reducing the risks within these risk factor categories. For 2 of the 4 risk factors evaluated (Volume of Small Craft Traffic and Traffic Mix), there was consensus that existing risk mitigations would NOT balance the risks introduced by the proposed infrastructure improvements. For the Dimension risk factor, there was consensus that the risks were well balanced, and for the Configuration risk factor, the participant's felt that existing mitigations would reduce the risk level; however there was no consensus that the risks were balanced. The results of the special assessment are included in Section 6 of this report.

Conclusion

The goal of a PAWSA workshop is not only to further the Marine Transportation System (MTS) objective of improved coordination and cooperation between government and the private sector, and involving stakeholders in decisions affecting them, but to provide the Coast Guard Sector and District 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 Chicago's maritime community.

The United States Coast Guard, Marine Transportation System Management Directorate, extends a sincere appreciation to the workshop participants for their contributions to the Chicago 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 Chicago, Illinois.

United States Coast Guard Marine Transportation Systems Directorate



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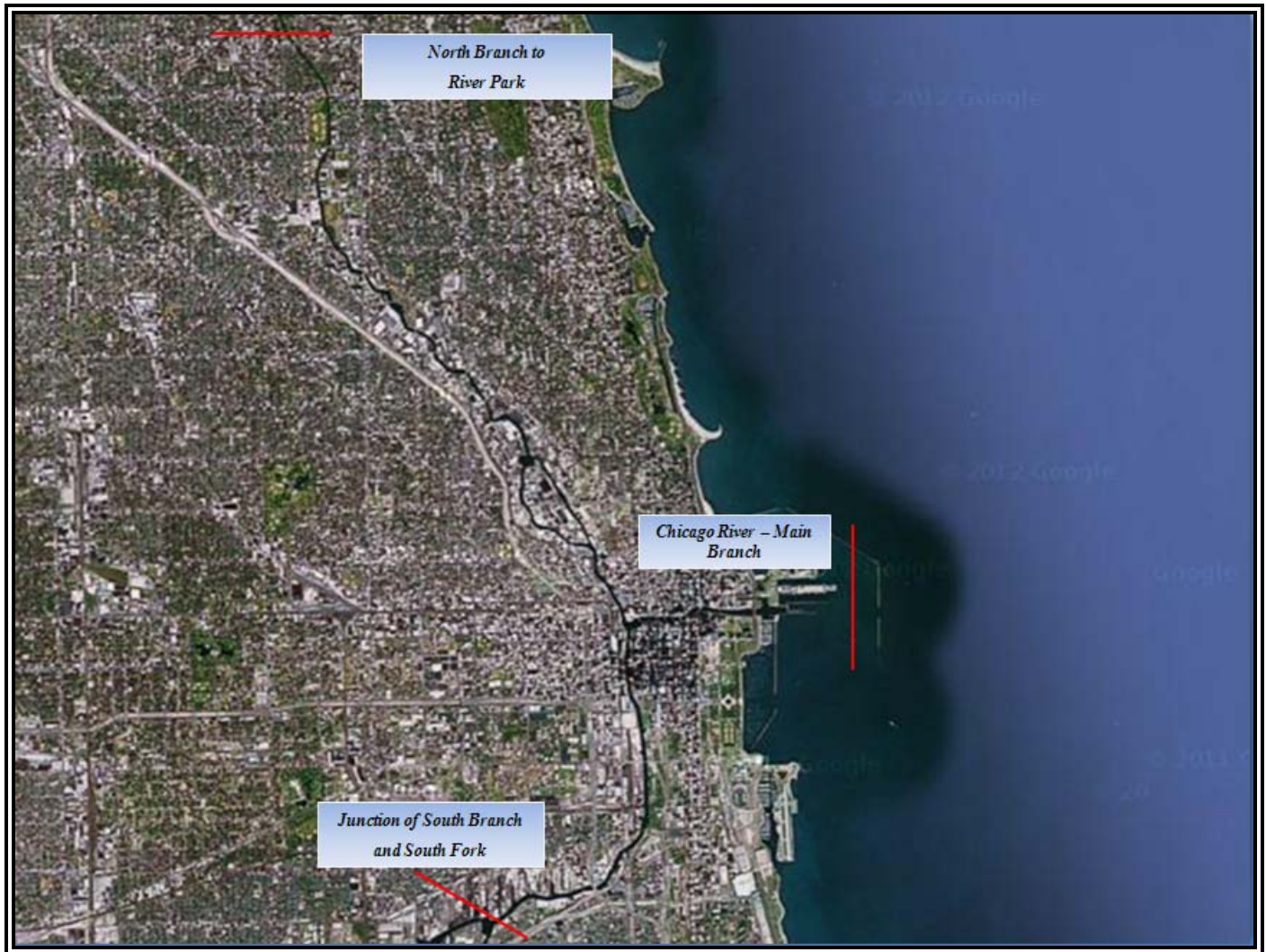
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Appendix A	Workshop participants - facilitation team
Appendix B	Participant observations - trends in the port and existing risk mitigations
Appendix C	Definitions - risk mitigation strategies
Appendix D	Participant recommendations - additional risk intervention strategies
Appendix E	Electronic Charting System (ECS) excerpts
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Section 1: Chicago PAWSA - Assessment Area

The geographic area assessed during the workshop included the main branch of the Chicago River from the Chicago Harbor entrance jetties to the junction of the North and South Branches; the North Branch up to the Wilson Avenue Bridge at River park, and the South Branch to the junction of the South Fork.

Figure 1



Section 2: Baseline Risk Levels

The first step in the workshop was the completion of survey book, used to determine a baseline risk level value for each risk factor in the Waterway Risk Model. Participants discussed each of the 22 applicable risk factors in the Waterways Risk Mode and selected a qualitative description for each risk factor that best described the conditions in the port. These qualitative descriptions were then converted to numerical values. 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 2 below shows that 11 of 22 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 2

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
	7.2	4.1	5.9	7.1	3.0
Shallow Draft Vessel Quality	Volume of Small Craft Traffic	Water Movement	Dimensions	Petroleum Discharge	Environmental
2.6	5.4	1.9	5.2	1.5	3.5
Commercial Fishing Vessel Quality	Traffic Mix	Visibility Restrictions	Bottom Type	Hazardous Materials Release	Aquatic Resources
	5.2	2.0	2.5	1.9	1.2
Small Craft Quality	Congestion	Obstructions	Configuration	Mobility	Economic
7.8	6.3	4.0	8.6	7.7	7.3

As the participants discussed each of the 22 risk factors, their comments and observations were documented for inclusion in this workshop report. An Electronic Charting System (ECS) was also utilized to plot the charted location associated with participant comments and observations, and assign a risk factor marker number for that specific comment and/or observation. Appendix B includes participant comments and observations, appendix E includes ECS chart extracts with the plotted locations associated with the comment/observation.

Section 3: Team Expertise Cross-assessment

The next second step in the 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 weight the inputs that each team provided in the other workbooks completed during the workshop.

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

The participants assessed their own and all the other participant teams' level of expertise for each of the six categories in the Waterway Risk Model. Overall, 40% of the participant teams were placed in the upper third, 33% in the middle third, and 27% 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 and evenly distributed for all categories.

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

Figure 3

Team Expertise - Distribution			
Risk Category	Top 1/3	Mid 1/3	Lower 1/3
Vessel Conditions	40%	29%	31%
Traffic Conditions	43%	34%	23%
Navigational Conditions	41%	32%	28%
Waterway Conditions	38%	36%	27%
Immediate Consequences	39%	33%	28%
Subsequent Consequences	41%	36%	23%
All Categories Average	40%	33%	27%

Section 4: Existing Risk Mitigation Strategies

The third step in the Chicago workshop was for participants to evaluate the effectiveness of existing mitigation strategies in reducing the risk level for each risk factor. Participants discussed existing risk mitigations for all risk factors in the model, and then evaluated how effective they thought the mitigations were at reducing risks.

For 14 risk factors (green), there was consensus that risks were well balanced by existing mitigations.

For 5 risk factors (yellow), there was no consensus that risks were well balanced by existing mitigations.

For 3 risk factors (red), there was consensus that risks were NOT well balanced by existing mitigations.

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

Figure 4

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
		7.2	5.7	4.1	3.0	5.9	4.4	7.1	5.1	3.0 2.5
		Balanced		Balanced		Maybe		Maybe		Balanced
Shallow Draft Vessel Quality		Volume of Small Craft Traffic		Water Movement		Dimensions		Petroleum Discharge		Environmental
2.6	2.6	5.4	5.9	1.9	1.8	5.2	4.2	1.5	1.4	3.5 2.6
Balanced		Rising		Balanced		Balanced		Balanced		Balanced
Commercial Fishing Vessel Quality		Traffic Mix		Visibility Restrictions		Bottom Type		Hazardous Materials Release		Aquatic Resources
		5.2	5.8	2.0	2.1	2.5	2.0	1.9	1.5	1.2 1.4
		Rising		Balanced		Balanced		Balanced		Balanced
Small Craft Quality		Congestion		Obstructions		Configuration		Mobility		Economic
7.8	7.1	6.3	6.2	4.0	3.0	8.6	5.7	7.7	6.0	7.3 6.5
NO		Maybe		Balanced		Maybe		Balanced		Maybe

Risk Factor		EXPLANATION	
Book 1 Score	Book 3 Score	Book 1	Level of risk - not taking into account existing mitigations
Consensus Reached ?		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
		Rising	Mitigated risk level is higher than the baseline risk level
		NO	Consensus that existing mitigations do NOT adequately balance risk

Section 5: Additional Risk Intervention Strategies

The workshop participants next completed survey book 4 for those risk factors not balanced by existing mitigations (Small Craft Quality, Volume of Small Craft Traffic, and Traffic Mix). Participants suggested additional risk intervention strategies, and then evaluated how successful a proposed risk intervention strategy could be at lowering risk levels for each of the risk factors.

To further reduce risks relating to Small Craft Quality, 12 of 15 participant teams recommended mandatory education for pleasure craft operators. To reduce risks associated with the Volume of Small Craft Traffic using the Chicago waterway, 12 of 15 participant teams agreed that a formalized harbor/port safety committee should be established. To further reduce risks for the Traffic Mix risk factor, 13 of 15 participant teams agreed that vessel transit statistics should be obtained and analyzed to help determine usage rates and the frequency of near-miss incidents. Appendix C is a description of each proposed risk intervention 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 5

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	Balanced
Shallow Draft Vessel Quality	Volume of Small Craft Traffic	Water Movement	Dimensions	Petroleum Discharge	Environmental
Balanced	Coordination / Planning	Balanced	Balanced	Balanced	Balanced
	4.5				
Commercial Fishing Vessel Quality	Traffic Mix	Visibility Restrictions	Bottom Type	Hazardous Materials Release	Aquatic Resources
Balanced	Other Actions	Balanced	Balanced	Balanced	Balanced
	5.5				
Small Craft Quality	Congestion	Obstructions	Configuration	Mobility	Economic
Enforcement	Balanced	Balanced	Balanced	Balanced	Balanced
4.1					

Risk Factor
Intervention Category
Risk Outcome

EXPLANATION	
Intervention Category	Intervention general strategy that most participants selected for further risk mitigation actions.
Risk Outcome	The expected risk outcome, the risk level that could be obtained if new mitigation measures were implemented

Section 6: Special Assessment – Proposed / Planned Infrastructure

An important objective of the Chicago PAWSA workshop was to discuss proposed changes to the waterside and shore side infrastructure along the Chicago River, discuss the risks to navigation safety these improvements could introduce (increased traffic, background lighting, waterway configuration restrictions due to new docks, etc.), and evaluate whether exiting mitigations would be sufficient to reduce the anticipated risks to an acceptable level.

The following projects/proposals were discussed and evaluated during the special assessment:

Main Branch

- New seawall – Wolf Point- north side of the turning basin.
- River walk expansion – south bank of the main branch, from Lake Street to State Street. Expansion will be a 50 ft. build out (extending an additional 25 ft. out into the main branch channel).
- Boat launch – State Street and Dearborn. Guided tours only, no single launches due to traffic in the main branch.
- Passenger embarkation point - existing dock at 401 Michigan Ave. Water taxis currently operate from this location, embarkation point proposed for east section of the existing dock. Adding 2 stairwells down from mezzanine levels so passengers can access the docks. Proposed operation will consist of one (1) mooring location, departures every ½ hour, with only one vessel mooring at the location at any one time.
- Upgrade to an existing boat launch – south bank of the main branch – Lake Shore Drive. Proposal is for a 1st class boating facility, 7200 sq. feet. Will have concession and other programming activities.
- New marina - Gateway Harbor- unlikely in the next 5 years. Some shifting of waterfront assets and vessel mooring, should not affect volume of vessel traffic.

North Branch

- Boat House/Launch - Foster Avenue Bridge (River Park). Existing non-motorized public launch with ramps on both sides of the dam. Proposed new facility at this location to be built this summer (completion at end of the boating season), will have storage for small non-motorized boats. Paddling only facility. Facility will accommodate up to 50 non-motorized boats. No motorized boat access at this facility. Will not store private boats at this facility
- Boat House/Launch - Addison Street and Belmont (Clark Park). New facility for boat and kayak launches. Kayak and canoe rentals are available now; new facility will accommodate kayak concession and storage for rowing shells. Existing clubs will be moving here, mostly youth. Some morning hours for HPC operation, most HPC's from this location will be in the afternoon following school dismissal. Most traffic will go north. Storage will accommodate twenty four (24) 8-person rowing shells. New facility will allow an increase in storage capacity. Facility does have walk-up rentals at this time, not sure if walk-up rentals will be allowed once the new facility is established.
- Water taxi service expansion - rush hour service from North Avenue to Madison Avenue. Morning and evening rush hour service, 5 days per week. Will use slip by turning basin for embarkation. Plans include 4 runs in the morning, and 4 runs in the evening, schedule to be determined. Will travel along backside of Goose Creek. Could possibly stop at Kendall College and other locations along the backside of Goose Creek.
- Electric boat rentals - southern tip of Goose Creek (at Kingsbury Yacht Club). Plans to include running rentals this summer, renting out as many as ten (10) ten person capacity electric boats.

South Branch

- Water taxi stop - between W. Adams and Jackson Ave, will use an existing dock where water taxi's moor up.
- Boat House/Launch - 18th Street park (Ping Tom Park). Existing water taxi stops on South side of the bridge. Proposed paddling only site on north side, tucked behind the dolphin. No operator at this time. Primarily will run tours through the city, just tours, no rentals.
- Boat House/Launch - 28th and Eleanor - will use existing dock. Location will become a public park. Storage can accommodate 36-8 person shells. New parking will be built. Design of the facility will accommodate use by police and fire emergency response personnel/vessels; launch will not be accessible for motorized public boats.

Following a general overview presentation of these projects/proposals, participants then conducted a separate, baseline risk survey book 1 for the Volume of Small Craft Traffic, Traffic Mix, Dimensions and Configuration risk factor categories taking into account the proposed infrastructure changes. Participants then conducted a separate book 3 survey to evaluate how effective existing mitigations could be at reducing the anticipated risks.

For 2 of the 4 risk factors evaluated (Volume of Small Craft Traffic and Traffic Mix), there was consensus that existing risk mitigations would NOT balance the risks introduced by the projects/proposals.

For the Dimension risk factor, there was consensus that risks were well balanced by existing mitigations.

For the Configuration risk factor, there was no consensus that risks were well balanced by existing mitigations.

The results of the special assessment are shown in the figure below. The number at the bottom left corner in each risk factor category is the risk factor score from the book 1 baseline risk survey, the number on the right is the mitigated risk score based on how effective existing mitigations could be at reducing the anticipated risks from the projects/proposals.

Figure 6

Special Assessment - 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
Shallow Draft Vessel Quality	Volume of Small Craft Traffic	Water Movement	Dimensions	Petroleum Discharge	Environmental
	5.4 6.1		5.9 5.5		
	Rising		Balanced		
Commercial Fishing Vessel Quality	Traffic Mix	Visibility Restrictions	Bottom Type	Hazardous Materials Release	Aquatic Resources
	5.8 6.2				
	Rising				
Small Craft Quality	Congestion	Obstructions	Configuration	Mobility	Economic
			8.4 6.4		
			Maybe		

Appendix A**Workshop Participants**

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Appendix B

Participant Observations- Trends in the Port and Existing Risk Mitigations

Shallow Draft Vessel Quality

Trends / Observations:

Shallow draft vessels are very prevalent in the Chicago River and waterways. The shallow draft vessel fleet in the area is comprised of charter fishing vessels, passenger vessels, barges, and towing vessels.

Charter Fishing Vessels

Several charter fishing vessels, up to 50-60 feet in length, operate out of the Burnham Harbor into Lake Michigan.

Passenger Vessels

The majority of the Chicago passenger vessel fleet is docked in the Main Branch of the Chicago River near Michigan Avenue (Marker SDVQ 1), and at Navy pier. Ogden slip, 330 North Wabash Building, and Navy Pier are also sites of several passenger vessel docks (Marker SDVQ 2). The size and capacity of the passenger vessel fleet operating in the Chicago area waterway vary. Passenger vessels are built to be low profile in order to easily fit underneath the area bridges. Most passenger vessels are of newer build (within the past ten years), and those vessels of older build are being phased out and replaced by 55 foot vessels and new water taxis. The oldest operating passenger vessel was built in 1961 and still runs well, which can be attributed to operation in a fresh water environment. Passenger vessels provide service year round. Several passenger vessels are available to provide charter services. Passenger vessel rates of speed differ depending on the time of day. In the morning hours, passenger vessels that stop at 200 South Wacker transport mostly commuters. These vessels operate at a higher rate of speed in order to deliver their passengers quickly. The afternoon runs typically transport tourists, so vessel speed is slower and voyages are not hurried. Passenger vessel operators have extensive navigation experience and are very knowledgeable of the Chicago River system.

Operators are “brought up through the ranks” and no one is allowed to enter directly into vessel operation, even if they have qualifications on a vessel from another state. The average passenger vessel operator in the Chicago waterways has an average of ten years experience. Tour boats, water taxis, and dinner cruise boats operate in numerous areas throughout the Chicago River and Lake Michigan.

Architecture tours operate in the Main Branch, North Branch, and South Branch of the Chicago River; some do enter the river system via the Chicago Lock. Architecture tours are extremely popular and are busiest during the summer months; however, the number of architecture tour transits is not reflected in the Army Corps of Engineers data since these vessels do not transit the Chicago Harbor Lock. A significant number of these tours operate during the daytime and early evening hours in the North Branch of the Chicago River and utilize the North Branch turning basin to perform turnarounds. Overnight storage areas for these vessels are located in the South Branch (Marker SDVQ 3) and several locations on the main branch near Michigan Avenue Bridge. Lake and River tours operate during the day and at night with the last tour scheduled for departure at 8:30 pm. Michigan Avenue and Navy Pier are the main stops for water taxis operating in the Chicago River.

Dinner cruise vessels docked at Navy Pier (Marker SDVC 4) operate mostly on Lake Michigan. Some of them transit into the Chicago River and turn at Adams Street on the South Branch (Marker SDVQ 5). Others are docked at Ogden Slip and predominately stay in the River. Dinner cruise vessels operate year round, including a New Year’s Eve and Valentine’s Day cruise.

The Chicago water taxi fleet typically operates daily from 6:30am-8.00 pm. Older water taxis are in the process of being decommissioned and should be out of service within the next two years. There are currently two water taxi’s built in the 1950’s that are in operation and in good working condition. There are several docking locations for the water taxis (Marker SDVQ 6). Overall, shallow draft passenger vessels operating in the Chicago waterways are well kept and are frequently updated and upgraded. They are of high quality and tend to be of better quality than shallow draft vessels operating on the coast. The winter months are typically used to perform vessel repairs.

Barges and Towing Vessels

A sodium chloride barge with an 18 foot draft transits through the Chicago lock approximately 12 times a year. Barges enter the Chicago River through the Chicago Harbor Lock and proceed down river to Lemont. Every Wednesday and Saturday evening a 200 foot deck barge moored on Lake Michigan and sets off fireworks, which are viewed by patrons at Navy Pier (Marker SDVC 7). To get to the proper launch location, the barge transits the Main Branch of the River and enters the Lake through the Chicago Harbor Lock.

Lake and Load Line Barges are inspected by the American Bureau of Shipping and are required to be out of the water every five years. Two (2) deep draft barges operate in the Chicago River; however, for the purposes of this workshop, they are classified as shallow draft vessels. There are also uninspected open hopper/deck barges carrying bulk products that transit the Chicago River. The majority of the bulk product barges operate in the North and South Branches of the Chicago River, therefore, since they do not go through the Chicago Harbor Lock, their transits are not included in the Army Corps of Engineers data. It was noted that more barges would enter the Chicago Harbor Lock if the O'Brien Lock was ever closed.

Construction occurs in the Chicago River annually in the summer months, however, the amount of construction barges are limited and enter the River through the Lock. During bridge construction, work scows will anchor under the bridges and are pushed into place by small work boats that do not require licensed operators or moved in place by cables.

Towing vessels in the area typically push one to two standard size 35' x 195' barges at a time, however, they can push up to six barges in a tow in the South Branch of the River. The average age of the Chicago towing vessel fleet is 15-30 years old, but with the current upkeep of these vessels, they could pass for 10 year old vessels. The overall quality of the towing vessel fleet is good and the fresh water environment helps maintain vessel quality. The average towing vessel Captain has been licensed for 15-20 years. The USCG – American Waterways Operators (AWO) “bridging program” helps towing vessel operators prepare for the new subchapter M towing vessel inspection regulations.

Locations in the South Branch of the Chicago River where towing vessels and barges operate and dock include:

- Domino Sugar dock. (Marker SDVQ 8)
- Hanson Fleeting area (Marker SDVQ 9)
- Damon Avenue Fleet and turning basin (Marker SDVQ 10)
- Midwest Generation dock located above Damon Avenue. (Marker SDVQ 11)
- Bulk scrap steel unloading dock (Marker SDVQ 12)
- EA Cox asphalt unloading dock (Marker SDVQ 13)
- Ozinga Ready Mix - South Branch location (Marker SDVQ 14)

Locations in the North Branch of the Chicago River where towing vessels and barges operate and dock include:

- Dock in South Halstead, aggregate products (Marker SDVQ 15)
- Azko salt unloading facility (Marker SDVQ 16)
- Turning basin used by commercial vessels (Marker SDVQ 17)
- Scrap unloading facilities (Marker SDVQ 18)
- Prairie ready Mix facility (Marker SDVQ 19)
- Coal unloading facility (Marker SDVQ 20).
- Ozinga Ready Mix - North Branch location (Marker SDVQ 21)

Existing Mitigations:

The majority of shallow draft vessels in the Chicago waterways have well qualified licensed operators. The passenger vessels are subject to Coast Guard inspections and frequently run emergency drills, such as fire and man-overboard. Passenger vessel companies also have extensive training programs for both the deckhands and Captains. Towing vessels are active participants in the USCG Towing Vessel Bridging program, follow the Coast Guard's requirement of employing licensed operators, and voluntarily use Automatic Positioning Systems, electronic charting, Geographic Positioning Systems, and radar units to minimize risk. The towing vessel companies in the area also participate in the AWO Responsible Carrier program and have audits performed by a third party. Towing vessel employees follow strict training programs for line handling, boat handling, and vessel operation. A company sponsored “steersman program” requires operators to train for 18 months, in addition to the 3-5 years of experience required by the Coast Guard licensing regulations, before they can operate a towing vessel in the waterway. The rules and regulations are well enforced in the

Chicago area by waterway law enforcement entities. All shallow draft vessel operators utilize the VHF radio to clearly communicate with each other.

Small Craft Quality

Trends / Observations:

There is an increasingly large population of human powered craft (HPC) in the Chicago waterway, including HPC vendors (operators who are associated with a for-profit, concession rentals that provide tours to the general public), HPC member users (persons who are affiliated with a private and non-profit organizations), and individual, non affiliated/associated HPC users. Paddlers and rowers utilize all areas of the Chicago River and a number of HPC operators transit through the Chicago Harbor Lock into Lake Michigan. Currently there are seven public access points for HPC, and there are four (4) newly proposed boat houses in the area, all will include public access. There is no legal requirement (boating safety education) for the operation of non-motorized vessels (HPC) in Illinois. HPC vendors who regularly utilize the Chicago River are very skilled, and have completed a variety of voluntary safety courses that promote the principles of safe kayaking/rowing. They make themselves visible by voluntarily placing lights on their craft when operating in the dark, however, inexperienced operators lack the knowledge of waterway navigation and proper safety procedures. Rowing clubs travel the waterways with a coach and are well managed. Students and beginners train in defined programs and are accompanied by a coach boat. It was noted that rented human powered craft are very stable and difficult to tip/roll over; the craft design also makes it easier for an operator to get back aboard the craft following a tip/roll over event.

Small craft vessels typically operate during daytime hours, with the exception of Wednesday and Saturday evenings when the fireworks display is held at Navy Pier. In general, most HPC vendor guides have an estimated 100 hours or more of on-water experience. Motorized recreational small craft vessels are not as prevalent on the Chicago River as HPC, however, the skill level of motorized recreational vessel operators vary greatly. To operate a motorized recreational vessel in Illinois, there are no requirements to attend training sponsored by the U.S. Coast Guard or other agency (with the exception of persons at least 12 years of age and less than 18 years who are required to possess a Boating Education Certificate of Competency or be accompanied by a person at least 18 years of age designated by a parent or guardian). Currently, there are no publically operated harbors located in the workshop's defined waterway area.

The state of Illinois is responsible for investigating small craft accidents, and reporting their statistics/findings to the Coast Guard. The Illinois Department of Natural Resources is able to provide recreational boating accident statistics as far back as 1964. During the busy month of July 2011, 18 recreational vessel accidents occurred, however, due to the reporting criteria, only two were required to be reported to the Coast Guard.

Locations of Small Craft Facilities, Launches, and Waterway Operations

Membership-based rowing and paddling facility, Main Branch, near the Lake Shore Drive Bridge (Marker SCQ 1). Even though this facility is "membership only", they work with outside groups and tourist groups that operate rowing, canoe, and kayak shells, as long as they have proper craft operation training. The facility is open for operation seven days a week from May-October. Rowers from this facility do not operate craft after 10:00 a.m. in an effort to keep the waterways clear for commercial vessel operation. Paddlers do not operate after sunset.

HPC facility, Main Branch, between the Lake Shore Drive Bridge and Columbus Avenue (Marker SCQ 2). This facility is a location in which uncertified paddlers are able to "walk-up" and rent kayaks. Paddlers leaving from this facility follow a dedicated route in Main Branch of the Chicago River. This facility provides guided paddling tours as well as individual rentals.

HPC facility, North Branch, west bank of the turning basin north of Goose Island (Marker SCQ 3). Facility offers guided tours southward along the west bank of the North Branch, along the backside of Goose Island, past Lake Shore Drive into the Main Branch of the River.

HPC facility, North Branch, southern end of Goose Island (Marker SCQ 4). Private facility which provides guided tours southward out of the North Branch into the Main Branch. These guided tours never transit through the Chicago Harbor Lock.

HPC storage facility, North Branch, on Goose Island (Marker SCQ 5). Facility is used for winter storage and can accommodate 300 HPC.

Condominium complex, North Branch, southern end of Goose Island, 20 private docks (Marker SCQ 6).

HPC facility (River Park), North Branch. No rentals currently operate from this location, future plans do include rentals.

HPC facility (Clark Park), North Branch, popular launch site for HPC (Marker SCQ 7). Currently no rental concessions at this location; however, a boat house is being built to accommodate a paddling vendor

HPC facility (Weed Street) North Branch, permanently moored floating boat house (Marker SCQ 8). Operators leaving this facility typically transit north in the River to Clark Park. A youth rowing program is conducted from this facility and they train in the North Branch where there is limited traffic.

Private dock, South Branch at Canal St (Marker SCQ 9). HPC groups launch from this site occasionally.

River City Marina, South Branch, private facility with 50 slips (Marker SCQ 10)

18th St Public Park, South Branch, site of a future paddling boat house (Marker SCQ 11).

Park 571, South Branch, at the South Fork Junction (Marker SCQ 12). Facility has an existing dock where several university rowing clubs, high school rowing clubs, and private rowing groups launch. In the future, this location will have public paddling access.

HPC facility, South Branch, at Western Avenue (Marker SCQ 13). Public boat launch for use by motorized boats. Location includes a boat ramp and trailer parking.

Existing Mitigations:

The Chicago Yachting Association supports and encourages training for powerboat or sailboat operators by utilizing the Coast Guard Auxiliary, the U.S. Power Squadron, and the Illinois Department of Natural Resources (IDNR). Training is mandatory for motorized vessel operators ages 12-18, which is sponsored by the State. Operators ages 12-18 can also be granted reciprocity with valid training certification from another state. Training is voluntary for motorized vessel operators ages 18 and up. Voluntary safety inspections are also conducted by the Coast Guard Auxiliary and IDNR in order to ensure that required and suggested safety equipment is correctly implemented onboard recreational vessels. The Coast Guard performs random recreational vessel boarding's, helping to mitigate risk in the Chicago River. The recreational boating community also supports the National Boating Federation.

HPC commercial operators are knowledgeable of the waterway and are highly trained. By training in groups with boat coaches, HPC operators learn the proper operation skills and safety procedures. The coaches are able to ensure that proper equipment is being utilized before the operators navigate the waterways individually. Guides on HPC tours are certified by professional organizations and are able implement the "bumping" and "pushing" method to alert HPC operators in the pod of approaching vessels. Evening HPC tours are accompanied by motorized boats and dinghies to provide additional safety and visibility. HPC operating companies encourage cooperation and open communication with the City of Chicago as well as other HPC operators and companies. Kayak locations that are not located near downtown provide a calm environment for training and only allow experienced paddlers to transit downtown. Rowers receive intensive and personalized navigational instruction. The Power Squadron is slated to start a "train the trainer" program, for their own members, in the Chicago area waterways in the near future. Kayakers who rent from local boat houses must first go through the basic paddle strokes, safety measures, and receive a map of the waterway. Several of the paddling and rowing clubs post safety procedures on their websites. This navigation season, kayakers in the Chicago area will be implementing the use of lighted poles and colored flags to make themselves more visible to surrounding traffic and will allow identification of the operator (i.e., guides will have a different colored flag than a beginning operator, etc.) Overall, there is excellent cooperation and communication between HPC companies in the Chicago area.

The IDNR help to mitigate risk due to small craft quality by issuing citations, enforcing safety and navigation, and arresting boaters who are operating under the influence. The IDNR address HPC problems in the waterway and communicate well with the kayak and canoe companies to prevent future accidents.

Volume of Commercial Traffic

Trends / Observations:

Recently, the volume of commercial traffic has been inhibited by the closure of the Chicago Harbor lock. In 2011, the Lock was closed for four month duration for maintenance, and currently the Chicago Harbor Lock is closed again for the installation of a new gate and machinery. The opening date for the lock is 11 May. If the Calumet Lock were to close, the Chicago Harbor Lock would see an increase in the volume of commercial vessel traffic.

Towing vessels operate 365 days per year, 24 hours a day. Towing vessel traffic increases between 3 p.m. and 6 a.m. as this is the time they are busy picking up empty barges and getting the dock ready for the next day. In the South Branch of the River, two-three towing vessels transit daily, making eight-ten roundtrips to fleeting areas on the North and South Branches. The volume of commercial traffic in the North Branch used to be greater; however, it has decreased over the past few years due to the poor economic conditions of the country. There are also four barges that transit northbound five-six days a week heading to the Prairie Ready Mix facility (Marker VCT 2). The Azko salt dock receives one barge a week (Marker VCT 3).

Passenger vessels operate daily as well as from 9 a.m.-midnight on weekends. Summertime, from Memorial Day-Labor Day, is the busiest time of year for passenger vessels; however the volume is manageable thanks to good communication via VHF radio under current traffic loads. During the spring and fall passenger vessel voyages are less frequent. The heaviest volume of passenger vessel activity occurs during the afternoon hours, and volume is lighter in the mornings and evenings. Wednesday and Saturday evening voyages are busier due to the fireworks display at Navy Pier (Marker VCT 4). The Fourth of July is another busy day for commercial passenger vessels, especially around the Chicago Harbor Lock. A significant amount of commercial traffic departs from Navy Pier into Lake Michigan. It was noted that the Chicago Harbor Lock has more passenger vessels transit through than any other lock in the country.

Dinner cruise vessels operating in the Lake depart at noon for a two hour cruise, 7:00 p.m. or 8:00 p.m. for a three hour cruise, and occasionally at 11:00 p.m. or 12:00 a.m. for a moonlight cruise. Three dinner cruise vessels typically operate at one time. Dinner cruises aim to run year round; however, not many tickets sell in January. Dinner cruise vessels are busiest on the weekends, and the warmer the weather, the more traffic there is (Marker VCT 5). Dinner cruise operations on the River run four-six cruises per day (Marker VCT 6), however, when the weather is warmer, they usually run six cruises a day. As seen in the Lake, weekends are busier, and it was estimated that 100 commercial vessels pass Wolf Point on a summer weekend (Marker VCT 7). It was asked if the cameras on the bridge by Wolf Point (Marker VCT 8) could be used to monitor vessel traffic in the River, however, it was noted that the cameras are used to document accidents on the bridge and the tapes are overwritten every 72 hours.

Water taxi departure schedules vary between companies. At the busiest times of the year, departures can occur every eight to nine minutes from the Michigan Avenue location. (Marker VCT 9).

Existing Mitigations:

To reduce the volume of commercial traffic in the Chicago area waterways, vessels follow each other in a line, much like elephants in a circus following each other trunk to tail. The tour boats travel at a slow rate of speed (4-5 knots) and have flexibility with the length of their routes, so if needed, the route can be altered to accommodate a high volume of commercial traffic. For the most part, the passenger vessel routines are repetitive and predictable. Tour boats also spread out along the length of the river to avoid being in close proximity and prevent a marine casualty. Most commercial vessels in the area have longevity in the area waterways, work well with each other, and communicate frequently all reducing risk.

Volume of Small Craft Traffic

Trends / Observations:

Motorized small craft registration has decreased significantly over the years (30,000 decrease in Illinois) due to high gas prices and the economic downturn. HPC registration, however, has increased (20,000+ increase in Illinois) which can be attributed to a higher availability of craft (i.e., sales at sporting goods stores). To date, there are 8,131 registered canoes/kayaks in Cook County and 609 rental boats. The Chicago River is a relatively safe body of water which attracts more small craft vessels. Rowing season on the River is typically from March -October. During this season, rowing shells operate from the first light to dusk. Several small craft moorings and launches are located throughout the PAWSA assessment area:

Main Branch:

Membership-based rowing and paddling facility, Main Branch, near the Lake Shore Drive Bridge (Marker VSCT 1).
HPC facility, Main Branch, between Lake Shore Drive Bridge and Columbus Avenue (Marker VSCT 2).

North Branch:

HPC facility, North Branch, west bank of the turning basin north of Goose Island (Marker VSCT 3).
HPC facility, North Branch, southern end of Goose Island (Marker VSCT 4).
HPC facility, North Branch, on Goose Island (Marker VSCT 5).
Condominium complex, North Branch, southern end of Goose Island, (Marker VSCT 6).
HPC facility (Weed Street) North Branch, permanently moored floating boat house (Marker VSCT 7).
HPC facility (Clark Park), North Branch, popular launch site for HPC (Marker VSCT 8).
HPC facility (River Park), North Branch, popular launch site for HPC (Marker VSCT 9).

South Branch:

Private dock, South Branch at Canal St (Marker VSCT 10).
River City Marina, South Branch, (Marker VSCT 11).
Park 57, South Branch, at the South Fork Junction (Marker VSCT 12).
HPC facility, South Branch, at Western Avenue (Marker VSCT 13).

There is an increase in the volume of rowers in the early morning hours and late evening hours (dusk and dawn) near the East Bank Club. These hours are when the university club rowers operate in the South Branch by Bubbly Creek. Clark Park and Eleanor Park offer rowing from March to November. The afternoons in the waterway areas around these parks are busier with high school student rowing clubs. The state kayak season is from May to October. Kayakers can operate at any time of day; however, one facility does not allow night operation. Most kayak traffic occurs in the afternoons and evenings, and on the weekends. Only HPC operate in Bubbly Creek at the South Fork of the Chicago River. There is an increase in small craft traffic near the Richard Day Daily recreational boat launch facility at Western Avenue on the South Branch of the River.

There is a large population of motorized small craft vessel operators that appear on warm weather days. Since the only drinking establishment closed on the River, motorized small craft traffic has decreased. For the past 10 years, regattas have been held annually on the Main Branch of the River. Sailboat traffic surges in the fall and spring and consists of vessels heading to or from boatyards on the River. The air and water show occurring every August on Lake Michigan increases small craft traffic. Overall, the nicer the weather is, the greater the volume of small craft traffic.

Existing Mitigations:

HPC instructor's control the speed of their kayak pods and tend to go at slower speeds reducing the risk caused by small craft traffic volume.

Traffic Mix**Trends / Observations:**

Commercial vessels work together, talk ahead of time, and have good open lines of communication with each other. Commercial vessels stay to one side of the waterway for northbound transits and the other for southbound transits (Marker TM 1). Deep V-shaped hulled vessels emit large waves in their wake; however, they reduce their speed in order to minimize the size of their wake. There are no speed limitations in Chicago waterways, but the majority of the waterway is a no wake zone and most vessels obey this law. There have only been a minimal amount of accidents over the past 10 years between recreational and commercial vessels in the Chicago waterways. HPC are able to operate in the waterway when a commercial vessel passes, as the wakes typically produced by these vessels are not large enough to capsize a HPC (Marker TM 2). However, the size, type, and other characteristics of an HPC could make it susceptible to commercial traffic wakes. HPC operators, however, have had issues with motorized recreational boats that can create large wakes. Inexperienced HPC operators and motorized recreational boat operators can cause traffic issues since they are not as aware of their surroundings as experienced operators. There are concerns that HPC crafts will greatly increase in association with the proposed boat houses and that these new HPC operators will not go through the proper training channels. Rowers traveling southbound from the Main Branch of the River past Roosevelt Park/Ping Tom Park areas occasionally encounter barges and tour boats, however, there have not been any issues. (Marker TM 3)

At various locations, some tour boats execute 180 degree turns in the middle of the river, which can create traffic mix risks. Navy Pier (Marker TM 4) is busy with tour boats, water taxis, and recreation boats. The addition of the proposed Gateway Harbor (Marker TM 5) in this area is concerning to the commercial vessel operators.

Existing Mitigations:

The wake limitations and enforcement of wake infractions help to mitigate risk from traffic mix. Kayak operators understand that they do not have the right-of-way to the waterway and are trained to move out of the way when a commercial vessel is approaching. There is excellent communication between commercial vessel operators and they are vigilant in watching out for other vessels. Dinner cruise operators have some flexibility with schedules and are able to quickly adapt to traffic situations as they arise. Safety training and training in general help to mitigate risk as well.

Congestion

Trends / Observations:

Kayak flotillas can be large and take up a lot of waterway space. During the fireworks events, kayaks are stationary in Ogden Slip and block tour boats and passenger vessels which can cause waterway congestion (Marker CONG 1). Each kayak company has its own procedures for operation and it was noted that these companies need to come together in a unified approach to navigation and safety. The area of the Wolf Point junction is very congested due to vessels approaching from three different directions and inexperienced waterway operators get confused (Marker CONG 2). Some passenger vessels will travel north up the River then back south to avoid crossing around Wolf Point. State Street east to the Chicago Harbor Lock, especially around Michigan Avenue, is an area of heavy congestion area with tour boats, HPC, jet skis, and other commercial and recreational vessels (Marker CONG 3).

Existing Mitigations:

If the schedule allows, (i.e., 3 day weekend), towing vessels will try to adjust their schedule to move boats in the late evenings to decrease the amount of waterway congestion. The commercial vessel operators display an excellent knowledge of the “Rules of the Road” also helping to minimize congestion. There is safety guideline signage posted at various launches in the River system, and the majority of the river is a “no wake zone” which reduce collisions during congested times.

Winds

Trends / Observations:

Pockets and gusts of wind on the River make certain sections windier than others. For example, the area around State Street experiences sudden gusty winds (Marker WIND 2). These winds can affect kayak movement and empty barges traveling north on the River (Marker WIND 3). Due to the dimensions of the River, the wind creates a vortex or wind tunnel, making it gusty on the water. The skyscrapers and bank line do help to protect certain areas from gusty winds. On the Main Branch, even the best day will have gusty winds. The Southern tip of Goose Island (Marker WIND 1) is an area where winds are stronger. The Jackson street area on the South Branch (Marker WIND 4) experiences strong southeasterly winds, which are commonly referred to as the “Jackson Street Monster”. Around the Sears Tower is a location where boats wait to turn around (Marker WIND 5). In this area, congestion and wind make it difficult to navigate and hold your position while you wait. Winds are unpredictable (Marker WIND 6) and sheers are intense coming off of the Lake causing flags to point in opposite directions. If a towing vessel is transiting the Chicago Harbor Lock (Marker WIND 7) with an empty barge and there are strong north or northeasterly winds blowing, you have to come off of the tow line or Lock. When windy, this area can be difficult to navigate if multiple vessels are trying to enter the Lock. When operating in the basin near Navy Pier, the wind will push you all over the place and vessels will have to slow their speed. Wind speeds average over 15-20 mph in this area. On consistently windy days, vessel speeds are reduced. The National Weather Service is supposed to get wind equipment near Varna. Inland near O’Hare Airport the wind speed averages near nine knots as noted in the Coast Pilot, however, wind speeds are mostly higher on the waterways.

Existing Mitigations:

Weather radio broadcasts and wind condition updates help to mitigate wind risk. HPC operators utilize their training and display good judgment when operating in windy conditions. Tour boat captains communicate regarding incoming barges, kayak pods, and will alert the other commercial operators if the “Jackson Monster” is particularly strong.

Water Movement

Trends / Observations:

Occasionally the sluice gates near the lakefront will open allowing a rush of water into the river which will push a vessel off course (Markers WM 1 and 2). Following heavy rains, the river swells, and the Chicago Harbor Lock is opened to release pressure pushing water out into the lake. Vessels with a normal clearance of one-two feet are more apt to get stuck under bridges after heavy rain fall (Marker WM 5). Debris also gathers after heavy rains causing sewer drains to overflow and empty into the Lake. Some downtown buildings discharge water causing a strong current that pushes kayaks. When the River is in flood stage following a weather event, the Metropolitan Water Reclamation District (MWRD) will draw river water in through grates to relieve pressure, which can draw HPC operators towards the grates. The North Branch aeration stations (Marker WM 3) can cause buoyancy with lightweight boats. After the Centennial Fountain erupts, the first 10 minutes of each hour can be congested and if combined with wind creates an iffy spot for navigation (Marker WM 4). Wheel wash behind commercial vessels can create a hazard for smaller craft. Usually the MWRD will predict water level and lower the pool in advance, however, vessels need to watch their draft in these situations

Existing Mitigations:

HPC operators set up gates or what may better be described as kayaks operated by experienced guides placed in front of potentially dangerous areas, to funnel kayakers in the pod away from water outfalls and discharge locations.

Visibility Restriction

Trends / Observations:

Fog is present in the Chicago area waterways; however, it is less than the amount stated in the Coast Pilot. When there is four to five feet of steam on the water in the fall, it is difficult to see small boats. Night lights from the city are distracting, especially on the Lake in the front of Navy Pier (Marker VR 1). Night light reflections produce a glare on the surface of the water making navigation difficult, and vessel operators stated that they are able to see better when there is a full moon. Kayaks operating at night that are not lit, or are poorly lit, create a visibility risk. Near the Trump Tower, light reflections at sunrise can impede a commercial operator’s ability to see rowers and kayakers. Poor contrasting lighting conditions also makes rust colored barges and bridges difficult to identify and tell apart, especially moored barges.

Existing Mitigations:

Starting this year, kayak companies will use lights and flags on their kayaks to increase visibility. If weather conditions are unfavorable, dinner cruise vessels will normally not operate. Tour operators monitor the weather throughout the day via the Internet; however they will still operate in the rain, as long as it is not severe. One kayak rental company has rescue boats to retrieve kayak operators if the weather conditions are worsening. If there is any threat of lightning, rowers do not operate on the waterway.

Obstructions

Trends / Observations:

Debris is prevalent in the Chicago River, especially following heavy rainfall. The debris consists of trash, sticks, trees, telephone poles, and even 55 gallon drums. A location past Wolf Point is where debris tends to re-circulate creating a waterway obstruction (Marker OBS 1). In the South Branch of the River, there used to be large groupings of debris, however, since the deep tunnel was created, the large debris groupings have decreased. The North Branch of the River typically contains more tree debris than the South Branch (Marker OBS 2). Occasionally there is ice in the water near Navy Pier around New Years Eve and the weekend closest to Valentine’s Day affecting dinner cruise voyages. On the inland waterway, ice is prevalent on the Main Branch, Navy Pier, and South Branch during most winter months. The North Branch normally has less ice.

Existing Mitigations:

The Metropolitan Water Reclamation Department and Chicago Department of Transportation Department of Street and Sanitation cleans up debris in the Chicago River. These organizations patrol the areas waterways looking for obstructions, and will also respond to calls of debris. The commercial vessel operators communicate locations of obstructions to other operators as well.

Visibility Impediments**Trends / Observations:**

The Wolf Point area (Marker VI 1) is a visibility impediment due to having the three sections of river meet around the point. When heading northbound on the North Branch of the River the East Bank Club kayak launch cannot be seen because it is tucked in behind the Dolphin (Marker VI 2). Background light can often make entrance to the Chicago Lock difficult, in addition, if the River is calm, the background light reflects off of the water making kayaks hard to spot. There is no lighting at the break wall creating an invisible obstacle for night navigators unfamiliar with the waterway (Marker VI 3). The lights in harbor make the entrance to the Chicago Harbor Lock difficult to locate if traveling near Diversey Harbor (Note: Diversey Harbor is not in the workshop waterway assessment zone). Towing vessel operators must lower their pilot houses in order to navigate the numerous bridges that cross the Chicago River system. By lowering the pilot house, visibility is lessened and operators are unable to see ahead of the barge(s) they are pushing.

Existing Mitigations:

The kayaks companies operate according to the philosophy “operate as if no one sees you”. This keeps the kayak operators on high alert for oncoming vessels and nearby structures. The towing vessel operators provide individuals to serve as bow lookouts in order to give the pilot a 200 foot vantage point, especially around bridges. Commercial vessel operators communicate to each other the locations of kayaks or HPC in low visibility areas on the waterway. They can also sound the danger signal if small craft vessels are in the way. Operators also use bend whistles when transiting around a bend to make their position known.

Dimensions**Trends / Observations:**

The Van Buren and Jackson bridges located on the South have more of a slope on the bottom framing, and if two double-decker passenger vessels and a tug and barge are attempting to pass each other, one will have to wait for the other to pass through (Marker DIM 1). Smaller boats do not have as large of a beam and do not have an issue passing at these bridges. When some bridges are closed the structure is rounded making it impossible for two boats to meet. Overhead bridge construction occurs frequently and at times the construction crew will leave the barges/work flats in the water when the work is completed or the work day has ended.

Areas with tight, heavy bends also make it difficult for two vessels to pass. One location is in the North Branch of the River at “Old Man’s Railroad” (Marker DIM 2) and the other is by the southern tip of Goose Island. (Marker DIM 3). The Kinzie Street Bridge is a location where two tour boats will frequently pass at the same time creating a problem for transiting kayakers (Marker DIM 4).

Existing Mitigations:

There is excellent communication and via radio calls between commercial vessel operators which helps to reduce risk caused by the waterway dimensions. Passing arrangements are worked out between operators. At Congress Parkway, bridge construction crews will blow a horn alerting all construction personnel to stop work while a vessel transits under the bridge. Kayakers operate with whistles on their jackets and pod guides have radios to communicate with other vessel operators as well as their staff.

Bottom Type**Trends / Observations:**

The east side of Goose Island is comprised of shallow water and a mud laden bottom. There are no known rock ledges in the Chicago area waterways.

Existing Mitigations: N/A

Configuration

Trends / Observations:

Wolf Point is located at the junction of the Main Branch, North Branch, and South Branch. There are sharp bends and perpendicular traffic flow where the three waterways converge (Marker CONF 1). The angles of certain areas of the waterway have the ability to toss HPC into each other. Vessel operators have to pay close attention when disembarking from a docking area and be aware of vessels transiting behind them. The area between State Street and Michigan Avenue (Marker CONF 2), the bend by Congress Parkway (Marker CONF 3), and West Chicago Avenue (Marker CONF 4) are all areas of risk due to the waterway configuration. A turning basin is located at Damon Street on the South Branch of the Chicago River (Marker CONF 5).

Existing Mitigations:

Verbal communication between operators via radio helps to mitigate risk due to the waterway configuration.

Personnel Injuries

Trends / Observations:

The largest passenger vessel in the area has an 800 passenger capacity, however, the most passengers it loads is 550-600. Dinner cruise vessels typically carry between 400-550 passengers. The risk of personnel injuries is minimal or low as the highest number of casualties would be from two passenger vessels colliding. The tour boats are slow moving at five-six knots maximum, and their routes are predictable, so if a collision were to occur with two tour boats, or an allision with one tour boat, there would most likely not be any casualties or severe injuries. If an on water injury situation were to occur in the Main Branch of the River, there are not many access points that could be utilized to remove individuals from the water. Also, there are not many alternate docking sites for larger vessels to offload in the event of an emergency. The Cascading Response document provides numbers and statistics for the area in the event of a terrorist attack. This document also provides information on economic consequences and costs and mobility issues.

Existing Mitigations:

There is good communication between the fire department and the passenger vessel operators. Fire personnel and vessel operators work together to hold a mass casualty drill in order to test the city resources and evaluate response times and evacuation procedures. The lessons learned from this drill assist in the rewriting of the city evacuation plan. The fire department has a new fire boat, the CHRISTOPHER WHEATLEY as well as a three-year-old quick response boat that responds to any 911 calls or mayday calls. Commercial vessel operators are well trained in both operation and safety and coordinate their personnel accordingly. Due to the large number of passenger vessel operating in the Chicago River, there is always a vessel near to assist. The dinner cruise operators frequently exercise mass casualty drills and internal drills, and have a reciprocal system with the other passenger vessel operators in the area that if an emergency evacuation situation occurs, the other operators will use their vessels to offload passengers. Even though the dinner cruise operators have a plan for evacuation, they are never too far from the dock.

Petroleum Discharge

Trends / Observations:

No oil barges transit the Chicago River. There is the minor potential of a petroleum discharge from a ruptured fuel tank if a vessel is involved in a collision or allision. The worst case discharge would be 20,000 gallons of fuel; however, the fuel tanks are separated into multiple compartments on each side of the vessel, so the maximum discharge of 20K gallons is unlikely. When fueling a vessel, minor spills can occur; however, these spills evaporate quickly and are always reported. The potential exists that trains traveling on the Amtrak Bridge (Marker PD 1) could have an accident and discharge petroleum into the River, as was the case several years ago.

Existing Mitigations:

All spills, no matter how minor, are reported immediately. There are no large quantities of petroleum products transported on the waterway.

Hazardous Materials Release

Trends / Observations:

There are no underwater pipelines that could be struck by a vessel and cause a hazardous material spill.

Existing Mitigations: N/A

Mobility

Trends / Observations:

If a blockage of the River were to occur, commuters would not be able to get to work using waterway transportation; however, Chicago offers a variety of other means of transportation. If the Chicago Harbor Lock and the Calumet Lock closed, waterway mobility would be limited (Marker MOB 1). A closure occurring at the junction on the North Branch could have vessels trapped making it impossible for them to transit back out. A closure on the Main Branch could prevent police and fire personnel from attending an event on the North or South Branches of the River (Marker MOB 2). There are not salvage operations in close proximity to the waterway, with the closest being located in St. Louis, so recovery of a waterway obstruction would be a lengthy process. There is a sunken boat located off of Goose Island, but it was determined that it is not an obstruction to commercial navigation, so it will not be salvaged by the Army Corps of Engineers. Although it is not an obstruction to commercial navigation, it poses a danger to HPC and small craft vessels.

Existing Mitigations:

There are a variety of resources available on water to alert other vessel and craft operators to mobility issues. Planning and training help to mitigate mobility risk. There is an existing plan between the Army Corps of Engineers and the Coast Guard to determine if a sunken vessel is an obstruction to Navigation. If it is determined that the obstruction hinders navigation, the Army Corps of Engineers is contracted to remove the obstruction on behalf of the Coast Guard. Commercial vessel operators also have salvage plans in place.

Health and Safety

Trends / Observations:

The potential for health and safety risk is minimal, as there is no hazardous cargo transiting through the waterways. If a fuel tank ruptured on a vessel, it could affect air quality and breathing in the area of the spill.

Existing Mitigations:

There is a large vessel presence on the water which could help to unload passengers in an emergency situation mitigating the risk of health and safety hazards.

Environmental

Trends / Observations:

There are no wetlands in the area. Water quality standards, primary contact standards, and drinking water standards are slated to be improved by 2016. The treatment plant is located outside of the workshop study area, but affects the quality of the water in the discussion zone. In the event of a waterway obstruction, all commodities that are currently transported by barge would need to be transported by truck; air quality would worsen as a result.

Existing Mitigations:

Most oil spills in the waterway are minor and are attended to immediately. The Chicago Harbor Lock helps to protect the River from the impacts of an oil spill.

Aquatic Resources

Trends / Observations:

There are no aquatic resources in the Chicago Harbor System.

Existing Mitigations: N/A

Economic

Trends / Observations:

If the Chicago Harbor Lock were to close on a permanent basis it would cause immense economic hardship on the area and have flooding impacts on the nearby houses and buildings (Marker ECO 1). The longer the Chicago Lock or Chicago River would be closed, the greater the economic hardship would be. The Chicago Flood of 1992 stranded barges in the North Branch of the River and could potentially be repeated with another flood event. Roadway surfaces would deteriorate at a faster rate if barges were unable to deliver the large volumes of materials/commodities that are transported in bulk quantities by barge. Road surfacing materials would have to be transported by truck, with each loaded barge having the equivalent capacity of approximately 70 tractor-trailer truck cargo loads. Road congestion would increase with extra trucks and commuters. Any failure of the marine transportation system would be a major stressor on other areas of transportation. Wolf Point is also critical juncture in the river system (Marker ECO 2).

Barges not carrying commodities both up and down the River would suffer greater economic costs. Vessel and facility employees may become unemployed if the waterway was closed for a length of time. Approximately one million customers are ferried across the waterways each season, and with a waterway closure, the city would lose tourism revenue. There are 500- 1,000 employees working in the Chicago maritime industry with payrolls estimated in the \$10,000,000 range. The City of Chicago averages two million dollars or more in taxes from River tours and could potentially lose \$500,000 every day the tours do not operate. According to the Cascading Report, a 30 day shutdown of the Illinois River would result in the loss of 30 billion dollars. With increased unemployment rates and the loss of revenue, the city of Chicago would suffer.

Existing Mitigations:

“Restoring the Natural Divide” by the Great Lakes Commission identifies engineering options for Chicago’s waterway system and potential improvements to the waterway’s roles in commercial navigation, recreational boating, flood and storm water management, and water quality

Appendix C

Definitions – Risk Mitigation Strategies

<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 (navigation rules, pilot rules, standard operating procedures, licensing, required 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 (Notice to Mariners, charts, Coast Pilots, Light Lists, Automatic Identification System (AIS), tides and current tables, etc.).
<i>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 D

Additional Risk Intervention Strategies

(The number listed before each risk intervention strategy is the number of participant teams who voted for that particular risk intervention strategy)

Small Craft Quality

Coordination / Planning:

- (9) Formalize a Chicago Waterway - Harbor Safety Committee.
- (3) Prior to granting operating permits to personal watercraft rentals or concessionaires; a formalized group should review permits so that comments and considerations can be voiced.
- (1) Increase coordination amongst state, local, and federal agencies as well as communication with the public.
- (0) Implement a well defined, publically known, multi-agency procedure for permitting.

Voluntary Training:

- (9) Organize a waterway safety class for kayak operators to be led by representatives of the U. S. Coast Guard and Marine Police.

Rules & Procedures:

- (12) Implement mandatory education for pleasure craft operators.
- (1) Implement safe distance and safe speed criteria for small craft operators.
- (1) Evaluate the skills of human powered craft operators and qualify them individually on the locations of the waterway they may transit, evaluations to be conducted by a credentialed Individual. Assign color coded signage to sections of the waterway so that operators will know where they are qualified to maneuver (similar to codes used in whitewater classifications).
- (0) Require all vessels to be registered by the City of Chicago / Cook County.

Enforcement:

- (11) Increase law enforcement entities and resources on the waterway.
- (3) Provide safety information to commercial HPC and powerboat businesses, including rental companies of personal watercraft, and follow up in order to determine if they are correctly implementing safety practices.

Navigation / Hydro Info:

- (9) Display signage that describes potential water hazards a person may encounter at entry points and points of waterway access.
- (0) Display cautionary signage for paddlers near Wolf Point and other high traffic areas throughout the waterway to alert them of potential dangerous situations and areas.

Communications:

- (11) Dedicated literature containing information a person should know that is specific to operation in the river system. This information would be available at every point of access to the river.
- (0) During their complimentary vessel safety exams, have the Power Squadron and Coast Guard Auxiliary pass along boating safety rules, procedures, and literature.

Active Traffic Management:

- (5) Create zones to be avoided by inexperienced paddlers or implement time constraints in high

traffic locations where paddlers operate. Zones could include areas where paddlers can only transit in a coordinated event.

Other Actions:

- (10) Add entrance and egress points on the River for public safety officials in case of an emergency response.

Volume of Small Craft Traffic

Coordination / Planning:

- (12) Formalize a Chicago Waterway - Harbor Safety Committee.
- (1) Add access points for HPC in less congested areas of the waterway. (to steer boaters away from using access points in the more congested areas)

Rules & Procedures:

- (6) Perform a narrow channel evaluation (Inland Rules of the Road) and designate waterway as a narrow channel if deemed appropriate.

Communications:

- (7) Implement a second radio channel (VHF Radio) for kayak operators to monitor.

Waterway Changes:

- (6) Establish regulated navigation areas.

Other Actions:

- (12) Gather vessel transit statistics on waterway usage rates. Collect near-miss incident data for use and analysis.

Traffic Mix

Coordination / Planning:

- (12) Formalize a Chicago Waterway - Port Safety Committee.

Rules & Procedures:

- (6) Evaluate the skills of human powered craft operators and qualify them individually on the locations of the waterway they may transit, evaluations to be conducted by a credentialed individual. Assign color coded signage to sections of the waterway so that operators will know where they are qualified to maneuver (similar to codes used in whitewater classifications).
- (3) Establish regulated navigation areas.
- (2) Restrict certain vessel types from navigating in the area south of Navy Pier.

Active Traffic Management:

- (5) Create zones to be avoided by inexperienced paddlers or implement time constraints in high traffic locations where paddlers operate. Zones could include areas where paddlers can only transit in a coordinated event.

Other Actions:

- (13) Gather vessel transit statistics on waterway usage rates. Collect near-miss incident data for use and analysis.

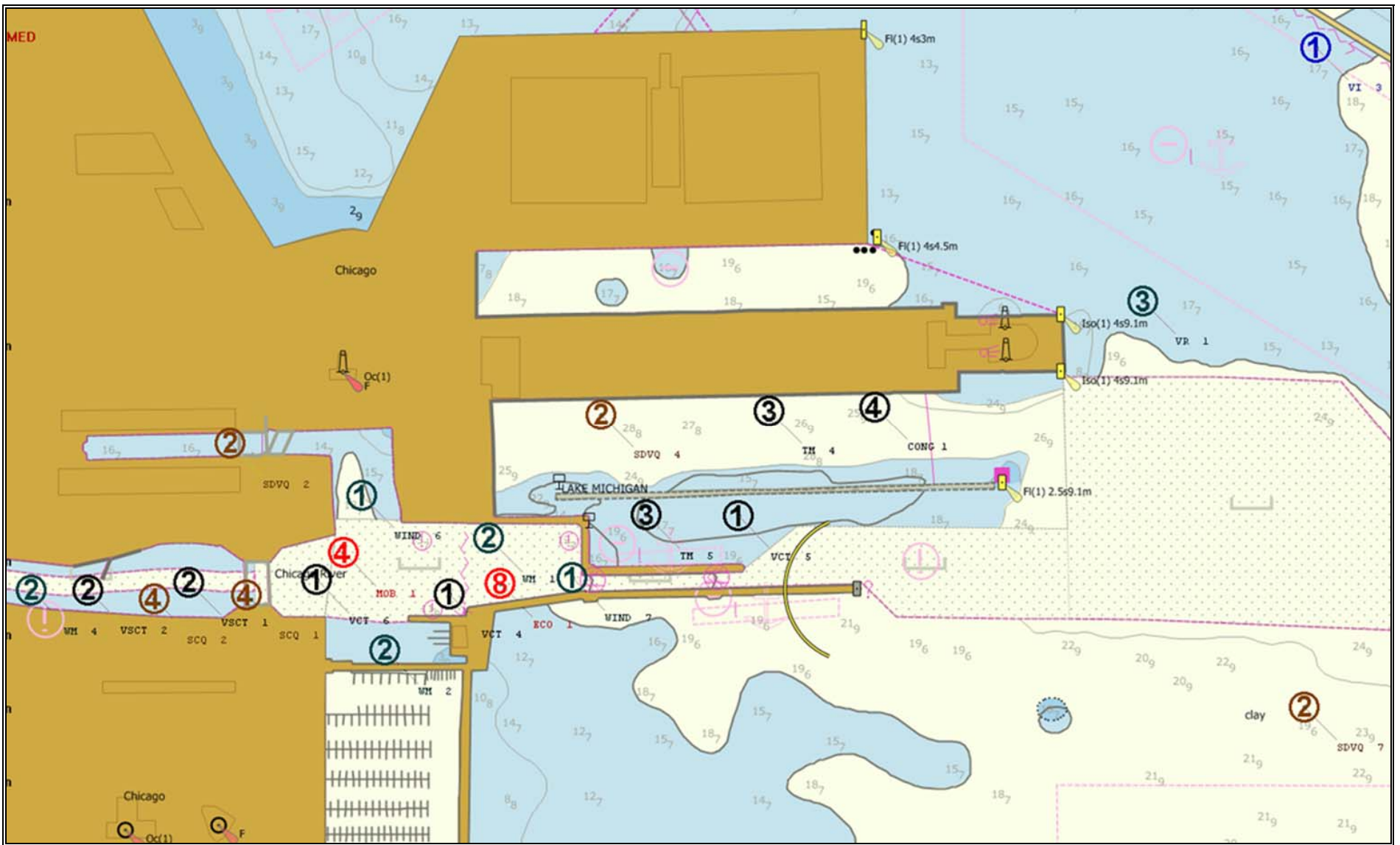
Appendix E

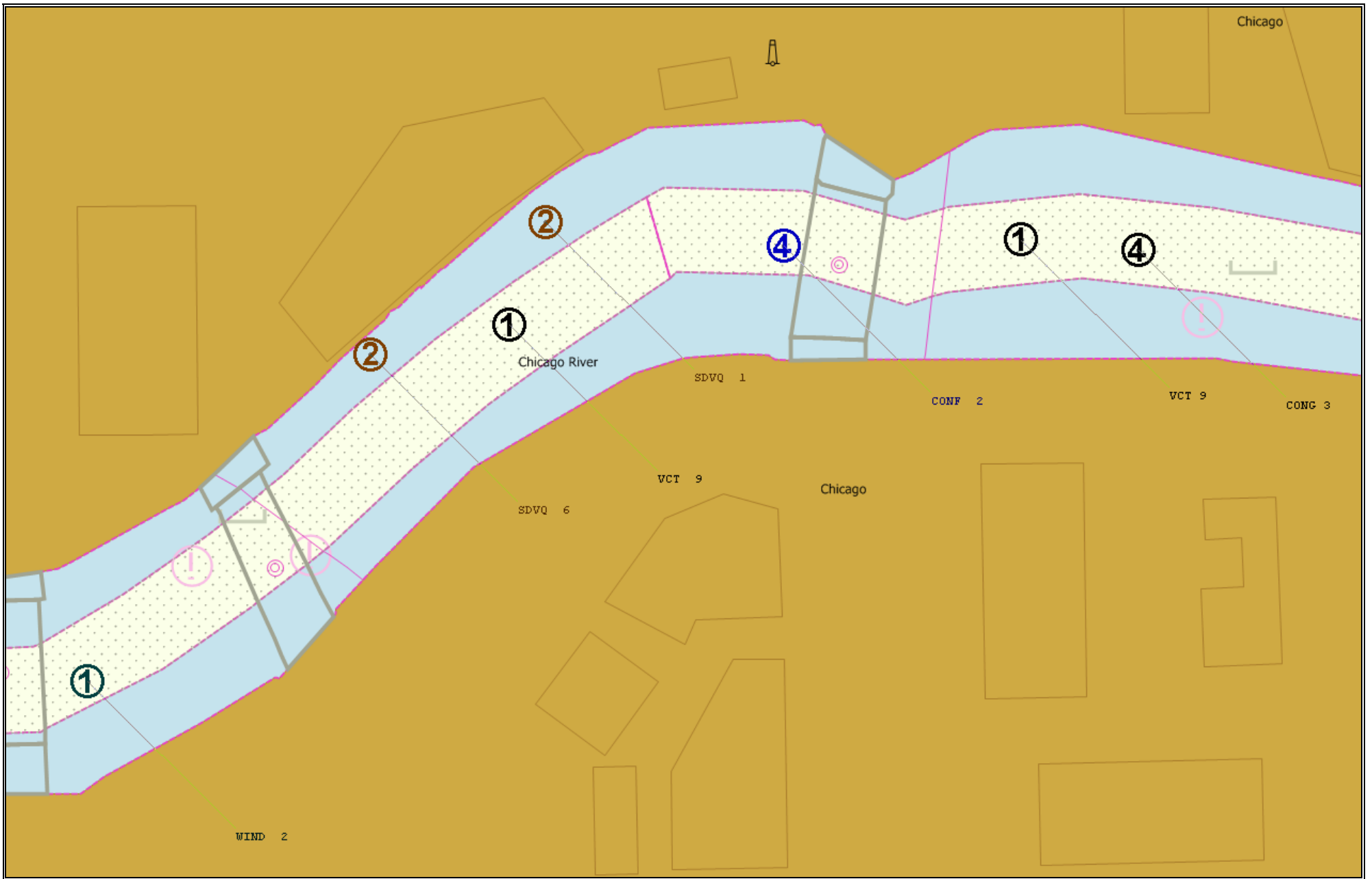
ECS Risk Factor Locations

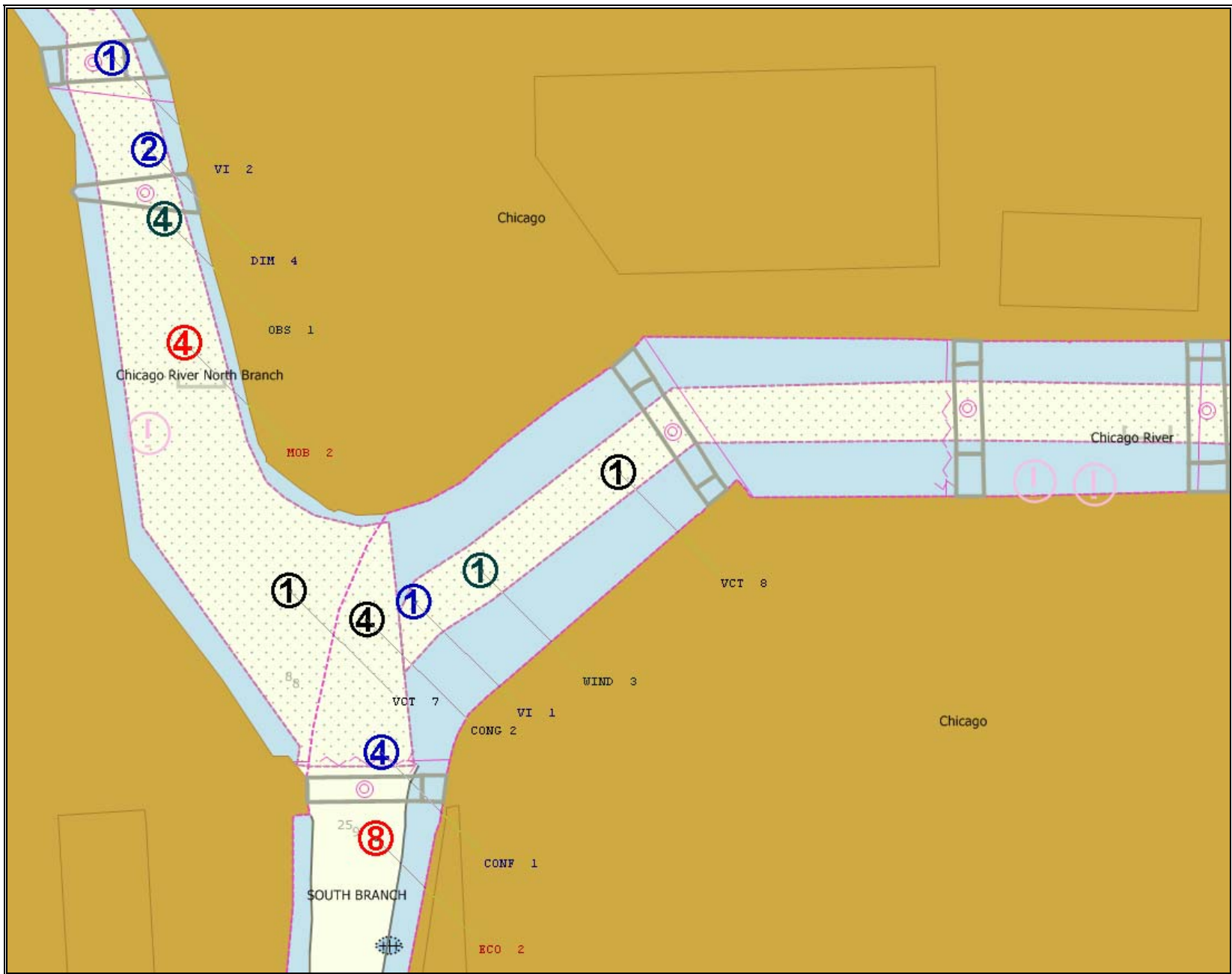
As the workshop participants discussed each of the 22 risk factors, an Electronic Charting System was utilized to plot the geographic locations associated with their comments and observations, and assign a risk factor marker number for that specific comment and/or observation.

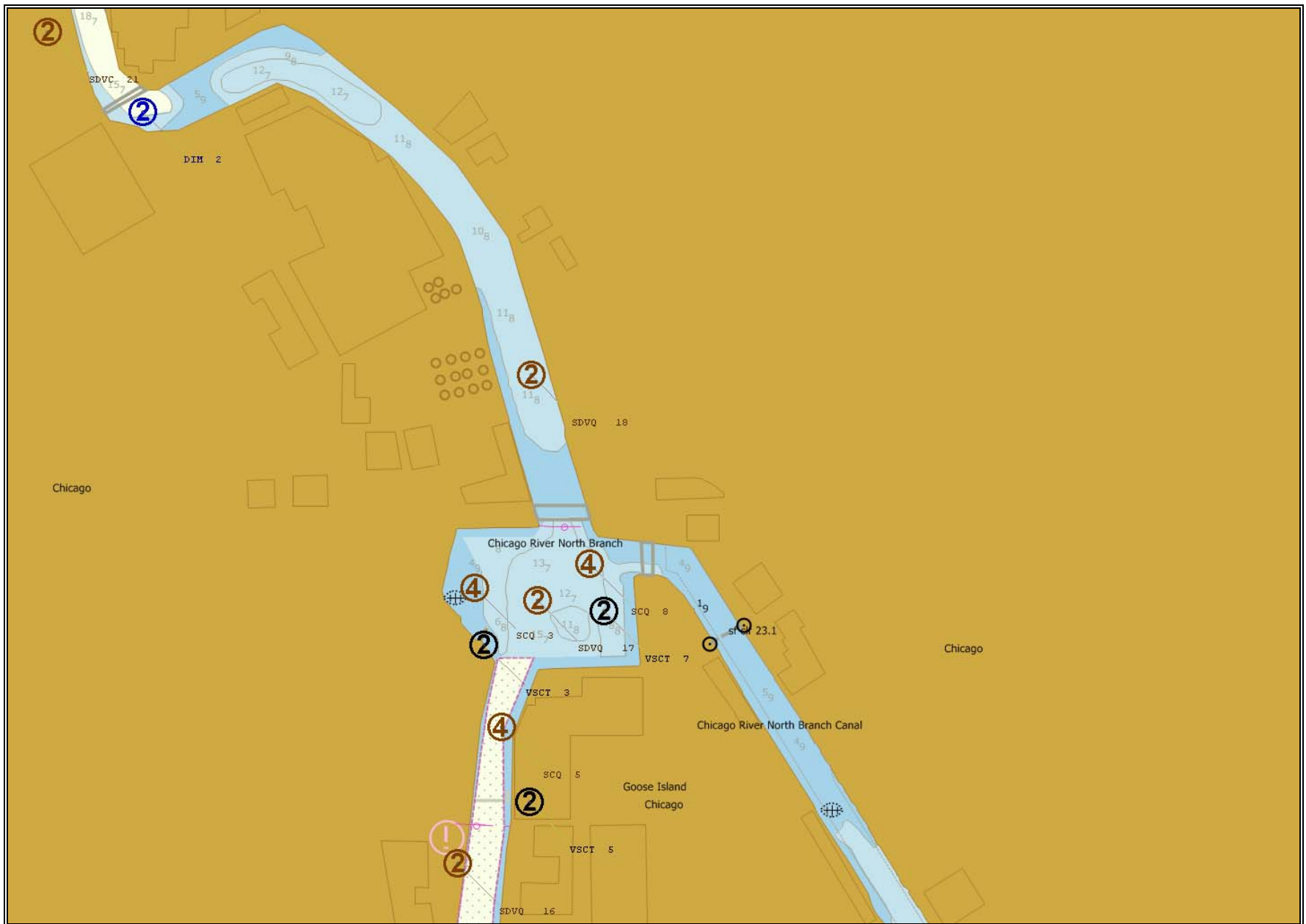
The diagram below describes the ECS marker color and numbering symbols for each risk factor in the PAWSA Waterways Risk Model.

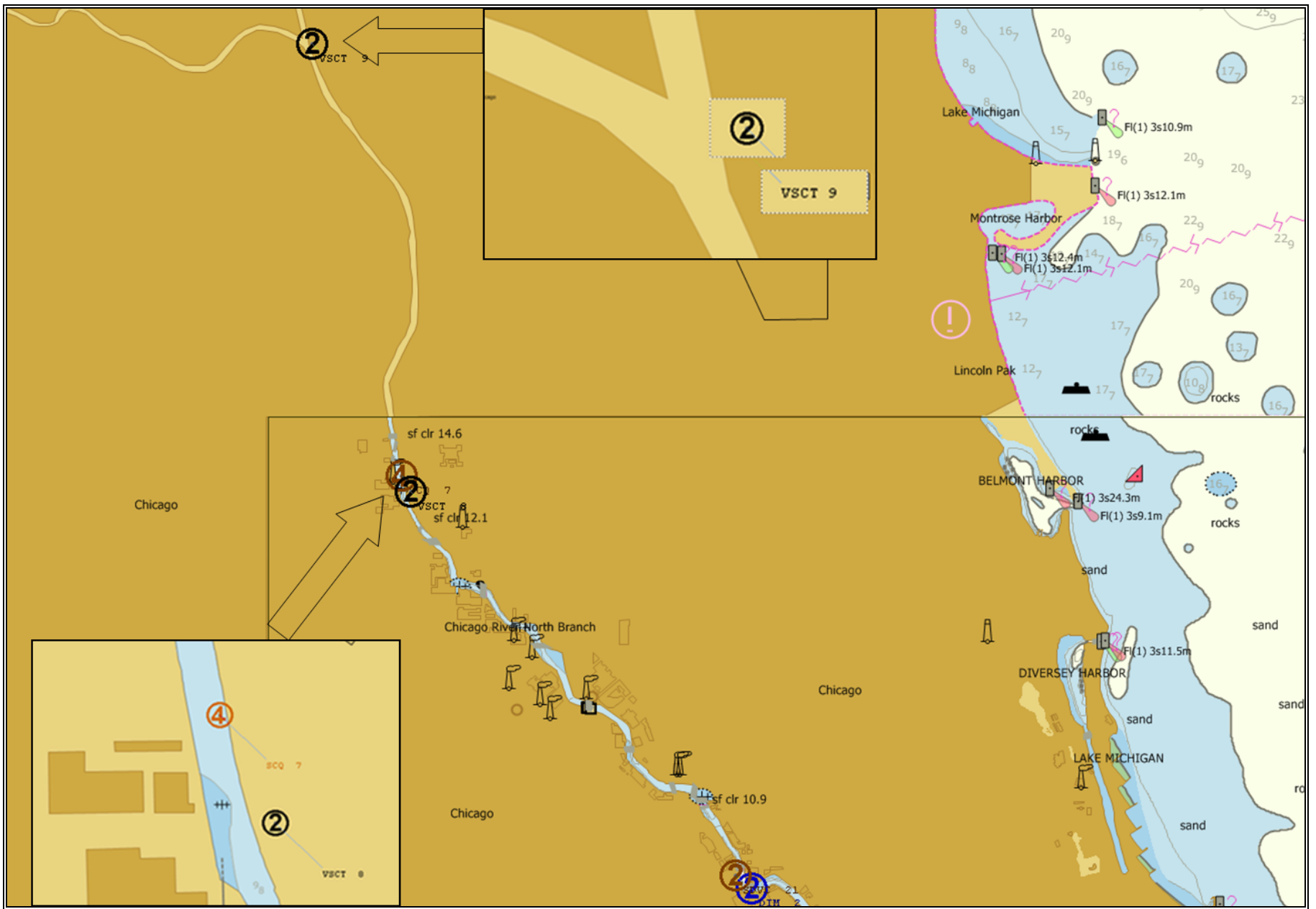
Vessel Conditions	Traffic Conditions	Navigational Conditions	Waterway Conditions	Immediate Consequences	Subsequent Consequences
Deep Draft Vessel Quality	Volume of Commercial Traffic	Winds	Visibility Impediments	Personnel Injuries	Health and Safety
①	①	①	①	①	⑤
Shallow Draft Vessel Quality	Volume of Small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

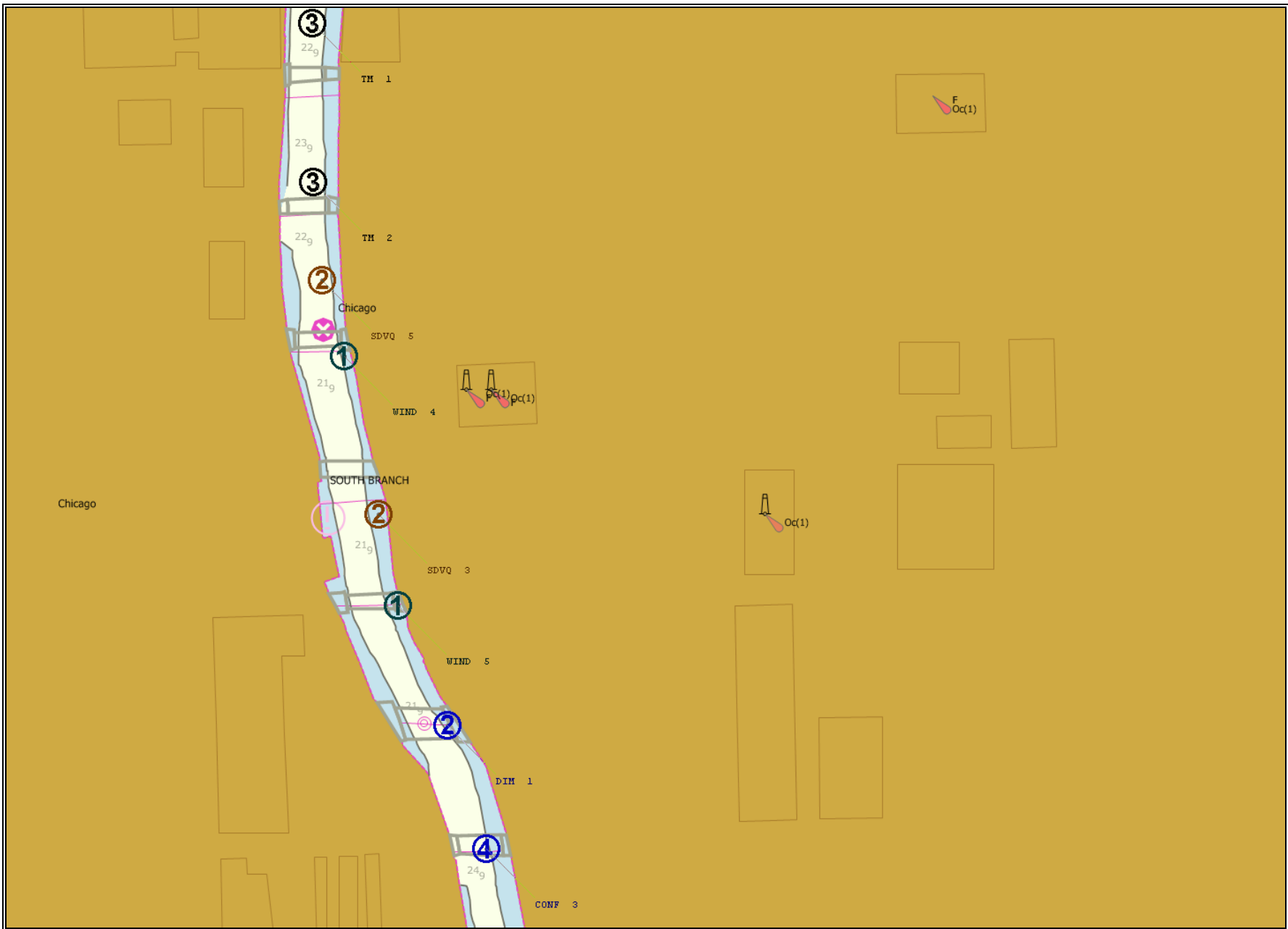


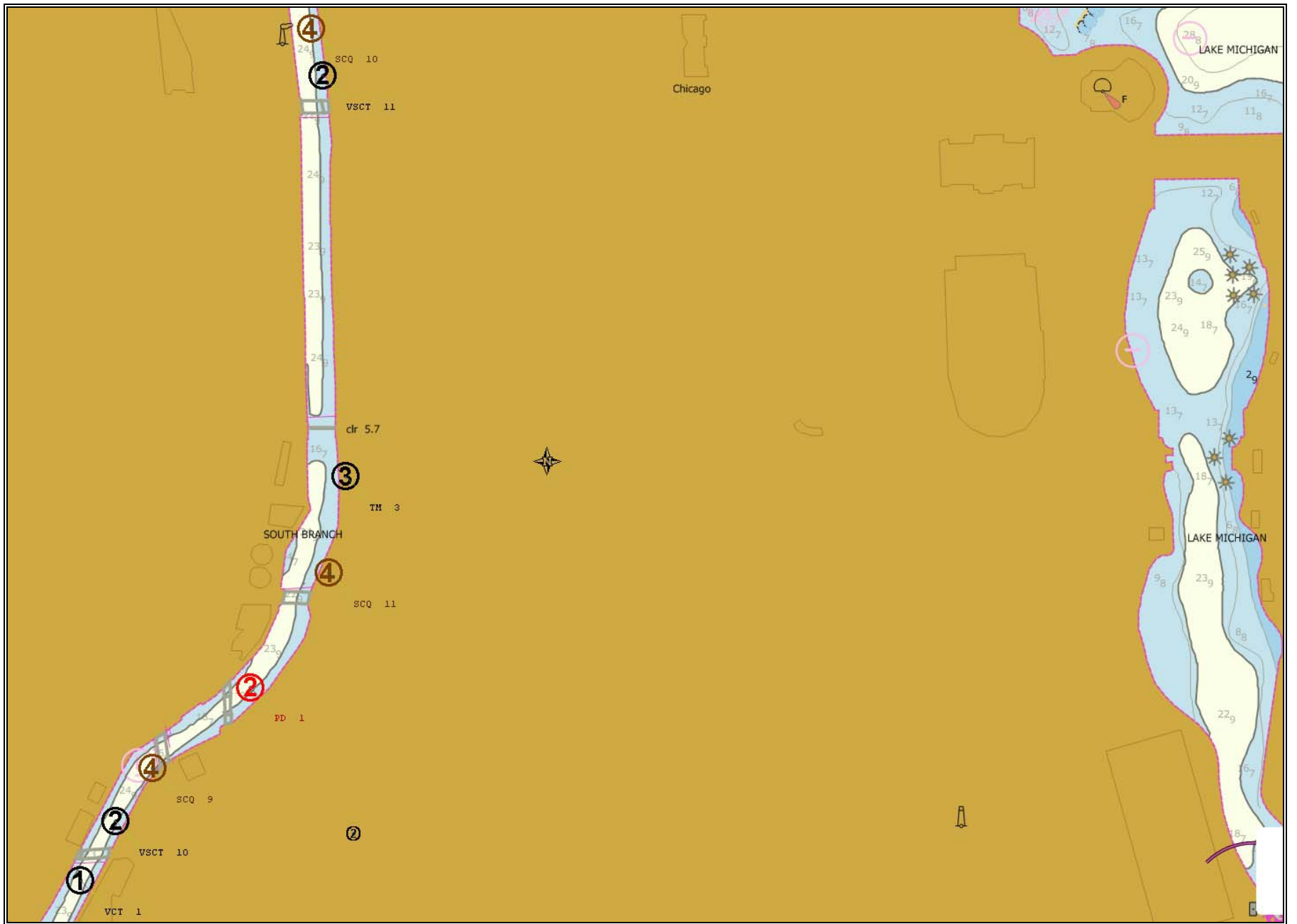


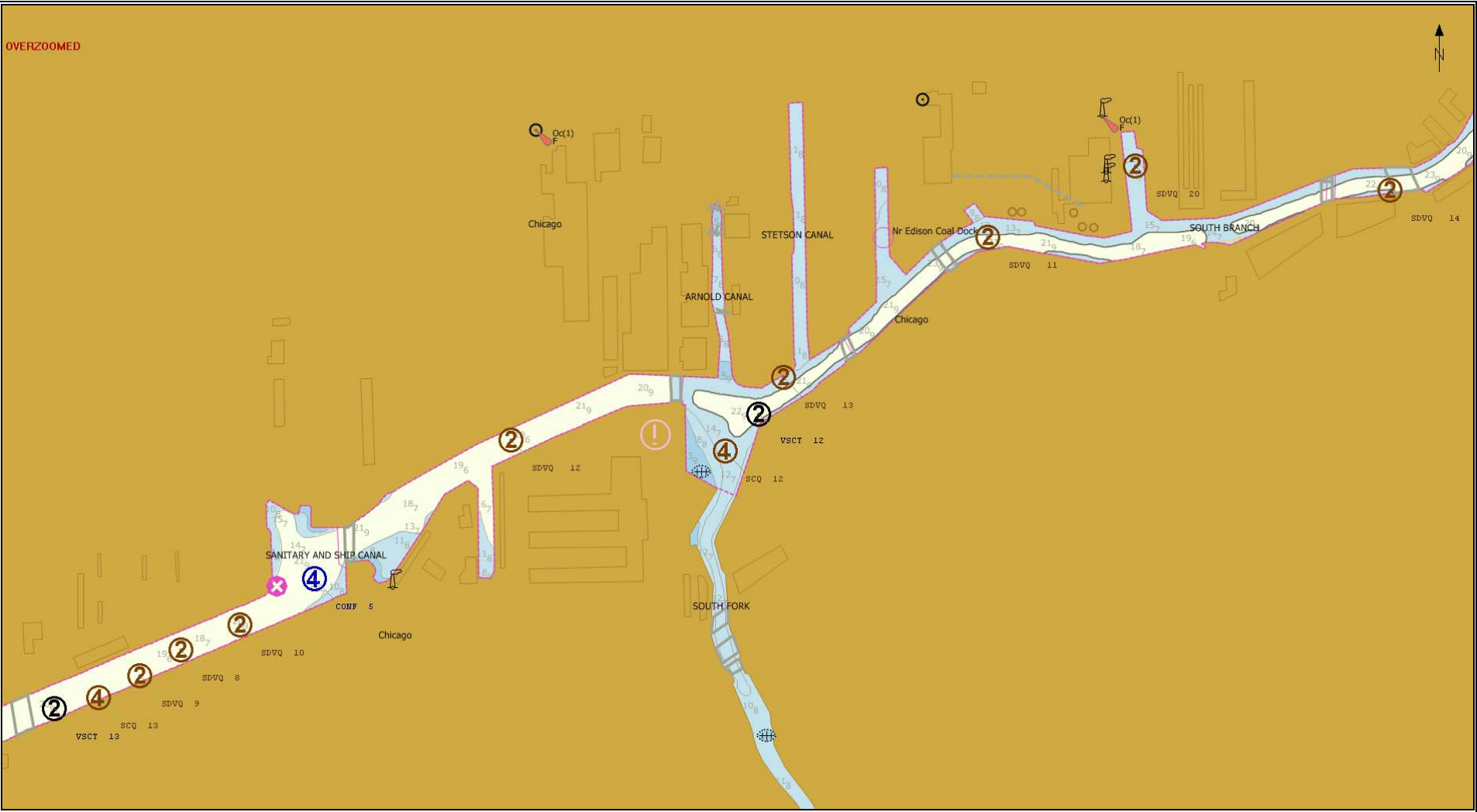


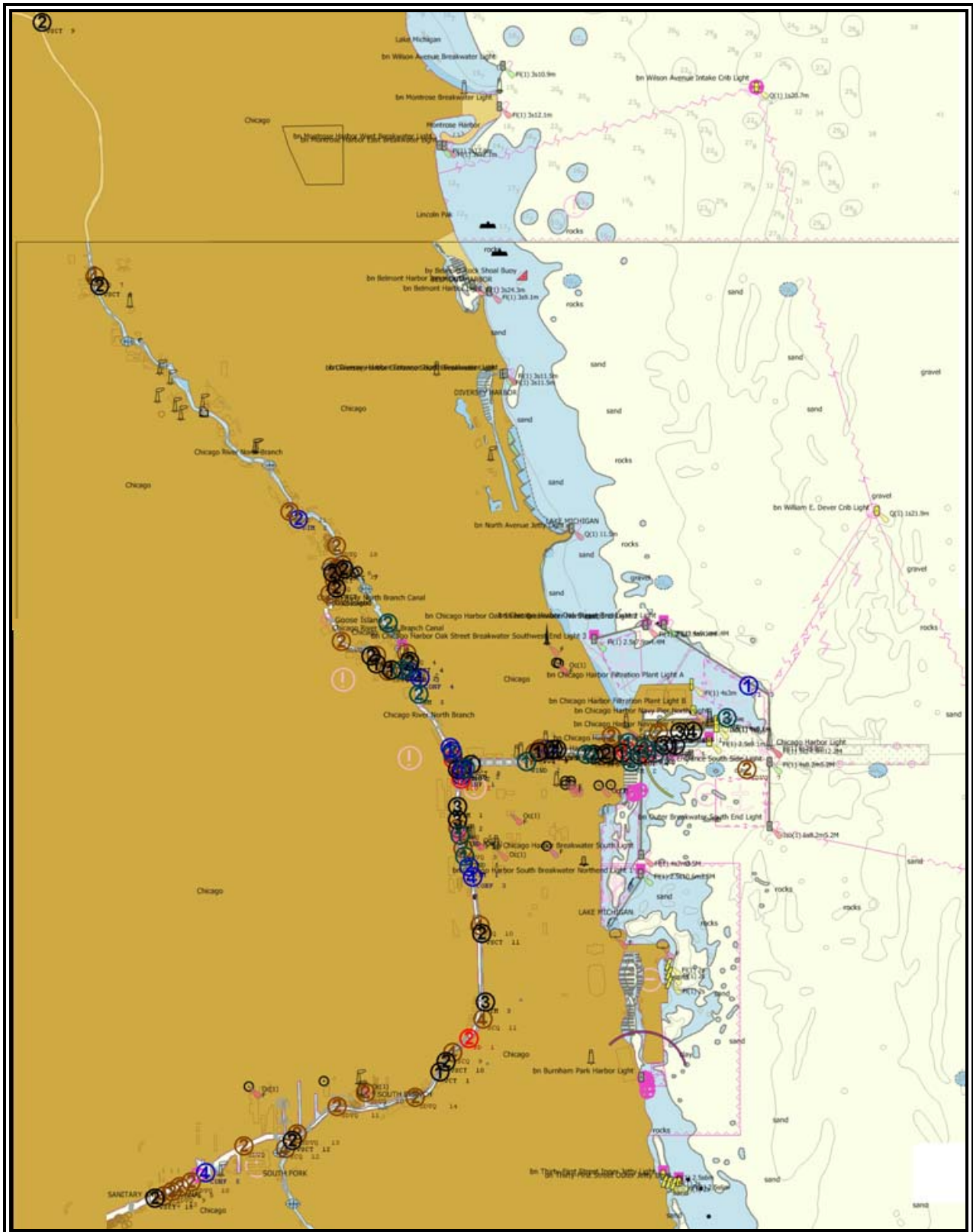












Appendix F

References / Guidance

	<u>Vessel Conditions / Operations</u>	<u>Navigation Safety</u>	<u>References / Statistics</u>
Illinois Department of Natural Resources	Boat Registration and Safety Act http://www.dnr.illinois.gov/recreation/boating/Documents/BoatDigest.pdf	Mandatory Safety and Education Programs http://www.dnr.illinois.gov/safety/Documents/SafetyEdBrochure.pdf	Boating Safety Education Safety : Boating Safety Education
		State-Specific Boating Safety Requirements http://www.boater101.com/Course/documents/IL/ILstatelaws.pdf	
U.S. Coast Guard	46 CFR Subchapter C – Uninspected vessels 46 CFR Chapter I - Vessel Inspection requirements Electronic Code of Federal Regulations:	U.S. Navigation Rules Navigation Rules Online	Recreational Boating Safety - Accident Statistics Statistics
	Recreational Boating Safety - Federal Regulations Regulations	Navigation regulations by location Navigation Regulations Search	USCG Auxiliary -Requirements -Recreational Boats Recreational Boating Safety Information & Resources
U.S. Army Corps of Engineers	Chicago District - Regulatory Branch USACE Chicago District Regulatory Branch - Illinois	Chicago District - Navigation Notices http://www.lrc.usace.army.mil/co-o/Nav_Notice.htm	Navigation Data Center - Vessel Transit Statics http://www.ndc.iwr.usace.army.mil/
	General Regulatory Policies - Permitting Electronic Code of Federal Regulations:		
National Oceanic and Atmospheric Administration		National Data Buoy Center - Chicago Weather NDBC - Station CHII2	Safe Boating Weather Tips http://www.nws.noaa.gov/om/brochures/safeboat.htm
		National Weather Service NOAA's National Weather Service	U.S. Coast Pilot 6 - Lake Michigan United States Coast Pilot®

Appendix G

Waterways Management / Best Practices

Chicago Metropolitan Agency for Planning
<http://www.cmap.illinois.gov/>

City of Chicago - Official website
<http://www.cityofchicago.org/city/en.html>

Illinois Department of Natural Resources
[DNR](#)

American Waterways Operators Foundation
[The American Waterways Operators](#)

American Canoe Association
[American Canoe Association](#)

U.S. Coast Guard
<http://www.uscg.mil/>

British Rowing
<http://www.britishrowing.org/>

Port of London Authority
<http://www.pla.co.uk/index.cfm>

Chicago Waterways Strategic Plan
<http://www.cmap.illinois.gov/documents/20583/7c1a57a4-4e4b-486f-952f-47d694df3d6f>

Chicago River Corridor Design Guidelines and Standards
[City of Chicago :: Chicago River Corridor Design Guidelines and Standards](#)

Illinois Online Boating License Course and Test
[Illinois Boating Safety Course & Online Boating License](#)
[my.Boat-ed.com: Get Your Boating License with the Boat Illinois Course](#)

Life Lines Brochure - Safety Tips That Could Save Your Life
http://www.americanwaterways.com/commitment_safety/lifelines.pdf

Top 10 safety tips for paddlers
[Top 10 Safety Tips - American Canoe Association](#)

Guidance for the establishment/development of Harbor Safety Committees
<http://www.uscg.mil/hq/cg5/nvic/pdf/2000/n1-00.pdf>

Notices for the boating public
[Boating Safety Circulars](#)

Incident reporting
<http://www.britishrowing.org/sites/default/files/rowsafe/4-1-IncidentReporting-v1.pdf>

Codes of Practice:
Safe mooring of vessels
Rowing on the Tideway
Passenger vessel operations
[Codes of Practice > Safety](#)

Guidance Documents
Mariners' Guide to Bridges on the Tidal Thames
Recreational Users Guide for the tidal River Thames
[Guidance Documents > Safety](#)