Ports and Waterways Safety Assessment

Workshop Report

Milwaukee, Wisconsin

14 – 15 May 2025

Providing Navigation Safety Information
for America's Waterways Users

Released By:
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Executive Summary

Coast Guard Sector Lake Michigan sponsored a Ports and Waterways Safety Assessment (PAWSA) workshop in Milwaukee, Wisconsin, from May 14, 2025, to May 15, 2025. Twenty participants representing a range of waterway users, stakeholders, federal, state, local regulatory and public safety authorities met and collaboratively assessed navigational safety in Port Milwaukee. This report provides a visual depiction of the study area and contains the full list of workshop participants and their associated organizations. The first day of the workshop included discussions about port and waterway attributes and vessel traffic in relation to the sixteen Waterway Risk Factors (WRFs) in the PAWSA Waterway Risk Model, which is described in more detail in this report. The Risk Characterization for each WRF was established based on participants' survey responses. Risk Characterization assesses the potential consequence, risk trend, risk tolerance, and effectiveness of existing mitigation strategies for a specific WRF. The metrics from the Risk Characterization quantitatively prioritize WRFs to inform discussions during the next phase of the workshop. During the second day, participants reviewed and validated the aggregated survey ranking of the WRFs and conducted follow-on discussions to identify and develop risk mitigation strategies. The five numerically highest WRFs ranked by participants are documented in the table below with their associated Waterway Risk Condition. This report contains a full list of prioritized WRFs with additional details.

Waterway Risk Condition	WRF
Vessel Quality & Operation	Recreational Vessels
Traffic	Congestion
Traffic	Volume of Recreational Traffic
Vessel Quality & Operation	Small Commercial Vessels
Waterway Configuration	Visibility Impediments

The recommended mitigation strategies and participant observations documented in this report will meaningfully facilitate continued collaboration between the Coast Guard and waterway stakeholders to improve safe and efficient navigation within the Marine Transportation System (MTS). The Director of Marine Transportation Systems (CG-5PW), Coast Guard's Navigation Center, and CG Sector Lake Michigan extend their sincere appreciation to participants for their contributions to the Milwaukee PAWSA workshop.

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CHAPTER 1. GENERAL

A. Background and Purpose

1. The Director of Marine Transportation Systems (CG-5PW) is responsible for developing and implementing policies and procedures that facilitate commerce, improve safety and efficiency, and maximize the commercial viability of the Marine Transportation System (MTS). In the late 1990s, the Coast Guard convened a national dialogue group (NDG) comprised of maritime stakeholders to identify the needs of waterway users with respect to Vessel Traffic Management (VTM) and Vessel Traffic Service (VTS) systems. A major outcome of the NDG was the development of the Ports and Waterways Safety Assessment (PAWSA) process, which the Coast Guard established as the formal model for facilitating stakeholder discussion to identify VTM improvements and determine candidate VTS waterways. The PAWSA methodology has been modernized several times by the CG NAVCEN and Office of Waterways & Ocean Policy (CG-WWM) since its original inception for purposes of creating a more adaptable tool available to Sector Commanders to engage the maritime community to monitor and improve the health of the MTS within their area of responsibility. The most recent PAWSA process update occurred in 2025.

2. The current PAWSA process involves convening a select group of waterway users and stakeholders to facilitate a structured workshop agenda to meet pre-identified risk assessment objectives. A successful workshop involves the participation of professional waterway users with local expertise in navigation, waterway conditions, and port safety. Stakeholder involvement is central to ensuring that important environmental, public safety, and economic consequences receive appropriate attention as risk interventions are identified and evaluated. The workshop culminates in a written report that includes proposed risk mitigations developed by participants, which is made publicly available on the CG NAVCEN's website (https://www.navcen.uscg.gov/ports-and-waterways-safety-assessment-final-reports.)

3. The PAWSA process strives to achieve the following objectives:

    a. Gather stakeholder input to identify major waterway trends, safety hazards, and potential mitigation strategies.

    b. Bolster public-private partnership and enhance cooperation across the MTS.

    c. Generate a stakeholder driven report that captures data gathered from the PAWSA to prioritize future projects impacting the MTS.

B. Methodology

1. Waterway Risk Conditions and Waterway Risk Factors. The PAWSA process is designed to convert qualitative experience, observations, and opinions of participants into quantitative assessments. This method utilizes numerical comparison among sixteen WRFs to facilitate consensus among participants to better inform conversations regarding risk mitigation strategies within an identified study area. The Waterway Risk Condition categories and associated WRFs are listed in Table 1 and further defined in Appendix B.

Navigation	**Vessel Quality & Operation**	**Traffic**	**Waterway**
Winds	Large Commercial Vessels	Volume of Commercial Traffic	Dimensions
Currents and Tides	Small Commercial Vessels	Volume of Recreational Traffic	Obstructions
Visibility Restrictions	Commercial Fishing Vessels	Waterway Use	Visibility Impediments
Bottom Type	Recreational Vessels	Congestion	Configuration

Table 1- The four Waterway Risk Condition categories and sixteen WRFs.

2. PAWSA Workshop Structure. The PAWSA workshop is a two-day facilitated process. The following sections provide more detail regarding the structure and goals for each day of a workshop. A maximum of 30 stakeholders divided into 15 two-person teams may participate.

   a. PAWSA Workshop - Day 1.

      (1) WRF Discussion. During the first day of a PAWSA, participants gain a comprehensive understanding of the workshop study area and are led through individual discussions for each WRF identified in Table 1. The purpose of these discussions is to provide a collaborative forum for stakeholders to generate a list of specific challenges unique to their respective port as related to each WRF. The identified issues serve as the starting point for the Day 2 discussions to develop risk mitigations. At the conclusion of Day 1, stakeholders complete a survey that establishes the Risk Characterization for each WRF.

      (2) Risk Characterization Survey. Risk Characterization is a combined qualitative measure of the risk tolerance, risk trend, and effectiveness of existing mitigation

strategies for a specific WRF. Surveys are completed at the end of Day 1 by the established two-person teams. The survey asks teams to evaluate the Current Risk Level, Current Risk Trend, and Current Risk Mitigations to characterize the risk associated with each WRF. Participants select from a pre-populated set of qualitative descriptors that have numeric values assigned to each answer. Table 2 provides the available selections for each Risk Characterization question.

	Available Selections
Current Risk Level	We could accept more risk
	Balanced
	Unacceptable
Current Risk Trend	Decreasing
	Steady
	Increasing
Current Risk Mitigations	Acceptable
	Acceptable, but tenuous
	Unacceptable *(*If unacceptable select all that apply*)
	Not Effective
	Too costly
	Slow operations
	Causes other issues

Table 2 - WRF Survey, Risk Characterization categories.

After each team completes the Risk Characterization survey, their assessment of the Waterway Risk Factors is compiled into a Characterization Count. The Characterization Count is crucial because it reflects how each team perceives risk for each WRF. The selected values from the survey generate a color-coded classification that informs the overall WRF Risk Characterization for each team. The results from each team survey are then aggregated together to determine the Characterization Rating for each WRF that represents the consensus of the stakeholder group. The Characterization Rating informs the prioritization of WRFs to guide mitigation development discussions during Day 2 of the workshop.

(3) Characterization Count Color Designations. Individual team Characterization Count for a WRF is designated as red, orange, yellow, or green. For this scale, red represents high risk, orange and yellow are intermediate risks, and green represents low risk. The following subsections outline the thresholds for each color-coded Risk Characterization designation for team Characterization Count.

(a) A WRF is designated with a red Risk Characterization when an individual team determines the WRF Current Risk Level is "unacceptable," or the Current Risk Mitigations are "unacceptable."

(b) A WRF is designated with an orange Risk Characterization when an individual team determines the Current Risk Trend is "increasing" and the Current Risk Mitigations are "acceptable, but tenuous."

(c) A WRF is designated with a yellow Risk Characterization when an individual team determines the Current Risk Trend is "steady" and Current Risk Mitigations are "acceptable, but tenuous."

(d) A WRF is designated with a green Risk Characterization when all other combinations of answers do not meet the threshold for red, orange, or yellow.

(4) Characterization Rating Color Designations. When the teams complete the Risk Characterization survey, their assessments are combined to calculate and assign the overall Characterization Rating for each WRF, as shown as an example in Figure 1.

WRC	WRF	Characterization	Red	Orange	Yellow	Green
Navigational	Winds	Unknown	8			7
Traffic	Congestion	Unknown	5	2		8
Vessel	Large	Unknown	6	1		8
Traffic	Commercial	Red	11	2		2
Vessel	Rec	Red	11	2		2
Navigational	Bottom	Green	5			10
Navigational	Tides	Green	4	2		9
Navigational	Vis	Green	5			10
Traffic	Rec	Green	3	2		10
Traffic	Usage	Green	3	2		10
Vessel	Fishing	Green	4			11
Vessel	Small	Green	3	1		11
Waterway	Config	Green	3	1		11
Waterway	Dims	Green	4			11
Waterway	Obstr	Green	3	2		10
Waterway	Vis	Green	1	1		13

Characterization Count - Individual Team
Red. The Risk Level is Unacceptable OR the Mitigations are Unacceptable.
Orange. The Risk Trend is Increasing AND the Mitigations are Tenuous.
Yellow. The Risk Trend is Steady and the Mitigations are Tenuous.
Green. All others.

Characterization Rating - Overall
Red. 60% or more teams rated as Red.
Orange. 60% or more teams rated as Orange OR 80% or more teams rated Yellow or higher.
Yellow. 60% or more teams rated as Yellow.
Green. 60% or more teams rated as Green.
Unknown. No clear characterization pattern.

Figure 1 – Example Risk Characterization survey results.

Characterization Rating for a WRF is designated as red, orange, yellow, green or unknown. The color-coded scale for the Characterization Rating is the same as Characterization Count, but the thresholds for attributing the color designation are

different. In Figure 1, the numbers below each of the header columns labeled red, orange, yellow, and green represent the number of individual teams that attributed a certain risk level to that specific WRF. The Characterization Rating for a WRF is determined by plurality. For some WRFs, the determination is "unknown" because there is no strong majority for a particular Characterization Rating. If a WRF is classified with an "unknown" Characterization Rating, participants are encouraged to discuss why the WRF received that designation. The following subsections outline the thresholds for each color-coded Risk Characterization Rating designation.

(a) A WRF is designated with a red, yellow, or green Characterization Rating if 60% or more of teams select that specific rating.

(b) A WRF is designated with an orange Characterization Rating if either 60% or more of teams had an orange rating or 80% or more of teams had a yellow, orange, or red rating.

(c) A WRF is designated with an unknown Characterization Rating if there is less than 60% consensus for any single rating.

b. PAWSA Workshop – Day 2. During the second day of the workshop, PAWSA facilitators present the Risk Characterization survey results and facilitate discussion among participants to determine prioritization of WRF for mitigation development. Stakeholders collaboratively determine the top five WRFs to focus dialogue for mitigation development during the remainder of the workshop. The development of mitigation strategies is guided by facilitators who extract key issues identified during discussions from Day 1. These issues are used as the starting point for participants to collaboratively brainstorm mitigations to address concerns.

CHAPTER 2. MILWAUKEE PAW PAWSA WORKSHOP

A. PAWSA Study Area

1. The geographical area for the Milwaukee PAWSA included the inner harbor, Milwaukee River, Kinnickinnic River, and Menomonee River as depicted in Figure 2. The coordinates bounding the Milwaukee study area were: 43.055°N, 087.951°W, and 42.993°N, 087.871°W. Graphic representations of this study area were used to facilitate discussion with participants. Additionally, geographically referenced comments were collected during the workshop and are documented as a chartlet in Appendix D.

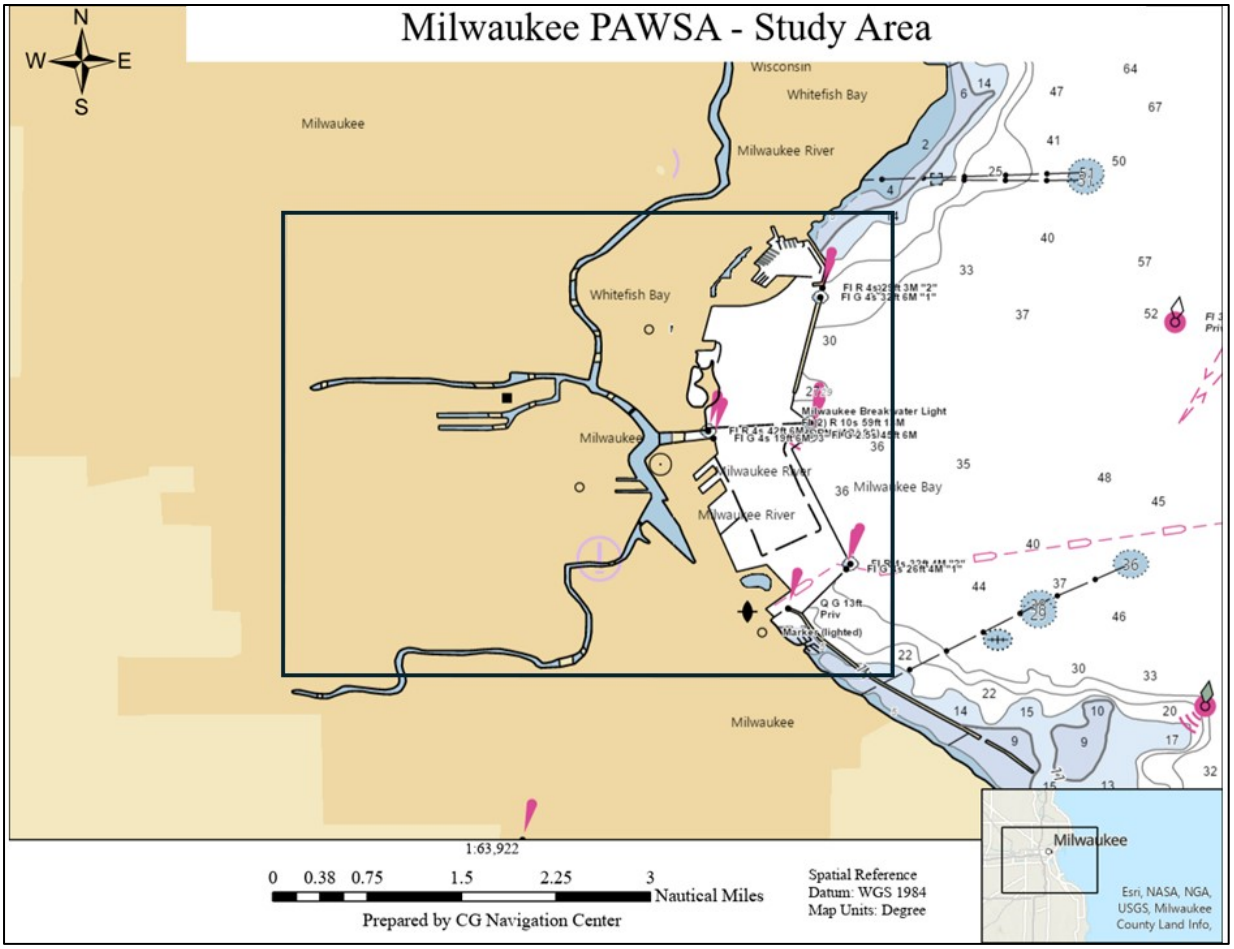

Figure 2- Milwaukee PAWSA workshop study area.

B. Participant Validation of WRF Prioritization.

1. The Risk Characterization survey results are depicted below in Figure 3. The results are grouped by Risk Characterization. These results were presented to participants to validate the prioritization order of WRFs for mitigation strategy dialogue and development.

2. The Risk Characterization results indicated a generally low level of existing risk within the Milwaukee PAWSA study area, with most WRFs categorized as green. This favorable risk profile appears to stem from the strong working relationships and proactive communication channels established among port stakeholders. The projected growth and increased vitality of the port present potential future challenges that warrant proactive mitigation strategies to maintain a safe and efficient waterway environment.

WRC	WRF	Characterization	Red	Orange	Yellow	Green
Traffic	Rec	Unknown	3	4		5
Traffic	Usage	Unknown	1	5		6
Vessel	Small	Unknown	2	4		6
Traffic	Congestion	Orange	2	8		2
Vessel	Rec	Orange	6	5		1
Navigational	Bottom	Green	1			11
Navigational	Tides	Green	2	1		9
Navigational	Vis	Green	1	2		9
Navigational	Winds	Green	2	1		9
Traffic	Commercial	Green		1		11
Vessel	Fishing	Green				12
Vessel	Large	Green		4		8
Waterway	Config	Green				12
Waterway	Dims	Green				12
Waterway	Obstr	Green		4		8
Waterway	Vis	Green	2	2		8

Characterization Count - Individual Team
Red. The Risk Level is Unacceptable OR the Mitigations are Unacceptable.
Orange. The Risk Trend is Increasing AND the Mitigations are Tenuous.
Yellow. The Risk Trend is Steady and the Mitigations are Tenuous.
Green. All others.

Characterization Rating - Overall
Red. 60% or more teams rated as Red.
Orange. 60% or more teams rated as Orange OR 80% or more teams rated Yellow or higher.
Yellow. 60% or more teams rated as Yellow.
Green. 60% or more teams rated as Green.
Unknown. No clear characterization pattern.

Figure 3- Risk Characterization survey results for all WRFs.

Following subjective evaluation, participants decided by consensus to prioritize discussions of Quality and Operation of Recreational Vessels, Congestion, Volume of Recreational Vessels, and Winds as the most significant WRFs impacting the Milwaukee PAWSA study area to mitigate. A consensus vote amongst participants determined the ranking of WRFs according to their level of concern. While Small Commercial Vessels and Visibility Impediments additionally ranked highly in the Risk Characterization Survey, participants collectively determined that the Winds were a higher priority WRF to mitigate. Due to time limitations, participants were limited to developing mitigations for four WRFs. Table 3 presents WRFs in descending priority order from high to low as ordered and validated by the participants. Mitigation strategies were discussed and developed in this order.

Waterway Risk Category	WRF
Vessel Quality & Operation	Recreational Vessels
Traffic	Congestion
Traffic	Volume of Recreational Vessels
Navigation	Winds

Table 3- Participant validated WRFs prioritized from high to low.

C. Risk Mitigation Strategies

1. The validated list of WRFs was used to prioritize discussion and development of risk mitigation strategies. Facilitators directed participants to capture potential mitigation strategies on sticky notes, which were then consolidated and grouped to identify major themes. From this bank of action items, participants were encouraged to create specific, measurable, actionable, realistic, and timebound (SMART) goals. Both types of mitigation strategies developed by participants are represented in this report. Recommended mitigation strategies documented in this section received consensus among workshop participants. Mitigation strategies are documented in order of significance to participants.

2. Participant comments are listed in Appendix C of this report and are referenced throughout this subsection to provide support of documented developed mitigation strategies.

3. <u>WRF – Recreational Vessel Quality & Operation.</u>

    a. Participants stated that some recreational vessels operating within Milwaukee Harbor and adjoining rivers fail to adhere to safe operating procedures. Issues identified by participants included recreational vessels exhibiting illegal lighting configurations, maintaining unsafe distances to commercial vessels, and a lack of situational awareness while navigating the navigable waterway in combination with general lack of knowledge of navigational rules. Participants recommended the following mitigations:

        (1) Leverage partnerships with local sailing schools, Coast Guard Auxiliary (CG AUX), United States Power Squadrons, and the Milwaukee Harbor Safety Committee (HSC) to increase public safety outreach to recreational boaters. Expand community outreach through these programs by engaging with vessel

rental companies, marinas, and boat launches to increase awareness and participation in available boater education programs.

(2) Create a training curriculum for human-powered craft (HPC) operators to address practical vessel operation topics including navigation rules and radio communication procedures. Participants proposed developing a comprehensive online resource or "one stop shop" specific to Port Milwaukee that includes local boating regulations, relevant Local Notices to Mariners (LNMs), Broadcast Notices to Mariners (BNMs), bridge closures, special events, and other relevant information for recreational boaters. Participants additionally proposed creating and promulgating QR codes at boat launches and high-volume recreational vessel areas to direct boaters to this online resource.

(3) To increase enforcement of existing vessel regulations, particularly illegal lighting, CG AUX should continue engagement with local marine dealers and conduct vessel safety checks to verify compliance with shipboard lighting regulations.

b. Wakes caused by recreational vessels, even at the posted five miles per hour speed limit, cause erosion and damage moored vessels. These wakes also create hazardous conditions for vessels entering and exiting the harbor and generate conflicts between recreational vessels under power and small HPCs in high-traffic areas. Additionally, participants noted that larger vessels traveling at five miles per hour still created significant wakes, requiring further mitigation. Participants recommended the following mitigation:

(1) Change the "5 miles per hour" regulatory signage along the river to "Slow, no wake" and install missing "No wake" signage at the North Gap harbor entry. Engage with city officials to create "Slow/No Wake" zones around piers, breakwalls, and docks on the Milwaukee River and adjoining rivers. Increase signage at boat launches and ramps to address the hazards of vessel wakes and incorporate this education into the QR code public safety outreach program prescribed in paragraph 3.a (2).

4. <u>WRF – Congestion.</u>

a. Vessel traffic congestion in Port Milwaukee is exacerbated by several factors including recreational vessels docking near waterfront restaurants and taverns, limited maneuverability of novelty watercraft, and convergence of vessels near the Hoan

Bridge. Participants further stated that locations where vessel congestion is most likely to produce safety hazards are at the confluence of the Milwaukee River and Kinnikinnic River, and the confluence of the Milwaukee River and Menomonee River. Participants recommended the following mitigations:

(1) The Milwaukee HSC should partner with business owners to discourage recreational vessels from rafting near popular waterfront restaurants that results in restricting the navigable waterway on the Milwaukee River, Kinnikinnic River, and Menomonee River. Specific businesses identified by participants to address vessel rafting included the Twisted Fisherman, Barnacle Bud's, and Boone & Crockett.

(2) Renewed communication with novelty watercraft (hot tub boats and pedal taverns) rental business owners to encourage vessels to operate along the riverbanks, avoid blind spots in riverways, and adhere to general safe operating principles. Communication with novelty watercraft rental companies should focus on limiting the operation of such vessels to safe river areas, because some types of vessels are not seaworthy in the outer harbor, and avoiding high-traffic convergence areas, including dwelling near the Hoan Bridge.

5. WRF – Volume of Recreational Vessels.

a. An increase in the volume of recreational traffic in Port Milwaukee has caused increased waterway congestion and safety concerns during high attendance events including Summerfest, Light the Hoan, fireworks displays, and air shows. Participants noted that the lack of a centralized schedule of marine events exacerbates congestion, especially near pier heads, where interactions between recreational vessels, tugs, and barges, are hazardous due to confused recreational vessel operators regarding navigational rules and draft restrictions. Participants recommended the following mitigation:

(1) Establish a centralized, publicly available online calendar or platform that lists all scheduled events impacting the Milwaukee River and harbor. Additional information on this resource available and relevant to recreational boaters should include potential bridge closures, Restricted Navigation Areas, and safety recommendations for operating near pier heads and blind corners such as the one located at Wisconsin Avenue Bridge. The calendar should be included in the QR code public safety outreach program prescribed in paragraph 3.a.(2).

6. WRF – Winds.

a. Northeast winds in the inner harbor create hazardous conditions for vessels and the potential for damage to docks and moored vessels. Wave action overtopping breakwalls during strong northeast winds further exacerbates these hazards which collectively impact the safe navigation and operation of vessels required to operate in inclement weather including emergency response operations. The newly constructed South Shore Breakwater was described as a successful existing mitigation. Participants recommended the following mitigations:

(1) Seek continued funding for U.S. Army Corps of Engineers (USACE) engineering projects to construct and maintain existing breakwalls to reduce the impact of wind and waves on docks and vessels.

(2) Designate and publicize safe mooring areas further upriver for vessels during strong wind events. Outreach should ensure that public boaters are also aware of these locations, and this information should be included in the QR code public safety outreach program prescribed in paragraph 3.a.(2).

(3) Enhance real-time monitoring of weather and harbor conditions by increasing the number of meteorological sensors and live cameras. Work is ongoing to add a live-feed camera at the under-construction South Shore Cruise Dock, located immediately east of the Lake Express High Speed Ferry Terminal. However, a need still exists to install additional sensors throughout the port.

b. A strong wind tunnel effect exists on the Milwaukee River between Wisconsin Street and Michigan Street, that creates challenging navigational conditions for commercial and recreational vessels, especially when bridge operators are not present. Participants recommended the following mitigation:

(1) Install a visual wind indicator, such as a windsock, in the vicinity of Wisconsin Street and Michigan Street to provide a readily visible indication of wind strength to mariners.

c. Wind-induced seiche currents, upwelling, and downwelling in the harbor can cause rapid changes in water depth and temperature, which increases the risk of hypothermia for recreational boaters and poses navigational hazards to larger vessels. Participants recommended the following mitigation:

(1) Increase awareness among recreational boaters of the effect of wind on water depth. Additionally, increase awareness of water temperature and associated hypothermia risks. This information should be included in the QR code public safety outreach program prescribed in paragraph 3.a (2).

Appendix A. Workshop Participants

Participant	Organization
1. Beth Fernandez	International Ship Masters' Association, Milwaukee Lodge 6
2. Greg Stamatelakys	International Ship Masters' Association, Milwaukee Lodge 6
3. Daniel Hecko	Lake Express High-Speed Ferry
4. Karen Forlenza	Milwaukee Department of Public Works Bridge Operations
5. Scott Alwin	Milwaukee Fire Department
6. Andrew Hargarten	Milwaukee Fire Department
7. Tanya Boll	Milwaukee Police Department
8. Austin Richards	Milwaukee Police Department
9. Peter Daniels	Port Milwaukee
10. Eric Polzin	Port Milwaukee
11. Maxwell Morgan	Research Vessel Neeskay
12. Paul Schwab	South Shore Yacht Club
13. Bruce Krogstad	RiverWalk Boat Tours & Rentals
14. Adam Strehlow	Wisconsin Department of Natural Resources
15. James Lubner	U.S. Coast Guard Auxiliary
16. John Veit	U.S. Coast Guard Aids to Navigation Team Two Rivers
17. Don Snider	U.S. Coast Guard Sector Lake Michigan
18. Christopher Tantillo	U.S. Coast Guard Sector Lake Michigan
19. Charlie Tenney	U.S. Coast Guard Sector Lake Michigan
20. Kevin Wagner	National Oceanic and Atmospheric Administration

Appendix B. Waterway Risk Model Terms and Definitions

A. Waterway Risk Conditions and WRF Definitions. The Ports and Waterway Safety Assessment (PAWSA) Waterway Risk Model utilizes sixteen WRFs categorized under four Waterway Risk Conditions. Definitions for each Waterway Risk Condition and their associated WRF are defined in this section.

1. Waterway Risk Condition - Navigation. The environmental conditions that affect vessel navigation, such as wind, currents, and weather.

    a. WRF -Winds. The difficulty in maneuvering vessels resulting from increased and unpredictable winds, particularly if the wind is from abeam.

    b. WRF - Tides and Currents. The difficulty in maneuvering vessels caused by water movement flow and speed, often affected by seasonal variations and sustained winds. Tide rips and whirlpools can be created by strong currents and affect the maneuverability of smaller vessels. The frequency of occurrence and the location of the strongest currents in the waterway are critical considerations (e.g., if current speed can exceed vessel speed, timing is critical when transiting the area).

    c. WRF - Visibility Restrictions. The natural conditions that may prevent a mariner from seeing other vessels, aids to navigation, or landmarks, such as fog, severe rain squalls, etc.

    d. WRF - Bottom Type. The material on the waterway bottom or just outside the channel, such as hard rock, mud, coral, etc.

2. Waterway Risk Condition - Vessel Quality and Operations. The quality of vessels and their crews that operate on a waterway. Each waterway has what are considered to be high risk vessels, such as old vessels, vessels with poor safety records, vessels registered in certain foreign countries, vessels belonging to financially strapped owners, vessels with inexperienced crews and operators, etc. When assessing risk, the following items should be considered (as appropriate) for each risk factor: maintenance, age, flag, class society, ownership, inspection record, casualty history, language barriers, fatigue related issues, and local area knowledge.

    a. WRF - Large Commercial Vessels. The quality of the large commercial vessel itself and the proficiency and quality of the crew. Large vessels are those ocean-going vessels, often in international trade, that usually are constrained by their draft to use dredged channels where such channels exist. Large vessels include such things as: oil tankers, container ships, break bulk cargo ships, and cruise liners.

    b. WRF - Small Commercial Vessels. The quality of the small commercial vessel itself and the proficiency and quality of the crew. Small vessels include all other commercial craft EXCEPT commercial fishing vessels. Examples

include tugs and towboats, offshore supply vessels, charter fishing boats, and small passenger vessels (inspected under 46 CFR Subchapters T and K), such as dinner cruises and ferries.

c. WRF - Commercial Fishing Vessels. The quality of the commercial fishing vessel itself and the proficiency and quality of the crew. These vessels are included because they are not required to undergo annual vessel inspections nor are the crewmembers required to hold USCG licenses; therefore, there may be a greater potential for increased incidents involving commercial fishing vessels.

d. WRF - Recreational Vessels. The quality of the recreational vessel itself and the proficiency and operating knowledge of the individuals who operate them. Recreational vessels include all boats used for noncommercial purposes (e.g., pleasure craft or craft used by indigenous people for transportation or subsistence fishing). They can be powered by an engine, the wind, or human exertion. Examples include yachts, personal watercraft (a.k.a., jet skis), and kayaks.

3. Waterway Risk Condition - Traffic Conditions. The number of vessels that use a waterway and their interactions.

a. WRF - Volume of Commercial Traffic. The amount of commercial vessel traffic using the waterway (i.e., the more vessels there are on the water, the more likely that there will be a marine casualty). Deep draft and shallow draft commercial vessels as well as commercial fishing vessels are included in this risk factor. Shoreside infrastructure is also addressed in this risk factor (i.e., can it handle the volume of commercial traffic within the waterway).

b. WRF - Volume of Recreational Traffic. The amount of non-commercial vessel traffic using the waterway. The volume may vary depending on the time of day, the day of the week, the season of the year, or during a major marine event.

c. WRF - Waterway Use. The interaction between vessels or boats of different sizes using the same waterway and their maneuvering characteristics. Conflicts occur as risk increases with each type of vessel's maneuvering characteristics and actions that are often different and unpredictable (e.g. commercial mariners and recreational mariners using deep draft vessels and shallow draft vessels within the same waterway).

d. WRF - Congestion. The ability of the waterway to handle the volume and density of traffic. Risk increases when a large number of vessels uses a small geographic area for an extended period of time. Risk also increases substantially when you get a larger than normal number of vessels together for a short time (e.g., fishing tournament or short season commercial fishery).

4. Waterway Risk Condition - Waterway Conditions. The physical properties of the waterway that affect vessel maneuverability.

    a. WRF - Visibility Impediments. The man-made objects (e.g., moored ships, condominiums, background lighting, etc.) or geographic formations (e.g., headlands, islands, etc.) that prevent a mariner from seeing aids to navigation or other vessels.

    b. WRF - Dimensions. The room available for two vessels to pass each other within the waterway.

    c. WRF - Obstructions. Floating objects in the water that impede safe navigation and could damage a vessel, such as ice, debris, fishing nets, etc. Fixed objects such as wrecks, pipelines, overhead wires, derelict piers, fixed bridges, and permanently moored vessels.

    d. WRF - Configuration. The arrangement of a waterway, including elements such as waterway bends, multiple and converging channels, and perpendicular traffic flow.

Appendix C. Participant Comments

A. Background.

1. This appendix documents participant observations and recommendations expressed during the workshop with respect to specific issues of concern within the study area. Discussion during the first day of the workshop was recorded and subsequently transcribed using professional services. Comments were compiled and categorized by most applicable Waterway Risk Condition and WRF.

B. Waterway Risk Condition - Navigation.

1. WRF – Winds.

a. High winds significantly impact vessel operations, particularly smaller vessels (18-feet to 25-feet in length) whose maneuverability may be restricted in winds exceeding 20 knots. Larger commercial vessels, such as tankers and cruise ships, are occasionally affected by delays or diversions due to high wind speeds. The ultimate decision to alter operations rests with the ship's captain, based on real-time conditions and individual vessel limitations.

2. Strong northeast winds cause increased wave action and overtopping in the harbor which increases risk to vessels while docking and damage to moored vessels and infrastructure. Vessels without bow thrusters have increased difficulty docking during off-the-dock wind conditions.

3. Winds are predictable throughout the year. Mariners rely heavily on real-time weather data and forecasts, particularly for information on sustained winds and gusts. Access to multiple, accurate wind data sources, including buoys and specialized wave prediction models (e.g., WaveWatch III) are crucial for safe and efficient navigation.

a. High winds can considerably increase response times for emergency services, particularly for incidents that occur in shallow water or near the shore. High winds also pose challenges to dive operations and maintenance activities on fixed structures. In certain cases, wind conditions may limit the ability to deploy assets, potentially delaying critical operations. Larger commercial vessels face fewer operational restrictions but still experience occasional disruptions due to adverse wind conditions.

4. WRF - Tides and Currents.

a. Strong currents in the Milwaukee River system can significantly impact vessel maneuverability, especially when approaching bridges, docking, or when navigating narrow passages including the South Shore Breakwater gap. The confluence of the Menominee and Milwaukee River creates a complex current dynamic, exacerbated by rain events and winds, which increases risk for downbound vessels while navigating river bends and bridge openings. Eddies, found in areas including near the North

Avenue Footbridge, present hazards to divers and can create unpredictable current conditions.

b. Kayakers and other small vessels are vulnerable to being swept downstream or becoming stranded due to strong currents, particularly when combined with opposing winds. Larger commercial vessels and ferries, are less susceptible to the direct effects of currents, but must take caution of current speeds and directions when transiting rivers, especially under bridges and while docking.

5. WRF – Visibility Restrictions.

6. Fog is the most common recurring visibility restriction in Port Milwaukee. Wildfire smoke occurs less frequently but occasionally impacts visibility in the port. Periods of reduced visibility increase risk for accidents, particularly collisions and allisions with fixed structures such as breakwalls. These conditions also hamper Search and Rescue responses times due to additional precautions taken by emergency responders during periods of low visibility.

a. Real-time visibility data for Lake Michigan is limited. Although wind data is more readily available, dedicated visibility sensors, comparable to those used at airports, are lacking in the port. This necessitates increased reliance on webcams and mariner reports for assessing current conditions. Participants recommended engaging with the National Oceanic and Atmospheric Administration (NOAA) to install a live-feed camera at weather station 45013 – ATW 20 – Atwater Park, to broadcast visibility conditions.

7. <u>WRF – Bottom Type.</u>

a. The bottom composition within the waterway varies considerably, ranging from soft mud and sand in certain areas to hard clay, rock, and significant debris in others. Hard bottomed areas, particularly near the primary breakwater gap and along the shoreline, increase the risk of damage during grounding events.

b. The Milwaukee River bottom is hazardous due to the prevalence of underwater obstructions including rebar and debris. These submerged obstructions pose entanglement risks for divers and underwater Remotely Operated Vehicle operations, as well as the risk of hull puncture to vessels. Determining responsibility for remediation of these hazards remains a challenge, as jurisdictional authority over submerged debris is not always clearly defined.

C. <u>Waterway Risk Condition - Vessel Quality and Operation.</u>

1. <u>WRF - Large Commercial Vessels.</u>

a. While the freshwater environment of the Great Lakes contributes to a longer lifespan for vessels compared to saltwater environments, the age and condition of older lake freighters is a concern. This includes the potential for fires during winter layup periods when fire suppression systems may be offline and crews are at minimal staffing levels.

Lack of consistent communication regarding the operational status of fire suppression systems on laid-up vessels poses a risk to emergency responders. While regular Coast Guard inspections and self-inspection programs exist, there are concerns about potential gaps in oversight and the need for improved communication and transparency regarding vessel conditions specifically for fire suppression systems and hull integrity.

b. While the proficiency of most large commercial vessel crews is generally considered high within the port, communication challenges exist during emergency scenarios. This includes coordination with local fire departments during shipboard fires and communication with dive teams during search and rescue operations. The potential disruption of dive operations due to the propellor wash from large commercial vessels highlights the need for better communication and coordination between vessel operators and emergency responders.

2. WRF - Small Commercial Vessels.

a. The age of some small commercial vessels, particularly those used for river cruises and tours, presents safety concerns. Older vessels may lack maneuverability and advanced technologies, such as dynamic positioning systems, found on newer vessels. This leads to difficulties navigating narrow channels, station keeping while waiting for bridge openings, and maintaining safe distances from other vessels. The disparity in technological capabilities between older and newer vessels requires mariners to exercise increased vigilance and communication with older vessels to avoid collision.

3. WRF - Commercial Fishing Vessels.

a. Commercial fishing activity in Port Milwaukee is minimal and does not present a significant risk factor. The potential exists for commercial fishing activity to increase in the future if lake trout becomes available for commercial harvest.

4. WRF - Recreational Vessels.

a. Individuals may rent vessels with minimal identification and payment, and without demonstrated proficiency or evidence of having completed a boating safety course. This results in a high number of inexperienced rental operators and contributes to unsafe boating practices on the waterway. Participants further stated that rental boat operators generally possess a poor understanding of basic navigation rules. Anecdotal evidence suggests operators exhibit a lack of situational awareness, poor understanding of vessel maneuverability, and are easily distracted, which collectively amplify risk to themselves and other vessels.

b. Many recreational boaters lack proper radio communication skills or equipment, hindering effective communication with other vessels. The inability of recreational boaters to hail or respond to radio calls increases the risk of collisions and near misses with commercial traffic. Further, a lack of awareness regarding LNMs, BNMs, and

other crucial safety information contributes to unsafe operation in complex river traffic junctions and near restricted areas.

c. The use of improper or illegal lighting aboard recreational vessels presents a significant hazard to other vessels. High-intensity headlights, aftermarket underwater lights (especially illegally installed blue lights), and readily available, inexpensive decorative lighting create confusion and contribute to waterway risks during night navigation.

D. Waterway Risk Condition - Traffic.

1. WRF - Volume of Commercial Traffic.

a. While some live Automatic Identification System (AIS) information is available through commercially available platforms such as MarineTraffic, there is a lack of centralized, publicly available scheduling information pertaining to the movement of deep-draft commercial vessels. This limited shared visibility adds difficulty for waterway users to anticipate and plan for interactions with large commercial vessels.

2. WRF - Volume of Recreational Traffic.

a. Recreational vessel traffic is highly seasonal, with peak activity during favorable weather conditions in the summer. This seasonal influx, combined with various marine events (e.g., festivals including Summerfest, Light the Hoan, fishing tournaments, fireworks displays, air and water shows, and organized boat processions,) significantly increases seasonal traffic density of recreational traffic.

3. Participants described the need for a centralized, readily accessible platform for disseminating public information pertaining to scheduled events, temporary restrictions, and marine safety information. While some information may be posted at marinas or broadcast via radio channels, it is not consistently available or easily accessible to all recreational boaters. The lack of a central repository hinders effective planning and contributes to unsafe operation, particularly for transient boaters or those unfamiliar with local regulations. The reliance on multiple reporting sources, some of which are not widely utilized by recreational boaters (e.g., LNMs and BNMs,) presently results in information gaps and increase risk during large recreational traffic events.

4. WRF - Waterway Use.

a. Conflicting waterway uses among different types of recreational vessels contributes to safety concerns. Participants noted that interactions between sailboats and recreational fishing vessels create recurring friction, with each group perceiving the other as impeding their activity. Similarly, the increasing popularity of paddle craft introduces an additional layer of challenges, particularly in congested areas where interactions with powerboats can be unpredictable.

b. Recreational shipwreck dive sites located in proximity to main traffic lanes pose challenges to navigation. While some popular dive sites are marked on charts, unmarked sites or those with poorly lit buoys increases the risk of collision, especially at night.

5. Unannounced vehicle and vessel traffic closures of the Hoan Bridge for security purposes causes marine traffic congestion. Although LNMs provide some advance notice regarding potential timeframes for closures, the imprecise nature of these closures disrupts vessel traffic flow and creates logistical challenges for waterway users.

6. WRF – Congestion.

a. Congestion at the confluence of the Milwaukee and Kinnikinnic Rivers, and the Milwaukee and Menomonee Rivers, were reported by participants as primary locations of concern. The convergence of vessels navigating in varying directions within these constricted areas creates unpredictable traffic patterns and increases risk of collisions. This risk is further amplified during peak hours when recreational vessels frequent waterfront restaurants and taverns, leading to increased vessel density and reduced maneuverability.

7. Novel watercraft, such as floating hot tubs and pedal taverns, contribute to waterway congestion. Although these vessels are operating within existing regulations, their slow speeds, limited maneuverability, and sometimes unusual dimensions can disrupt traditional traffic patterns and increase congestion in high-traffic areas. The rapid emergence and evolving nature of these crafts make it difficult for regulations and safety guidelines to keep pace, creating a need for proactive communication and collaboration between rental operators, users, and maritime authorities.

E. Waterway Risk Condition – Waterway.

1. WRF – Dimensions.

a. Current waterway dimensions require cruise ships to moor at an industrial dock, which requires captains to undertake complex maneuvers such as backing up the channel. Port Milwaukee is building a new cruise ship facility, the South Shore East cruise dock, which is anticipated to mitigate these challenges by accommodating larger vessels and facilitating safer, more efficient mooring procedures.

2. WRF – Obstructions.

a. Participants noted that various forms of floating debris pose navigational hazards including tree branches, lost fishing gear, and deadheads. These obstructions are particularly prevalent after heavy rainfall events when debris is carried downstream.

3. Participants raised concerns about a floating dry dock positioned near the Kinnikinnic River South 1st Street Bridge regarding safe passage for vessels when only one leaf of the bridge is open and the navigable waterway is restricted.

a. Damaged fendering and protruding spikes at the corners of piers at Jones Island pose a risk to vessels maneuvering in close proximity, particularly those without tug assistance.

4. WRF – Visibility Impediments

a. Lighting on land, particularly during events like Summerfest, creates background illumination that hinders the visibility of Aids to Navigation and other vessels. Participants noted that the intensity of these lights washes out navigational signals, creating hazardous conditions for mariners. Headlights and taillights of vehicles transiting on roadways adjacent to waterways further exacerbates this issue.

b. Decorative light-emitting diodes on the Hoan Bridge can obscure navigational lighting and make it challenging for mariners to determine vessel position and heading when approaching from Lake Michigan. The lack of a predictable schedule for lighting color changes further complicates navigation. Participants noted that the planned expansion of this lighting to the east face of the bridge has raised concerns among waterway users.

5. WRF – Configuration.

a. The sharp river bend and presence of private docks near the Wisconsin Street Bridge create a blind turn that restricts visibility and makes maneuvering challenging for larger vessels. The combination of the sharp bend, bridge angle, and proximity of structures collectively contribute to waterway risk in this location.

Appendix D. Geospatial Participant Comments

Facilitators captured participant observations that made specific geographic references. Those observations were then transferred to an ArcGIS online web-application to generate the chartlet reflecting the location and specific context of each comment. The chartlet, included below, is represented as Figure 1.

Geospatial Comments	
Point	**Comment**
1	Instability and potential dock collapse was reported at riverfront dock west of South 2nd Street, accompanied by ground subsidence into the river, presenting a navigational hazard due to possible shoaling.
2	Strong winds and currents at the confluence of the Milwaukee and Menomonee Rivers pose navigational challenges, particularly for downbound vessels transiting beneath the Water Street Bascule Bridge.
3	Significant wind channeling effects were reported near the Michigan Street Lift Bridge which cause a hazard to navigation to underpowered vessels and human powered crafts.
4	Strong currents and wind conditions were reported at the confluence of the Milwaukee and Menomonee Rivers, which may present navigational challenges to downbound vessels transiting under the Water Street Bascule Bridge.
5	The confluence of the Milwaukee, Kinnickinnic Rivers, and the harbor entrance experiences significant vessel traffic density, with convergence of numerous powered and human-powered craft. This area presents a heightened risk of congestion and potential conflicts due to vessels converging from multiple directions.
6	Strong northeast winds have resulted in bollard failures and damage to docks on the east side of the Kinnickinnic River.
7	Small private vessels frequently create traffic conflicts with large vessel commercial traffic despite sécurité calls and pose a safety concern to larger vessels in the area between the Hoan Bridge and the pierheads.
8	Occasionally north and southbound vessels transiting outside the Milwaukee pierheads do not yield appropriately to outbound vessels that are constrained by draft or maneuverability, which increases potential for vessel collision.
9	The south gap of the Milwaukee breakwater can induce eddy formations in close proximity to the Milwaukee-Muskegon Lake Express Fast Ferry route which occasionally presents navigational challenges to vessel operators unfamiliar with local conditions.

Table 1- Geospatial Comments.

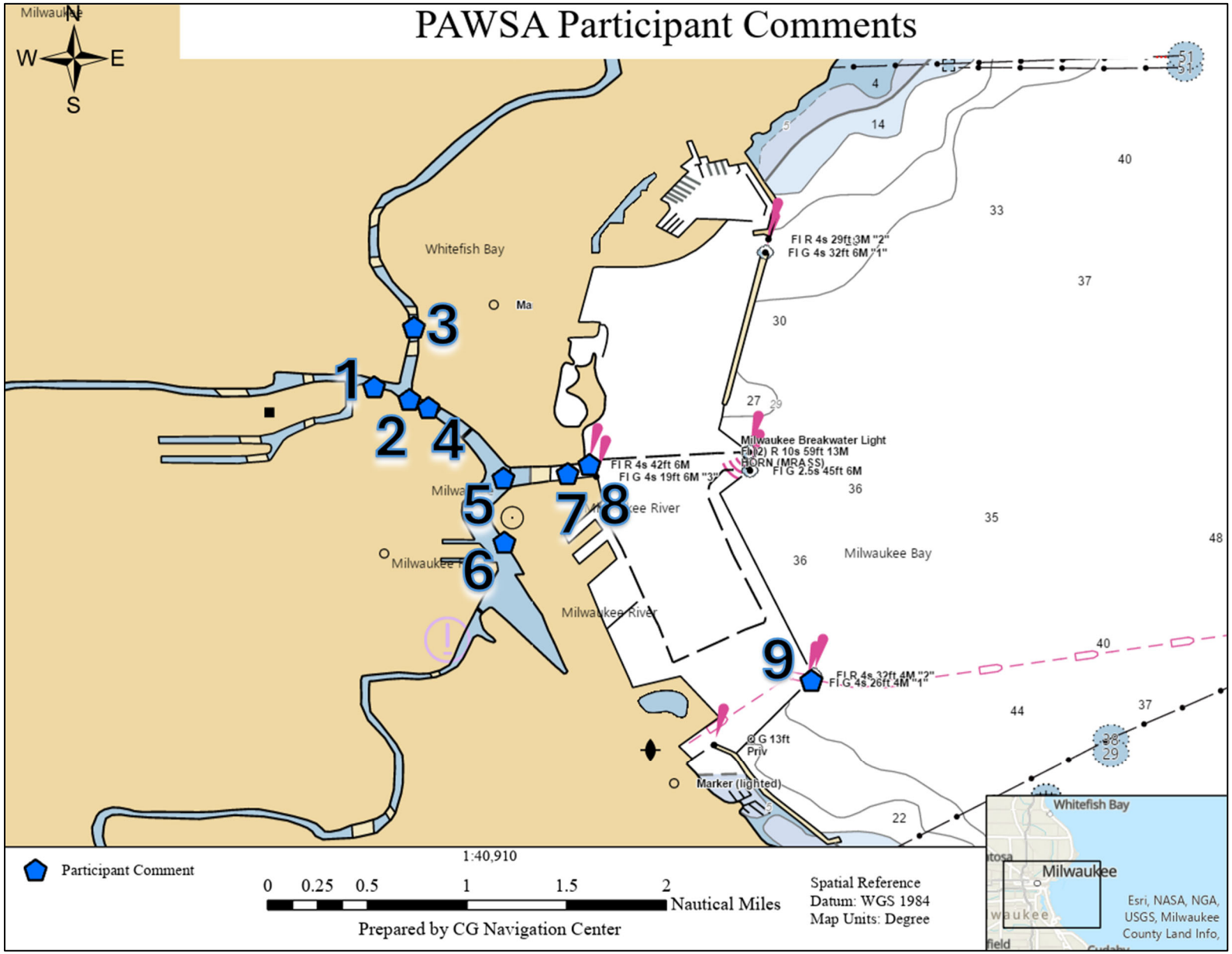

Figure 1- Mapped location of geospatial comments of Participants.