Ports and Waterways Safety Assessment Workshop Report

Columbia River, Oregon
7 – 8 November 2023

Providing Navigation Safety Information for America's Waterways Users

Released By:
CAPT Margaret Kennedy
Commanding Officer
U.S. Coast Guard Navigation Center

The views and opinions expressed in Chapter 2, Section B-E, Appendix C and Appendix D of this report are those of the participants and do not reflect the official view or position of the United States Coast Guard. This information is a posting for the public's information alone and the Coast Guard does not endorse this information or anything on it. The USCG disclaims responsibility and liability for the information, its messaging, and its content.

Executive Summary

Coast Guard Sector Columbia River sponsored a Ports and Waterways Safety Assessment (PAWSA) workshop in Portland, OR, from November 7, 2023, to November 8, 2023. Eighteen participants representing a range of waterway users, stakeholders, federal, state, and local regulatory and public safety authorities met to collaboratively assess navigational safety on the waterways adjoining the Columbia River. Prior to the workshop, the Coast Guard Navigation Center (CG NAVCEN) facilitated a stakeholder engagement meeting on September 13, 2023, to enhance community outreach and prepare stakeholders for the formal workshop. 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 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 Baseline Risk Value (BRV) and Risk Characterization for each WRF were established based on participants' survey responses. BRV quantifies the overall risk, whereas Risk Characterization assesses the potential consequence, risk trend, risk tolerance, and effectiveness of existing mitigation strategies for a specific WRF. The metrics from the BRV and Risk Characterization were combined to 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. Participants opted to combine discussion of mitigations for Tides and Currents with Visibility Restrictions and separately combine discussion of mitigations for Dimensions with Obstructions. This report contains a full list of prioritized WRFs with additional details.

Waterway Risk Condition	WRF
Vessel Quality and Operation	Large Commercial Vessels
Navigation	Tides and Currents
Vessel Quality and Operation	Recreational Vessels
Waterway	Dimensions
Traffic	Waterway Use

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 Columbia River Marine Transportation System (MTS). The Director of Marine Transportation Systems (CG-5PW), CG NAVCEN, and USCG Sector Columbia River extend their sincere appreciation to participants for their contributions to the Columbia River PAWSA workshop.

TABLE OF CONTENTS

Appendix List

CHAPTER 1. GENERAL

A. Background and Purpose

1. 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 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 PAWSA process, which the Coast Guard established as the formal model for facilitating stakeholder discussion to identify VTM improvements and determine candidate VTS waterways. In 2020, CG NAVCEN modernized the PAWSA process to create a more flexible tool available to Sector Commanders to engage the maritime community for purposes of monitoring and improving the health of the MTS within their area of responsibility.

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 WRFs. 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 for purposes of facilitating 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 outlined in Table 2 below and further

defined in Appendix B.

Waterway Risk Conditions	Navigation	Vessel Quality & Operation	Traffic	Waterway
WRFs	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. Waterway Risk Model. The PAWSA Waterway Risk Model defines risk as the product of the probability of an unwanted event and the consequences resulting from that event. Figure 1 provides a visualization of the relationship between the probability of an unwanted event for each Waterway Risk Condition and the impact of the risk in terms of Immediate and Subsequent Consequences. Appendix B provides an explanation of Immediate and Subsequent Consequences as defined by the PAWSA Waterway Risk Model.

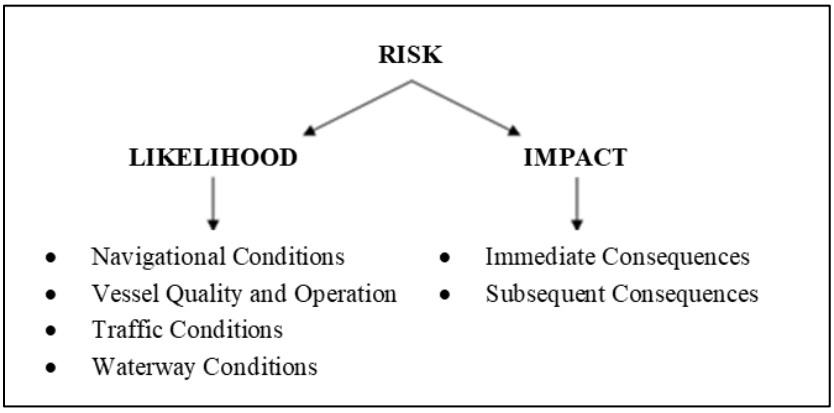

Figure 1- Relationship between risk, likelihood, and impact.

3. WRF Survey. During day one of the workshop participants are led through individual discussions for each WRF identified in Table 2. Each discussion concludes with the completion of a three-part participant survey that establishes the BRV and Risk Characterization for each risk factor. Following completion of all surveys, the WRFs are numerically prioritized by BRV and Risk Characterization from greatest to least. At the beginning of the second day of the workshop, the order of the risk factors are presented to participants for validation and consensus to prioritize mitigation strategy discussions and development. A description of the methodology to calculate the BRV and Risk

Characterization is provided in the following sub-sections.

a. BRV. This value is calculated using numerical values attained from Part One and Part Two of the survey that are then input into the formula outlined in Figure 2.

(1) Part One. The first section of the survey asks participants to evaluate the Risk Level of a specific risk factor based on four options specific to each individual WRF. Risk Levels are presented as written options to participants. Each written option has an associated numerical value between one and four based on their likelihood. Appendix B contains a list of the WRFs and the associated Risk Level options with their attributed numerical value.

(2) Part Two. The second section of the survey asks participants to assign the Impact Level for Immediate and Subsequent Consequences associated with each risk factor. Appendix B contains the list and definition of Immediate and Subsequent Consequences.

(a) The Impact Level of Immediate and Subsequent Consequence are presented as three choices for each WRF. The choices correlate to the numerical values shown in Table 3.

Impact Level of Consequence	Numerical Value
None or hardly any impacts	0
Moderate impact	0.5
Impacts are likely severe	1

Table 2- Impact level of consequences with associated numerical value.

(b) The numerical values for Risk Level from Part One and Impact Level from Part Two of the survey are used in the formula outlined in Figure 2 to calculate the associated BRV for each WRF. The BRV numerically ranges between zero and eight, with zero representing low BRV and eight representing high BRV.

$$\text{BRV} = (\text{Risk level}) \times \left(\frac{\sum \text{Immediate Consequences}}{4} + \frac{\sum \text{Subsequent Consequences}}{4} \right)$$

Figure 2- Risk Value formula.

b. Risk Characterization. Risk Characterization is ascertained from Part Three of the survey. It provides additional context to the BRV generated from Part One and Part Two of the survey and is mainly used by facilitators to better guide participant discussion.

(1) Part Three. The third section of the survey asks participants to evaluate Risk Characterization in terms of the Current Risk Level, Risk Trend, and Current Mitigations. Table 4 provides the associated available selections for each Risk

Characterization Category. Questions to ascertain Risk Characterization are standard for all WRFs. The answers to these questions are calculated by plurality, wherein the option that was most frequently selected by participants serves as the prevalent group consensus for each question. In the event a plurality cannot be determined, PAWSA facilitators examine the raw data and determine the most appropriate selection.

Risk Characterization Category	Available Selections
Current Risk Level	We could benefit by accepting more risk
	The level of risk is acceptable, keep the status quo
	Unacceptably high risk
Risk Trend	Increasing
	Decreasing
	Staying the same
Current Mitigations	Acceptable
	Acceptable, but tenuous
	Unacceptable, we need more or better mitigations

Table 3- WRF Survey Part Three, Risk Characterization categories.

CHAPTER 2. COLUMBIA RIVER PAWSA WORKSHOP

A. PAWSA Study Area

1. The geographical area for the Columbia River PAWSA included the Columbia River from the sea buoy to the Cascade Locks as depicted in Figure 3. The boundaries for the Columbia River study area are defined by the following coordinates: 46.564ºN, 124.421ºW and 45.321ºN, 122.234ºW. 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 chartlets in Appendix D.

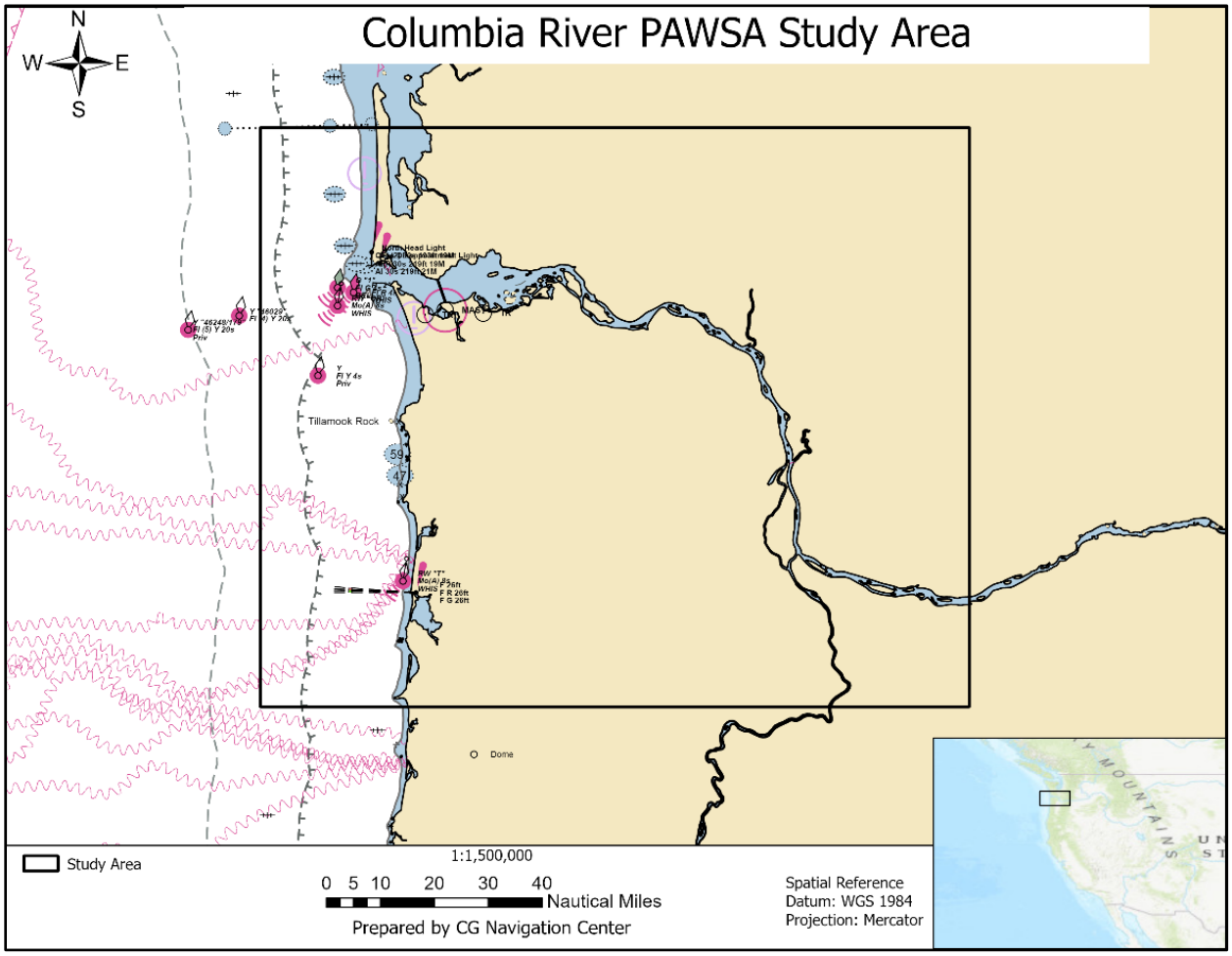

Figure 3- Columbia River PAWSA workshop study area.

B. BRV

1. The resultant BRV using the methodology described in Chapter 1.C for the Columbia River PAWSA workshop is depicted in Figure 4.

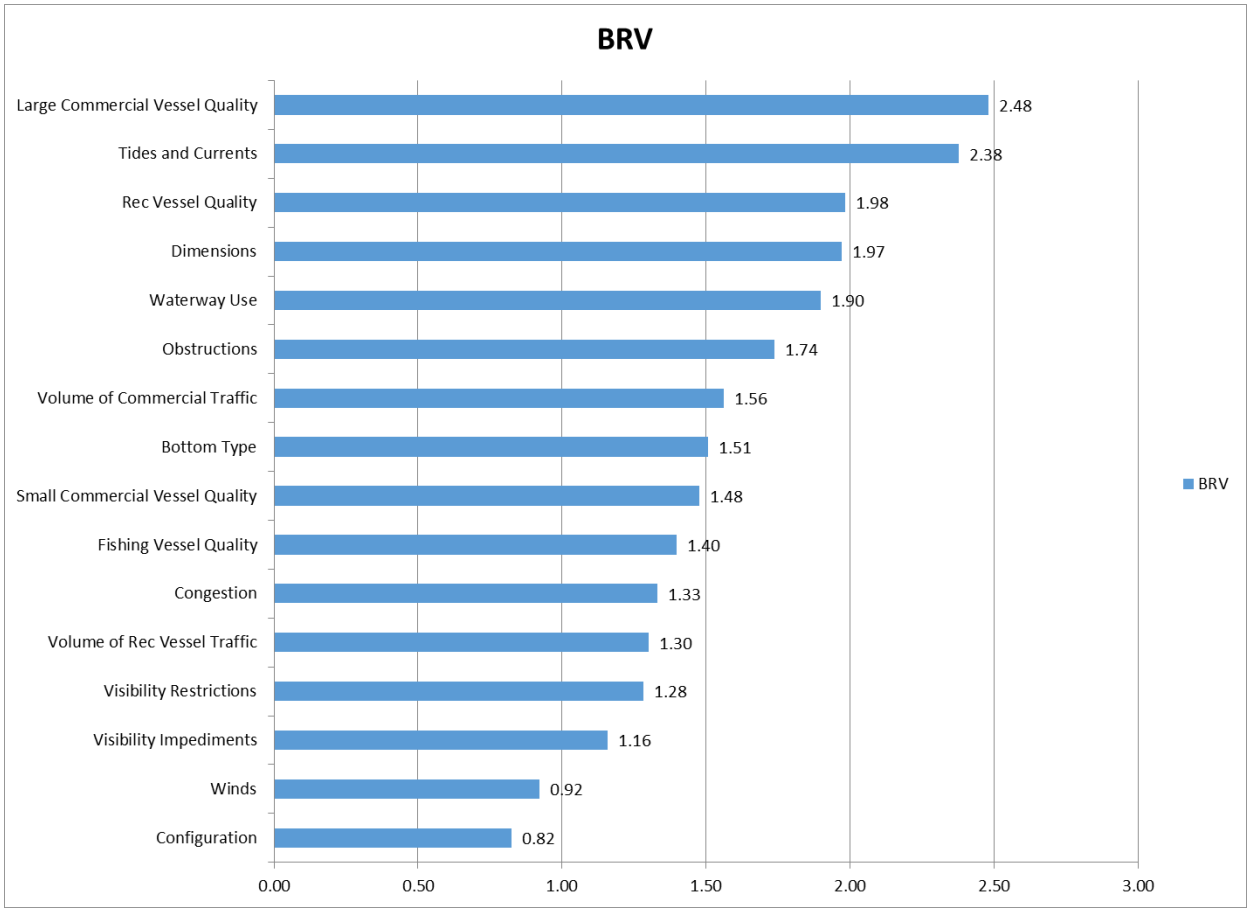

Figure 4- Columbia River PAWSA workshop WRF BRV.

2. The five highest priority WRFs and their associated Waterway Risk Condition for the Columbia River PAWSA prior to combining the BRV with the Risk Characterization results are documented in Table 5.

Waterway Risk Condition	WRF
Vessel Quality and Operation	Large Commercial Vessels
Navigation	Tides and Currents
Vessel Quality and Operation	Recreational Vessels
Waterway	Dimensions
Traffic	Waterway Use

Table 4- Five highest priority WRF based on BRV.

C. Risk Characterization

1. The Risk Characterization for each WRF use the methodology described in Chapter 1.C for the Columbia River PAWSA Workshop is presented in Table 6.

WRF Risk Characterization				
Waterway Risk Condition	**WRF**	**Current Risk Level**	**Current Risk Trend**	**The Current Mitigations Are**
Navigation	Winds	The level of risk is acceptable, keep the status quo.	Staying the same	Acceptable
Navigation	Tides and Currents	The level of risk is acceptable, keep the status quo.	Staying the same	Acceptable but tenuous
Navigation	Visibility Restrictions	The level of risk is acceptable, keep the status quo.	Staying the same	Acceptable
Navigation	Bottom Type	The level of risk is acceptable, keep the status quo.	Staying the same	Acceptable
Vessel Quality & Operation	Large Commercial Vessels	The level of risk is acceptable, keep the status quo.	Increasing	Acceptable but tenuous
Vessel Quality & Operation	Small Commercial Vessels	The level of risk is acceptable, keep the status quo.	Staying the same	Acceptable
Vessel Quality & Operation	Fishing Vessels	The level of risk is acceptable, keep the status quo.	Staying the same	Acceptable but tenuous
Vessel Quality & Operation	Recreational Vessels	Unacceptably high risk.	Increasing	Unacceptable, we need more/better mitigations
Traffic	Volume of Commercial Traffic	The level of risk is acceptable, keep the status quo.	Increasing	Acceptable
Traffic	Volume of Recreational Traffic	The level of risk is acceptable, keep the status quo.	Increasing	Unacceptable, we need more/better mitigations
Traffic	Waterway Use	The level of risk is acceptable, keep the status quo.	Increasing	Acceptable but tenuous
Traffic	Congestion	The level of risk is acceptable, keep the status quo.	Staying the same	Acceptable but tenuous
Waterway	Dimensions	The level of risk is acceptable, keep the status quo.	Increasing	Acceptable but tenuous
Waterway	Obstructions	The level of risk is acceptable, keep the status quo.	Increasing	Acceptable
Waterway	Visibility Impediments	The level of risk is acceptable, keep the status quo.	Staying the same	Acceptable
Waterway	Configuration	The level of risk is acceptable, keep the status quo.	Increasing	Acceptable

Table 6- Columbia River PAWSA workshop WRF Risk Characterization.

D. Validation WRF Prioritization.

1. The combined WRF BRV and Risk Characterization results are depicted below in Table 7. These results were presented to participants to validate the prioritization order of WRFs for mitigation strategy dialogue and development. The rows highlighted in green in Table 7 represent the highest priority WRFs for the Columbia River PAWSA workshop participants following the prioritization validation discussion.

			Risk Characterization		
Waterway Risk Condition	**WRF**	**Baseline Risk Value**	**Current Risk Level**	**Current Risk Trend**	**The Current Mitigations Are**
Vessel Quality and Operation	Large Commercial Vessels	2.48	The level of risk is acceptable, keep the status quo	Increasing	Acceptable but tenuous
Navigational Conditions	Tides and Currents	2.38	The level of risk is acceptable, keep the status quo	Staying the same	Acceptable but tenuous
Vessel Quality and Operation	Recreational Vessels	1.98	Unacceptably high risk	Increasing	Unacceptable, we need more/better mitigations
Waterway Conditions	Dimensions	1.97	The level of risk is acceptable, keep the status quo	Increasing	Acceptable but tenuous
Traffic	Waterway Use	1.90	The level of risk is acceptable, keep the status quo	Increasing	Acceptable but tenuous
Waterway Conditions	Obstructions	1.74	The level of risk is acceptable, keep the status quo	Increasing	Acceptable
Traffic	Volume of Commercial Traffic	1.56	The level of risk is acceptable, keep the status quo	Increasing	Acceptable
Navigational Conditions	Bottom Type	1.51	The level of risk is acceptable, keep the status quo	Staying the same	Acceptable
Vessel Quality and Operation	Small Commercial Vessels	1.48	The level of risk is acceptable, keep the status quo	Staying the same	Acceptable
Vessel Quality and Operation	Fishing Vessels	1.40	The level of risk is acceptable, keep the status quo	Staying the same	Acceptable but tenuous
Traffic	Congestion	1.33	The level of risk is acceptable, keep the status quo	Staying the same	Acceptable but tenuous
Traffic	Volume of Recreational Traffic	1.30	The level of risk is acceptable, keep the status quo	Increasing	Unacceptable, we need more/better mitigations
Navigational Conditions	Visibility Restrictions	1.28	The level of risk is acceptable, keep the status quo	Staying the same	Acceptable
Waterway Conditions	Visibility Impediments	1.16	The level of risk is acceptable, keep the status quo	Staying the same	Acceptable
Navigational Conditions	Winds	0.92	The level of risk is acceptable, keep the status quo	Staying the same	Acceptable
Waterway Conditions	Configuration	0.82	The level of risk is acceptable, keep the status quo	Increasing	Acceptable

Table 5- Combined BRV and Risk Characterization results for all WRFs.

2. Following subjective evaluation, participants selected Large Commercial Vessels, Tides and Currents, Recreational Vessels, Dimensions, Obstructions, and Visibility Restrictions as the most significant WRFs that contributed to potential incidents in the Columbia River PAWSA study area. WRFs were ordered by the participant's criticality of concern. Table 8 presents the concerns in descending order of priority, from the most to the last significant. The mitigation strategies were discussed and developed in this order. Although Tides and Current and Visibility Restrictions were separate WRFs participants chose to combine discussion because many of the concerns and mitigation strategies were interrelated.

Waterway Risk Condition	WRF
Vessel Quality and Operation	Large Commercial Vessels
Navigation Conditions	Tides and Currents
Navigation Conditions	Visibility Restrictions
Vessel Quality and Operation	Recreational Vessels
Waterway Conditions	Dimensions
Waterway Conditions	Obstructions

Table 6- Validated and prioritized WRFs listed from top to bottom.

E. 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 as well as general goals. Both kinds 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 – Large Commercial Vessels.</u>

    a. Participants noted an increase in frequency and severity of mechanical issues and decrease in overall mechanical reliability due to required vessel compliance with emission regulations. These regulations vary from state to state. Vessels will often comply with the strictest state standards, to reduce operational burden and confusion to the crews, leading to further reliability issues (Appendix C, C.1.c). It was noted that vessel age in the port was increasing which has resulted in a material degradation of vessels in the port (Appendix C, C.1.b). The Coast Guard issued "Marine Safety Information Bulletin (MSIB) 02-23 Use of Engine/Shaft Power Limiters in Pilotage Waters" to mitigate the risk from this issue. Participants recommended the following

additional mitigations:

(1) Create a voluntary harbor safety plan measure to establish a tug escort for outbound crude oil tankers.

(2) Establish a single uniform emissions standard for the maritime community.

(3) Change class society rules to ease vessels' ability to control emission limiters and better enforce the pre-entrance disabling of power limiters.

b. Participants noted an increase in issues relating to visibility from the bridge on large commercial vessels carrying wind turbine blades as cargo. Participants observed that blades are loaded in a manner that they impact visibility from the vessel's pilot house for the crew. The Coast Guard issued "MSIB 04-23 Reduced Visibility from the Navigation Bridge" prevent the issue from worsening (Appendix, C C.1.d). Participants recommended the following additional mitigations:

(1) Strengthen the Coast Guard's enforcement of bridge visibility issues.

(2) Resolve or harmonize class rules regarding bridge visibility.

c. Participants observed a decrease in verbal English language proficiency onboard large commercial vessels. This contributed to an increase in language barriers and communication challenges on these types of vessels in the port. Participants stated they believed this was an issue for approximately 80% of large commercial vessels (Appendix C, C.1.a). To mitigate this issue, participants recommended having the Coast Guard place a stronger emphasis on English proficiency for crews.

4. <u>WRF – Tides and Currents and Visibility Restrictions.</u> Participants opted to combine discussion of mitigation strategies for Tides and Currents and Visibility Restrictions.

a. Participants noted a lack of real-time data on the Columbia River. There were no real-time current meters on the river; the current data provided was interpolated from the tidal data in real-time (Appendix C, B.2.b). Participants observed the lack of available visibility data. It is left to pilot discretion to determine if the visibility is too restricted for a vessel transit (Appendix C, B.3.a). Participants recommended the following additional mitigations:

(1) Establish current sensors and increase the amount of wind/fog sensors to help collect a more accurate representation of the environmental conditions on the river for mariners.

(2) Continue support of the Coast Guard's Memorandum of Understanding (MOU) with NOAA to service weather buoys.

b. The tides and currents in the Columbia River are primarily controlled by the release of water from upstream dams governed by the Columbia River Treaty and Flood Risk Management Program, which expires in September of 2024 (Appendix C, B.2.c).

Additionally, external factors influencing river height create significant variability for the tides and currents, causing larger vessels to transit in stages in order to adapt to pulses of tidal water in the river (Appendix C, B.2.d). To mitigate this issue, participants recommended to establish an initiative to renew and amend the Columbia River Treaty prior to the current treaty expiration.

5. WRF – Recreational Vessels.

   a. Participants noted that many recreational vessels operating on the Columbia River do not have the same understanding of the Rules of the Road as experienced licensed mariners (Appendix C, C.4.a). This was especially prevalent during salmon season when hundreds of recreational boaters congregated around Buoy 10 and did not understand that large vessels were restricted to the channel (Appendix C, C.4.c). Participants recommended the following additional mitigations:

      (1) Streamline boater safety courses between Washington and Oregon, specifically by:

         (a) Encouraging counties to better enforce Oregon boater requirements such as the requirement to have a boater safety card to purchase a boat.

         (b) Increasing public service announcements with a heightened emphasis on boater safety.

         (c) Supporting the Coast Guard Auxiliary efforts to increase education campaigns at locations such as boat shows, schools, and marinas.

         (d) Enhancing regulatory requirements for becoming a fishing guide.

      (2) Increase enforcement for violations of Rule 9, Narrow Channels, through cooperation between the Coast Guard and county entities. It was additionally recommended to publicize and seek higher penalties for violations, specifically by:

         (a) Increasing enforcement early in each season.

         (b) Strengthening law enforcement presence on the water.

         (c) Supporting law enforcement efforts to monitor traffic volume.

         (d) Increasing local engagement and boater safety education to encourage recreational vessels to reduce to safe speed and avoid close quarter crossing situations.

      (3) Recommend to the Oregon State Marine Board to create an outreach campaign to encourage recreational boaters to stay clear of ships transiting in the channel.

      (4) Emphasize the significance of the harbor safety committee to the community to

help foster representation from the recreational vessel and sailing communities.

6. WRF – Dimensions and Obstructions. Participants opted to combine discussion of mitigation strategies for Dimensions and Obstructions.

   a. Increased vessel sizes (Appendix C, E.2.a) has put a strain on the current anchorages and turning basins as well as the air gap clearance for bridges (Appendix C, E.3.d). Participants recommended the following additional mitigations:

      (1) Perform an analysis using vessel Automatic Identification System (AIS) data to support realignment of the channel in the vicinity of long view bridge and the U.S. Gypsum facility.

      (2) Continue to advocate to state and federal legislatures for support funding and appropriations for channel maintenance.

      (3) The channel was last deepened in 2010. Participants recommended to conduct a study to determine if a need exists to widen and/or deepen the channel and to specifically consider the following:

         (a) Dredging the Willamette River as needed to support two-way traffic flow.

         (b) Increasing the channel project depth to 45', which is close to the current design of the class of ships that navigate the Columbia River.

         (c) Increasing the width of the channel to address safety concerns associated with increased vessel lengths. Margins for error have decreased with the increase in vessel size.

      (4) Continue the development of the proposed anchorages at Rice Island, Port Westward, and Crimms Island and designate additional anchorages near Wauna and/or Puget Island for fully loaded vessels.

      (5) Collaborate with U.S. Army Corps of Engineers (USACE) to place stern buoys to mitigate vessel swing radius from entering the channel.

      (6) Continue the USACE study for the establishment of two new turning basins.

      (7) Establish air gap sensors on bridges to provide real time data from the bridge to the waterline.

   b. There is an issue with derelict vessels in the waterway (Appendix C, C.2.b). Presently funding is dedicated to the removal of larger vessels leaving fewer resources for the removal of smaller vessels. Some vessels are tied off to pile dikes and are at risk of breaking free during adverse conditions. The process to remove derelict vessels is expensive, onerous, and time consuming. Currently there is a working group to address funding and removal. Additional mitigations participants recommended

included to:

(1) Continue to advocate for funding to remove derelict vessels.

(2) Advocate for and support funding for local vessel turn in-programs.

Appendix A. Workshop Participants

Participant	Organization
Commercial Shipping and Tow	
1. Carl Bertapelle	Merchants Exchange
2. Christi Dunham	Inchcape Shipping
3. Jon Hellberg	Shaver Transportation
4. Ross McDonal	Sause Brothers
Community Planning	
5. Ken Davaiv	Port of Vancouver
6. Dena Horton	Pacific Northwest Waterways Association
7. Kate Mickelson	Columbia River Steamship Operators' Association
8. Scott Ouchi	Port of Vancouver
9. Richard Troudt	Port of Vancouver
10. Richard Vincent	Port of Portland
Cruises, Tours, and Charters	
11. Christian Kanschat	American Cruise Lines
Physical Infrastructure	
12. Casey O'Donnell	U.S. Army Corps of Engineers
Pilots	
13. Dan Jordan	Columbia River Bar Pilots
14. Ken Lawrenson	Columbia River Pilots
Public Safety and Emergency Management	
15. Jim Fenske	U.S. Coast Guard Auxiliary
16. Brian Kirk	Washington Department of Ecology
17. Sean Kuschel	Washington Department of Ecology
18. Sean Whalen	Portland Fire Rescue

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 uses sixteen WRFs categorized under four Waterway Risk Conditions. Definitions for each Waterway Risk Condition and their associated WRF are provided 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 engaged 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. Besides local knowledge, understanding of the rules of the road and inebriation also should be considered for this risk factor.

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.

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

B. WRF Survey. During the first day of the PAWSA workshop, facilitators guide participants through a discussion about each WRF. Following each dialogue, participants take a three-part survey that is used to prioritize the development and discussion of mitigation strategies during the second day of the PAWSA. The following sections provide the associated numerical values, selection options, and definitions for Part One and Part Two of the WRF Surveys that are utilized to calculate the BRV of each WRF.

1. Part One. This first section of the survey asks participants to evaluate the likelihood of a specific WRF based on four available selections. Likelihoods are presented as written options to participants. Each written option has an associated numerical value between one and four based on the likelihood of the condition. Tables 1- 4 in this appendix provide the four written options and associated point value for each WRF.

Waterway Risk Condition - Navigation	
WRF - Winds	
Selection Option	**Point Value**
Strong winds affect maneuverability less than twice a month and are well forecasted.	1
Strong winds affect maneuverability more than twice a month but are well forecasted.	2
Strong winds affect maneuverability less than twice a month but without warning.	3
Strong winds affect maneuverability more than twice a month and without warning.	4
WRF – Tides and Currents	
Selection Option	**Point Value**
Fast tidal and seasonal currents are weak.	1
Fastest tidal and seasonal currents are moderate.	2
Fastest tidal and seasonal currents are strong but do not affect maneuverability.	3
Fastest tidal and seasonal currents are strong and affect maneuverability.	4
WRF – Visibility Restrictions	
Selection Option	**Point Value**
Restricted visibility occurs less than 24 days a year.	1
Restricted visibility occurs more than 24 days a year but usually persists less than 6 hours.	2
Restricted visibility occurs more than 24 days a year but usually persists less than 24 hours.	3
Restricted visibility occurs more than 24 days a year and usually persists more than 24 hours.	4
WRF – Bottom Type	
Selection Option	**Point Value**
Deep water throughout the waterway; no channel is needed, vessel breakdown unlikely to result in grounding or allision.	1
Soft bottom with no hard obstructions.	2
Soft bottom with some hard obstructions.	3
Hard or rocky bottom.	4

Table 1- Selection options and point values for WRFs categorized under the Waterway Risk Condition – Navigation.

Waterway Risk Condition - Vessel Quality and Operation	
WRF – Large Commercial Vessel Quality and Operation	
Selection Option	**Point Value**
All of the large commercial vessels using the waterway are materially sound and are operated proficiently.	1
Most of the large commercial vessels using the waterway are materially sound and are operated proficiently.	2
Many of the large commercial vessels using the waterway are materially sound and are operated proficiently.	3
Some of the large commercial vessels using the waterway are materially sound and are operated proficiently.	4
WRF – Small Commercial Vessel Quality and Operation	
Selection Option	**Point Value**
All of the small commercial vessels using the waterway are materially sound and are operated proficiently.	1
Most of the small commercial vessels using the waterway are materially sound and are operated proficiently.	2
Many of the small commercial vessels using the waterway are materially sound and are operated proficiently.	3
Some of the small commercial vessels using the waterway are materially sound and are operated proficiently.	4
WRF – Commercial Fishing Vessel Quality and Operation	
Selection Option	**Point Value**
All of the commercial fishing vessels using the waterway are materially sound and are operated proficiently.	1
Most of the commercial fishing vessels using the waterway are materially sound and are operated proficiently.	2
Many of the commercial fishing vessels using the waterway are materially sound and are operated proficiently.	3
Some of the commercial fishing vessels using the waterway are materially sound and are operated proficiently.	4
WRF – Recreational Vessel Quality and Operation	
Selection Option	**Point Value**
All of the recreational vessels using the waterway are materially sound and operated proficiently.	1
Most of the recreational vessels using the waterway are materially sound and operated proficiently.	2
Many of the recreational vessels using the waterway are materially sound and operated proficiently.	3
Some of the recreational vessels using the waterway are materially sound and operated proficiently.	4

Table 2- Selection options and point values for WRFs categorized under the Waterway Risk Condition – Vessel Quality and Operation.

Waterway Risk Condition - Traffic	
WRF – Volume of Commercial Traffic	
Selection Option	**Point Value**
Light commercial traffic.	1
Moderate Commercial Traffic.	2
Heavy commercial traffic but waterway infrastructure handles load easily.	3
Heavy commercial traffic and vessels regularly have to wait for berths.	4
WRF – Volume of Recreational Vessel Traffic	
Selection Option	**Point Value**
Light recreational use of the waterway.	1
Moderate recreational use of the waterway.	2
Heavy recreational use of the waterway but seasonal.	3
Heavy recreational use of the waterway year-round.	4
WRF – Waterway Use	
Selection Option	**Point Value**
Predominately a single use waterway serving one interest.	1
Multiple use waterway but no conflicts occurring.	2
Multiple use waterway and some minor conflict occurring.	3
Multiple use waterway and major conflicts occurring.	4
WRF – Congestion	
Selection Option	**Point Value**
No congestion ever occurs in the waterway.	1
Congestion only occurs in small areas for limited times.	2
Congestion occurs regularly but flow of vessel traffic is not impeded.	3
Congestion occurs regularly and flow of vessel traffic is impeded.	4

Table 3- Selection options and point values for WRFs categorized under the Waterway Risk Condition – Traffic.

Waterway Risk Condition – Waterway Condition	
WRF – Visibility Impediments	
Selection Option	**Point Value**
No visual impediments on the waterway.	1
Visibility impediments that do not impact navigation.	2
Visibility impediments that sometimes impact navigation.	3
Visibility impediments that often impact navigation.	4
WRF – Dimensions	
Selection Option	**Point Value**
No waterway constrictions.	1
Waterway constrictions (width and depth) exist but never impact navigation.	2
Waterway constrictions (width and depth) exist and sometimes impact navigation.	3
Severe waterway constrictions often impact navigation.	4
WRF – Obstructions	
Selection Option	**Point Value**
No obstructions.	1
Some obstructions not affecting navigation.	2
Obstructions sometimes affect navigation.	3
Obstructions often affect navigation.	4
WRF – Configuration	
Selection Option	**Point Value**
Current waterway configuration is adequate for navigation.	1
Current configuration is inadequate but does not pose a safety concern.	2
Current configuration poses a safety concern.	3
Current configuration poses a significant safety concern.	4

Table 4-Selection options and point values for WRFs categorized under the Waterway Risk Condition – Waterway Condition.

2. Part Two. This portion of the survey asks participants to assign an Impact Level for Immediate and Subsequent Consequences for each WRF. Definitions for terms associated with Part Two of the Survey are provided in this section.

    a. Immediate Consequences. The instantaneous impacts of a vessel casualty (i.e., what happens right after a collision, allision, or grounding). These include the following events or categories –

        i. Personnel Injuries. The maximum number of expected casualties. People can be injured, killed, or need to be rescued.

        ii. Petroleum Discharge. The largest petroleum spill in the most probable worst-case scenario.

iii. Hazardous Materials Release. The largest chemical or hazardous material spill in the most probable worst-case scenario.

iv. Mobility. The infrastructure that is critical to the Marine Transportation System within the waterway (i.e., the significant structures upon which moving people and cargo through the marine transportation system depend). The waterway can be blocked and the shoreside Marine Transportation System can be disrupted, ultimately causing greater problems moving cargo through a port—both on the water and ashore.

b. Subsequent Consequences. The longer-term effects of a marine casualty that are felt hours, days, months, and even years afterwards, such as shoreside facility shut-downs, loss of employment, destruction of fishing areas, decrease or extinction of species, degradation of subsistence living uses, and contamination of drinking or cooling water supplies. These include the following events:

i. Health and Safety. The potential consequences to the community that lives or works on or near the waterway. Risk is increased when more people live or work in close proximity to a waterway.

ii. Environmental. The risks to wetlands and endangered species and how sensitive people are to the quality of their environment. The more sensitive, the more people will expect in terms of both preparedness and response effectiveness for any marine accident that threatens environmental quality.

iii. Aquatic Resources. Water dwelling life forms harvested for commercial or recreational reasons. Timing of a marine casualty could affect the seriousness of the consequences (i.e., some species are only in the waterway at certain times of the year).

iv. Economic. The extent of the impact if a particular waterway is closed for some period.

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. Winds are seasonal, wintertime is worse than the summer. The Columbia River Gorge can make the river feel like a wind tunnel.

b. Winds are well forecasted. Any time the winds are predicted to be near 50 knots the weather service notifies the pilots 24 hours in advance. This notice is passed from the pilots to the Columbia River Steamboat Operators' Association who transmits the information to industry.

c. Strong winds have caused vessels to break loose from moorings. Local tugs are dispatched to return the vessels to the pier.

d. When the port is closed due to high winds it can cause additional vessel congestion and economic impacts because trains that use the port to discharge grain are restricted from conducing cargo operations.

2. WRF - Tides and Currents.

a. The maximum current in the river can easily be seven knots or faster which causes maneuverability issues for vessels with lower maximum speeds. During certain tidal conditions, pilots will not transit loaded deep draft vessels since they are difficult to control.

b. There are no current meters on the river offering real-time data, it is all done by forecast interpolated from real-time tidal data. At the time of the PAWSA there was a model in development to increase the accuracy and reliability of the forecast. The currents for the lower Columbia River are based on Grays Harbor, WA.

c. The tides and currents in the Columbia River are largely controlled by the release of water from upstream dams. This release is governed by the Columbia River Treaty and the Flood Risk Management Program, which is set to expire in September 2024. Given the uncertain status of renewing the treaty, flow regimes may change, and operators adapted to the current river state are concerned as to how a change in tides and currents will affect vessel operations.

d. External factors including the amount of precipitation in the mountains, the

temperatures causing runoffs, and the release of water from the dams can cause significant variability for tidal and current ranges in different parts of the river system. The river is constrained to 43' of draft and during times of low water (typically August through October) vessels deeply laden while transiting need to be moved in two or three stages due to the location and timing of tidal pulses throughout the river.

3. WRF – Visibility Restrictions.

   a. The harbor safety plan addresses vessel transits in fog. If the visibility is less than one and a half miles, vessels do not get underway and will not be brought into the river which can cause slight congestion. Pilots traditionally make the final determination to conduct a vessel transit. Typically, the fog is worse in the fall and can last anywhere from a couple of hours to a few days.

   b. Fog and rain can cause significant delays in vessel transit, sometimes for weeks. This is particularly prevalent for vessel carrying grain as cargo.

4. WRF – Bottom Type.

   a. The bottom type of the Columbia River is mostly mud, with the lower portion of the river consisting primarily of sand. Groundings have occurred in the river and typically do not result in hull damage. There are rocky areas in the river, but they are generally well surveyed and continually updated. There are increasingly more surveys completed outside the main channel, specifically for areas planned for new anchorages.

C. Waterway Risk Condition - Vessel Quality and Operation.

1. WRF - Large Commercial Vessels.

   a. Language barriers are an issue on roughly 80% of the large commercial vessels in the Columbia River. A current mitigation available to pilots is a list of specific navigation terms translated into Chinese, Ukrainian, and Russian. Additionally, when on board, the ability to use hand gestures and see facial expressions helps to mitigate risks posed by language barriers.

   b. Vessel age in the port is increasing. There is an observed degradation in the material condition of bulk carriers. Both older tankers and container vessels are viewed as relatively well-maintained and in sound material condition.

   c. Vessel compliance with emission regulations, such as fuel rack limiters and electronic power limiting systems, create physical arrangements that the crew may not be able to manually override and contributes to an increase in vessel mechanical reliability issues. The Coast Guard issued Marine Safety Information Bulletin (MSIB) 02-23 "Use of Engine/Shaft Power Limiters in Pilotage Waters," which helped address the issue. Additionally, emission standards vary from state to state, particularly vessels complying with California's regulations entering the Columbia River. Participants

stated it is preferrable to have a single federal standard.

d. There is an increase in bridge visibility issues for large commercial vessels carrying wind turbine blades. The blades are loaded to a height that impacts crew visibility from the pilot house. The Coast Guard issued MSIB 04-23 "Reduced Visibility from the Navigation Bridge" which helped address the issue.

e. Large commercial vessel air draft is increasing. This has increased risk and concern for bridge allisions when transiting beneath Longview Bridge, which has the lowest air draft clearance on the river. Transits beneath the Longview Bridge are required to be scheduled and monitored to ensure clearance.

f. Since the end of the COVID-19 pandemic, there is an observed decline in mariner proficiency on the Columbia River.

2. WRF - Small Commercial Vessels.

a. There is no parity for merchant mariner credentials between different types of vessel operations. For example, it takes approximately four years to obtain a masters of towing vessel license while a passenger vessel operator can receive a credential within a few weeks.

b. There is an issue with derelict vessels being used as temporary housing for the homeless population. Vessels are borrowed long-term and then grounded in the channel or on shore and utilized as temporary housing.

3. WRF - Commercial Fishing Vessels.

a. Commercial fishing is uncommon on the river. There are some primary fisheries in the lower portion of the river. These include crab in the winter and tuna and salmon in the summer.

b. Crab boats use bright sodium lights which create visibility issues for other mariners.

4. WRF - Recreational Vessels.

a. Many recreational vessels operating in the Columbia River do not have the same proficiency of the Navigation Rules as a licensed mariner. The Coast Guard Auxiliary provides an 8-hour boater safety course through the Oregon Marine Board.

b. Wind surfing and stand up paddleboarding are issues for commercial operators on the river. There is no requirement for a license or completion of a safety course to engage in either of these activities. Mariners have observed wind surfers and paddleboarders near commercial vessels on the river.

c. During salmon season hundreds of recreational boaters congregate in proximity to Buoy 10. Commercial vessel traffic relies on the Coast Guard and local sheriff departments to ensure the channel remains clear of recreational vessels. Many

recreational boaters are unaware that larger commercial vessels are restricted to specific areas of the river due to draft limitations.

D. Waterway Risk Condition - Traffic.

1. WRF - Volume of Commercial Traffic.

a. There is a moderate volume of commercial vessel traffic in the Columbia River comprised of a wide variety of vessels, including cruise ships, bulk carriers, container ships, and tankers. The port can support the current volume of commercial vessel traffic. However, there is not sufficient anchorage space. Many vessels are directed to lay berths instead of anchorages due to limited availability.

2. WRF - Volume of Recreational Traffic.

a. Recreational traffic is seasonal particularly in the summer and fall. Most of the recreational traffic is related to fishing. The presence of recreational boaters is largely dependent on the weather and if the fish are running. Other seasonal marine events cause higher volumes of recreational traffic including Fleet Week, the Rose Festival, and dragon boat races.

3. WRF - Waterway Use.

a. The Columbia River is a multi-use waterway with minor conflicts. Commercial traffic consists primarily of bulk carriers, tankers, and passenger vessels. Recreational traffic is seasonal and is primarily related to fishing. The Columbia River is also used for the freshwater storage of vessels.

4. WRF – Congestion.

a. Normal congestion in the river is light to moderate, with exceptions for seasonal recreational traffic causing additional congestion. Large commercial traffic is deconflicted by the pilots, particularly in the narrower parts of the river. When congestion is an issue, it is typically near Astoria, OR; Longview, WA; and Warrior Rock, OR.

b. The current anchorage space available on the Columbia River is not sufficient to handle the number of vessels operating on the river and causes additional congestion.

E. Waterway Risk Condition - Waterway.

1. WRF – Visibility Impediments.

a. There are a lot of sources of light that reflect on the river and make it increasing difficult for vessels to navigate at night. Sources include, cars, shoreside terminals, and high populated metro areas.

b. The crab fleet uses sodium lights at night to locate crab pots. The luminosity of these

lights makes it difficult to see these boats while transiting.

2. WRF – Dimensions.

   a. The width of the channel has not been increased to accommodate the influx of larger vessels transiting the Columbia River. For example, a vessel that is 1,200 feet in length only has a couple of degrees to either side before the bow or stern will allide/soft ground with the riverbank.

3. WRF - Obstructions.

   a. After a rainstorm, it is common to observe debris in the river. The U.S. Army Corps of Engineers will only remove debris if it is obstructing a federal navigational channel.

   b. The bridge height for the Astoria bridge has never been surveyed. Its height is based on the original 1962 construction and was calculated from mean high water instead of mean low water.

   c. There is voluntary coordination between the crab and the towing vessel fleets to establish offshore traffic lanes and locations for crabbers to avoid dropping pots. This is to facilitate safer transits for towing vessels.

   d. The Longview bridge has the lowest clearance on the river. There is no real-time data for the air gap. Currently, if the forecasted clearance is less than ten feet there is a physical survey of the vessel to ensure there is at least five feet of clearance beneath the bridge.

4. WRF – Configuration.

   a. There is an ongoing feasibility study to determine if a new turning basin should be established near Kalama, WA.

   b. There is an ongoing feasibility study to determine if an existing turning basin in Longview, WA should be deepened and widened.

   c. It requires a large commercial vessel approximately 90 course changes to transit from the Columbia River Bar to the sea wall in downtown Portland, OR. Increasing vessel size could pose an issue to the existing dimensions and configuration of the channel.

Appendix D. Geospatial Participant Comments

Facilitators captured participant observations that made specific geographic references. Those observations were transferred to an ArcGIS online web-application to generate chartlets reflecting the location and specific context of each comment. The chartlets and corresponding comments are included in this appendix.

Geospatial Comments	
Point	**Comment**
1	Sodium lights on crab boats cause visibility impediments.
2	A growing number of derelict vessels are observed at this location.
3	Vessels often must wait to anchor. There is a need for additional anchorages and stern buoys in safe locations. Applications for additional anchorages have been submitted for over 10 years.
4	Recreational vessels, especially at Buoy 10, are a risk to commercial vessels and a definite navigational hazard. When salmon fishing season opens, commercial vessels and pilots would benefit from an increased Coast Guard and Oregon Department of Fish and Wildlife-Sheriff's Department.
5	Vessel congestion is seasonal and affects commercial vessel movement, becoming hazardous around Buoy #10.
6	The Astoria Bridge has never been surveyed. The 205' bridge height is based on a 1962 construction drawing and a 1946 tidal datum at mean low water.
7	Buoy 10 gets congested during the late summer. Recreational traffic volume varies yearly and is dependent on fish run predictions.
8	Air gap sensors are needed at this location.
9	There is a need to consider widening and deepening the channel and for regular dredging of the turning basin due to increased vessel size.
10	There is an established need for air gap meters at Astoria-Megler bridge as well as current meters throughout the river.
11	A participant stated that a few years ago, there were vessels that lost anchors in the Federal Navigation Channel (FNC). They also noted "I only get reports that affect the navigation channel. I had heard this was due to use of cheap steel. Maybe the Coast Guard is checking for this now or I'm not hearing about it."
12	There is a need to widen the channel. Ships have become significantly larger which has reduced the margin of error for a marine casualty. Widening the channel in certain areas would likely improve safety.
13	There is the potential for high winds at the north end of Puget Island.
14	At Bugby Hole fixed power transmission lines can sag in hot weather.
15	Debris, wrecks, derelict vessels on the river are primarily an environmental hazard but, present some risk to commercial and recreational vessels.
16	There is an established need for air gap sensors at Lewis and Clark Bridge with current meters needed throughout the river.
17	The air gap at Longview Bridge presents an increased risk to tall cruise or container vessels that are transiting during spring freshet. During this time, there may be up to a fifteen foot reduction in air gap due to increased river flow and volume.
18	A wind gauge is needed on Longview Bridge.

19	A participant noted “Assuming report shows it is in the federal interest, two new turning basins will be established at Kalama. Assuming authorization is secured in the Water Resources Development Act (WRDA) in 2026, the Army Corps of Engineers will take over after it is constructed.”
20	This location is the confluence of Willamette River & Columbia River. At Kelley Point there are heavy traffic-fleeting container ships at T-6, barge areas, heavy recreational fishing activity, and a popular beach/park causing wake concerns.
21	The Willamette River super-fund needs federal resolution to enable dredging to navigation depth.
22	Bridges on Willamette River are of different heights and alignments that blocks the view of the river.
23	The BNSF railroad Bridge 9.6 is a choke point in the federal navigation channel as well as the Interstate Bridge. Both are currently narrower than the authorized channels.
24	Recreational vessels experience grounding on Columbia River above river from I-5 to I-205 in spring and summer as sand bars become exposed due to vessel operators not paying attention to changes in water level conditions.

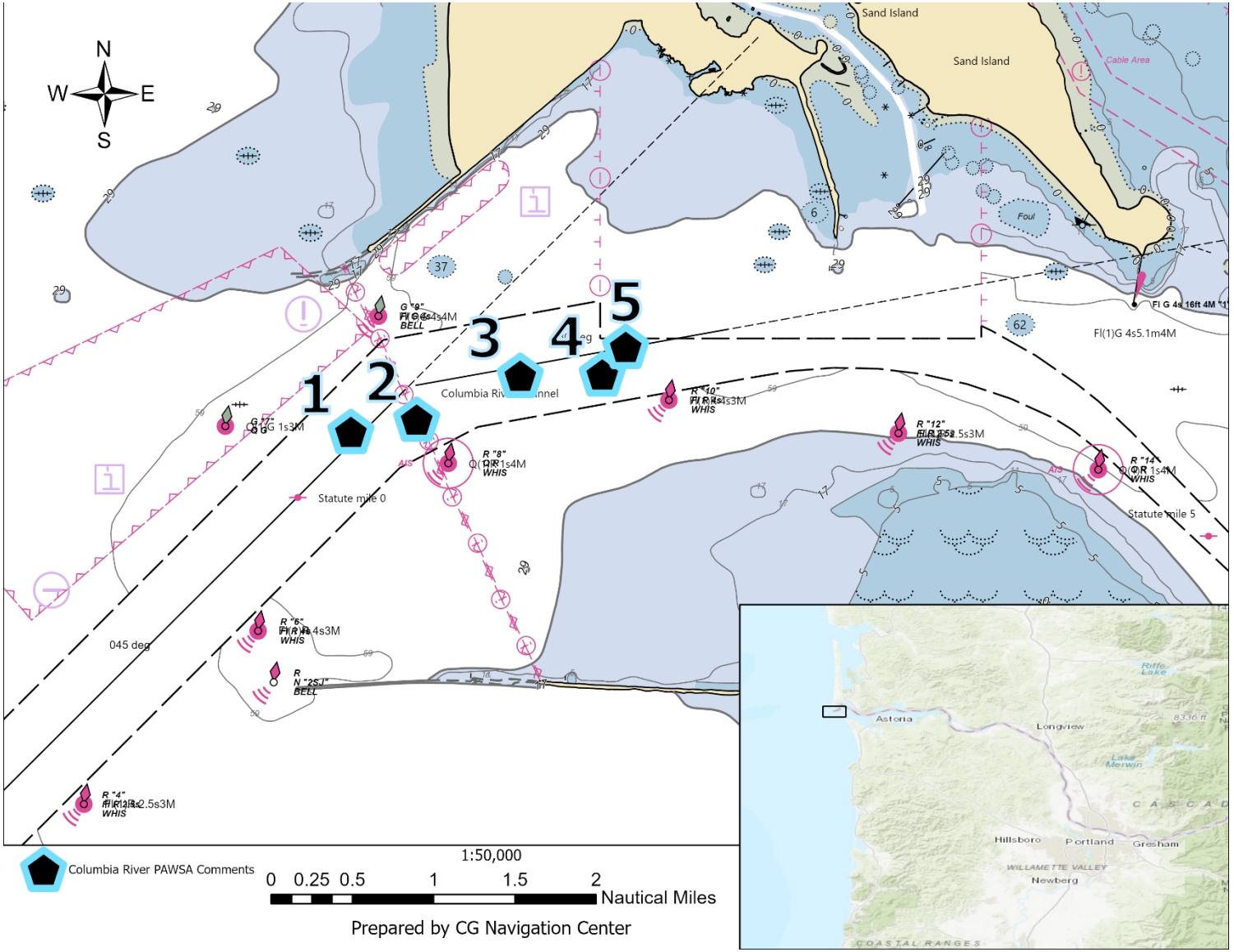

Figure 1- Mapped location of geospatial comments 1-5.

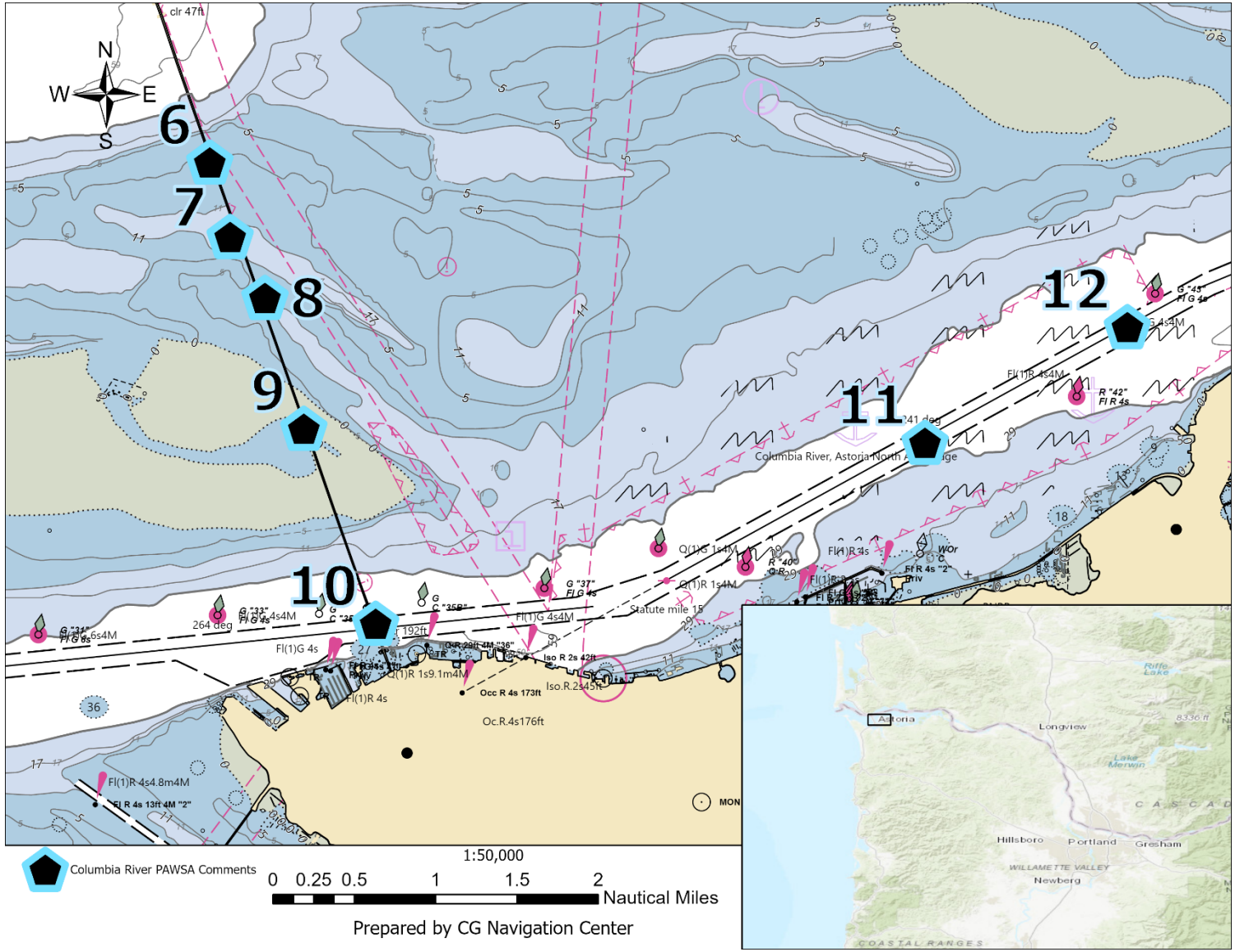

Figure 2- Mapped location of geospatial comments 6-12.

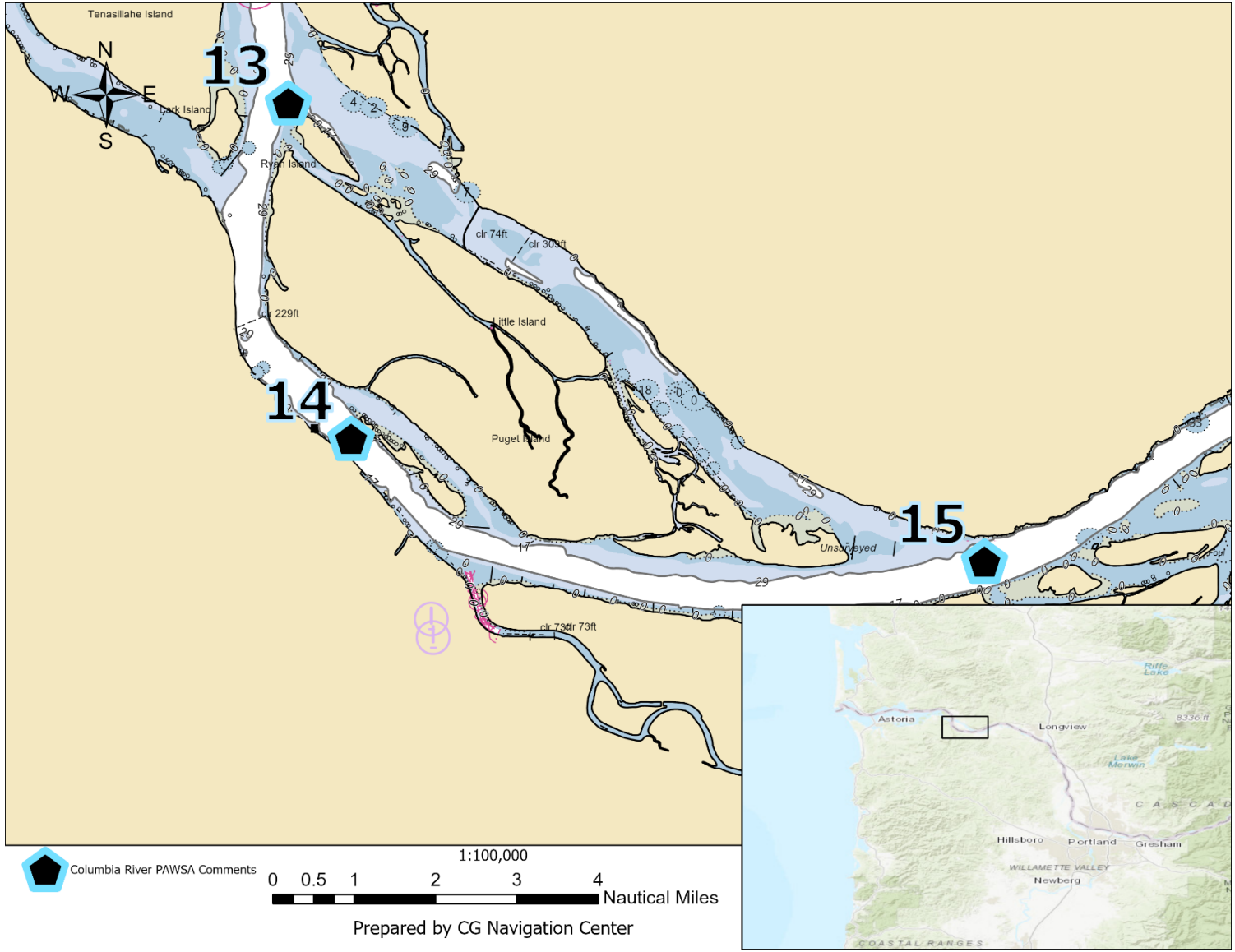

Figure 3- Mapped location of geospatial comments 13-15.

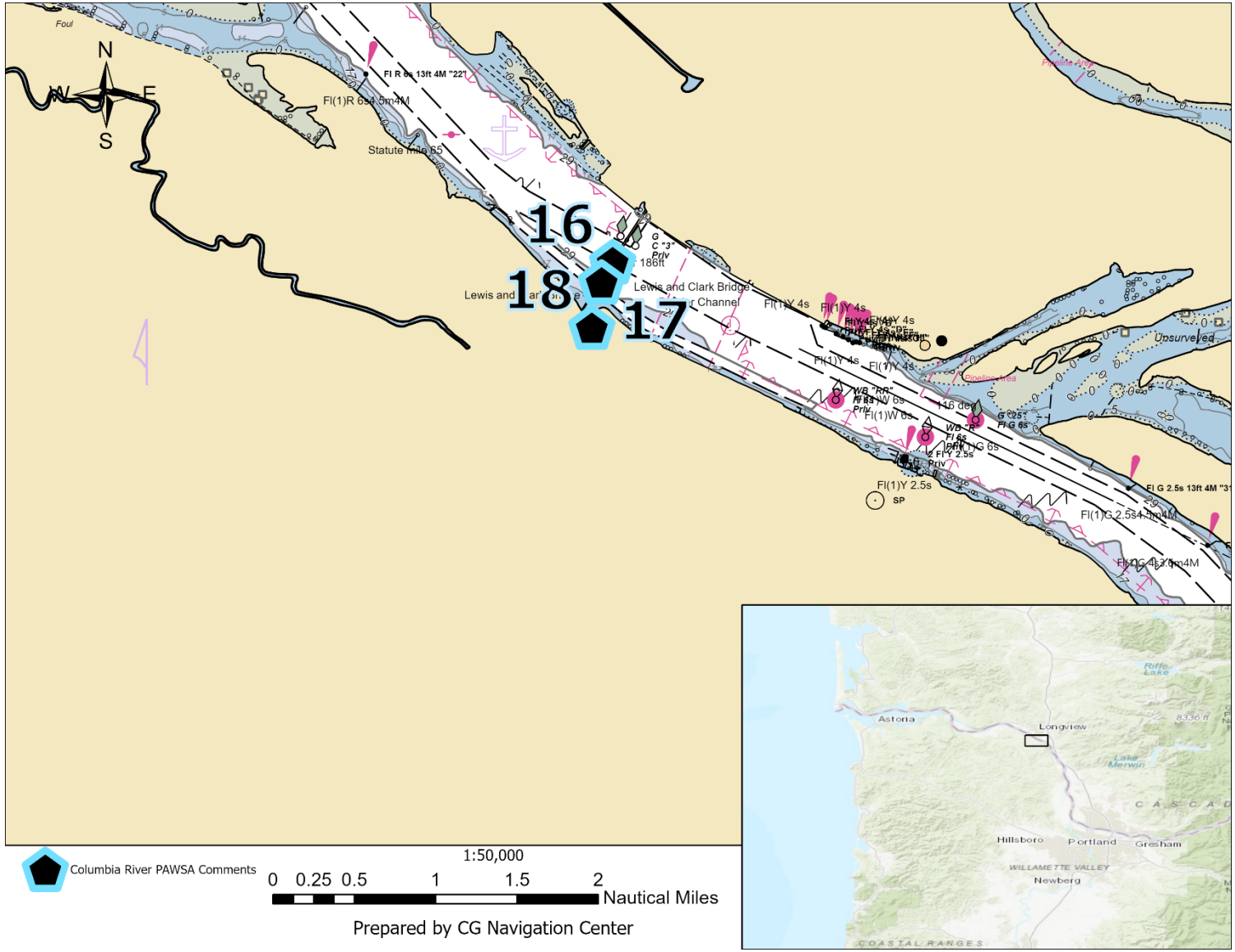

Figure 4- Mapped location of geospatial comments 16-18.

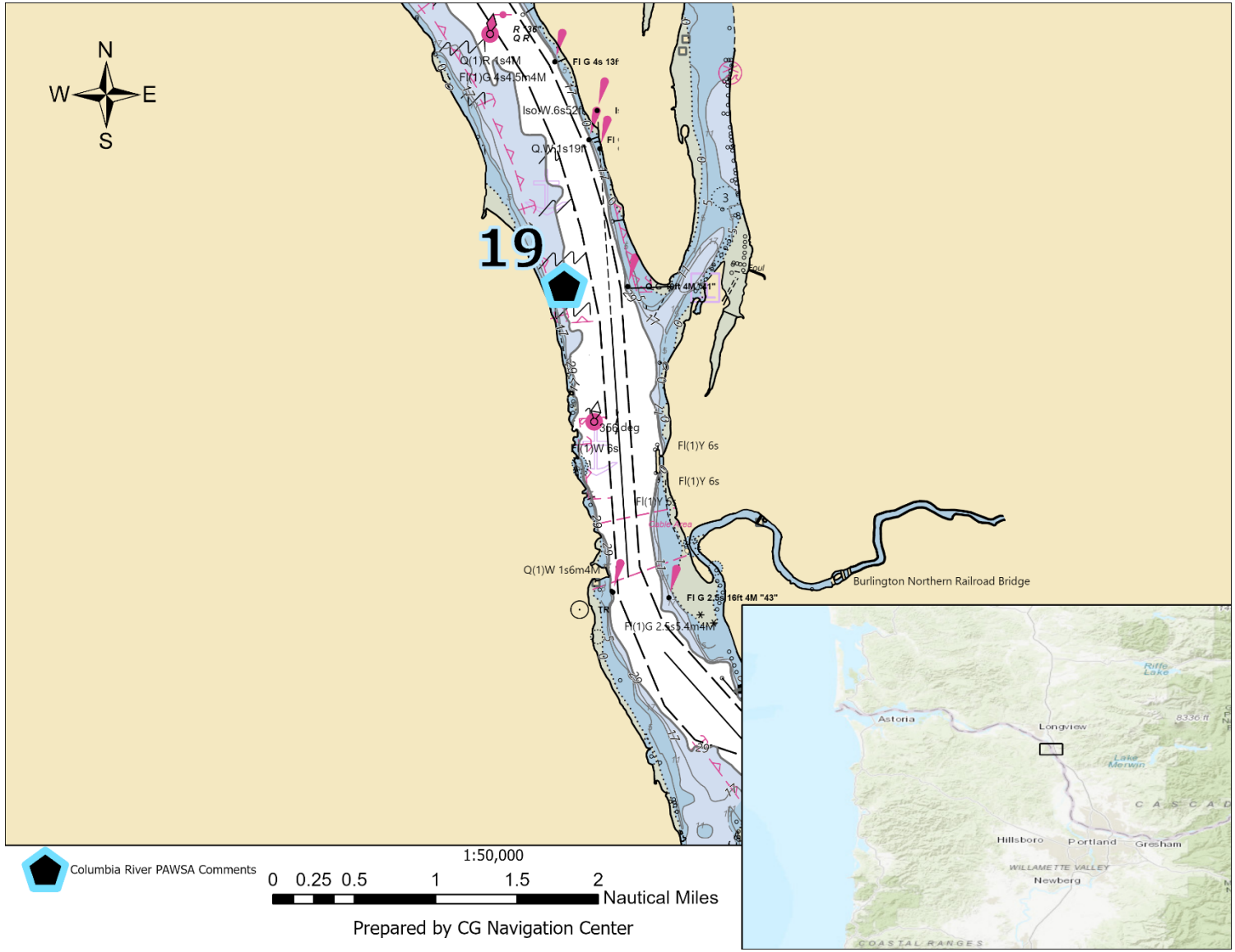

Figure 5- Mapped location of geospatial comment 19.

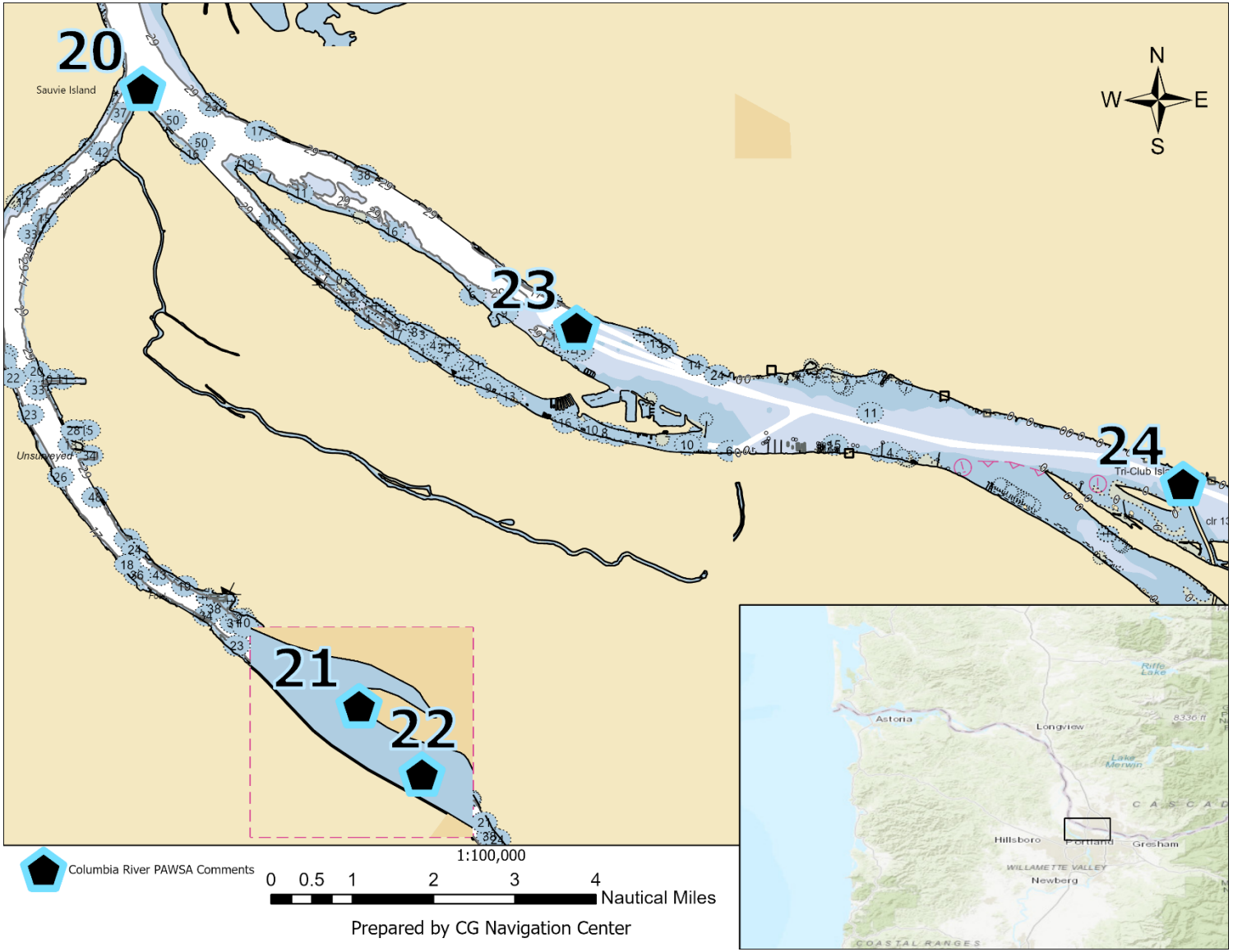

Figure 6- Mapped location of geospatial comments 20-24.