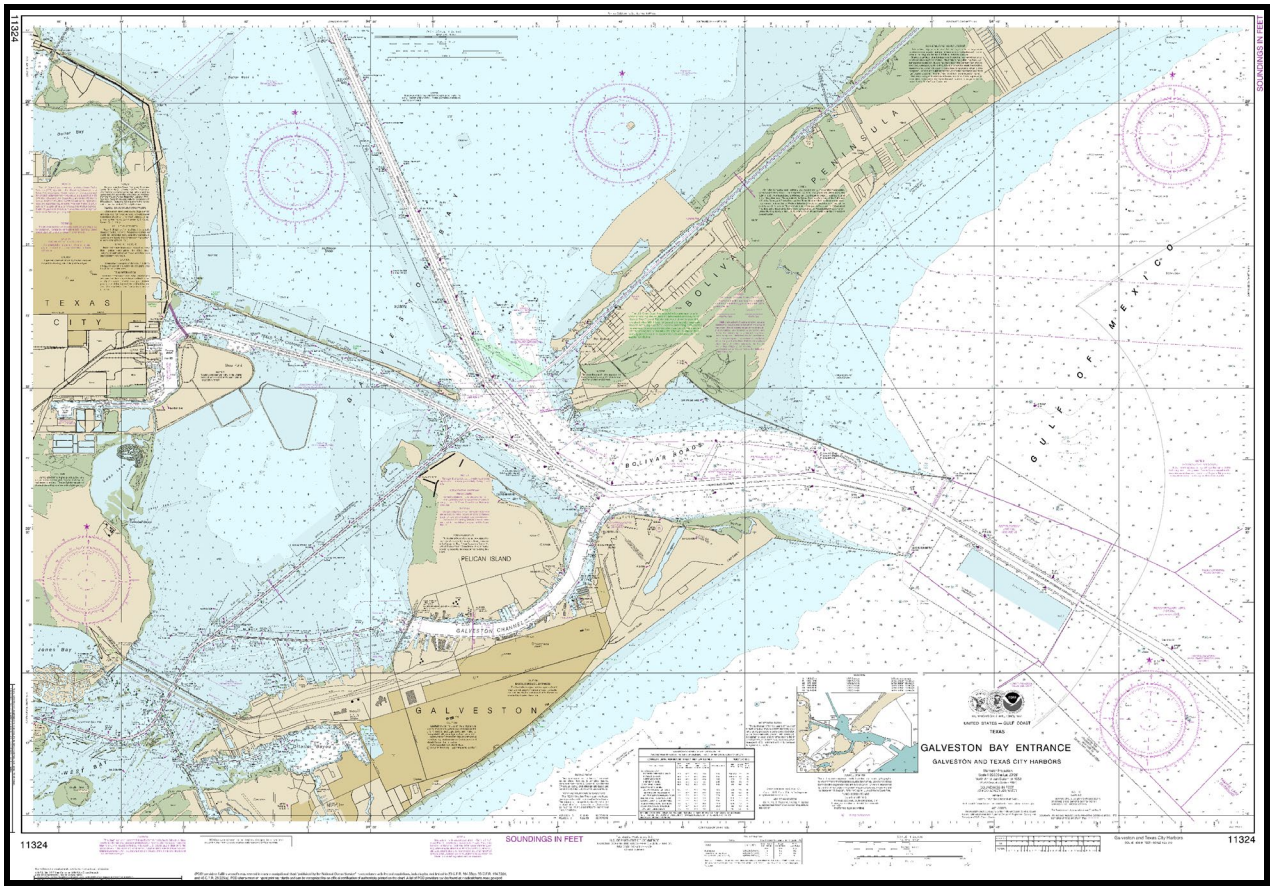
Ports and Waterways Safety Assessment
Workshop Report

Houston/Galveston/Texas City



United States Coast Guard

Marine Transportation Systems Directorate

Providing Navigation Safety Information

for America's Waterways Users

Table of Contents

Page

Background and Purpose 3
PAWSA Waterway Risk Model and Workshop process 4
Houston/Galveston/Texas City PAWSA Workshop 5
Section 1: Houston/Galveston/Texas City PAWSA - Assessment Area 6
Section 2: Baseline Risk Levels 6
Section 3: Team Expertise Cross – Assessment 7
Section 4: Existing Risk Mitigations 8
Section 5: Additional Risk Intervention Strategies 10

Appendix A Workshop Participants
Appendix B Participant Comments on Trends in the Port and Existing Risk Mitigations
Appendix C Additional Risk Intervention Strategies
Appendix D Navigation Charts with Participant Observations
Appendix E References
Appendix F Abbreviations and Acronyms
Appendix G Houston/Galveston/Texas City PAWSA – Vessel Traffic Statistics

Background and Purpose

The United States Coast Guard (USCG), Marine Transportation Systems Directorate, is responsible for developing and implementing policies and procedures that facilitate commerce, improve safety and efficiency, and inspire dialogue with ports and waterway users with the goal of making waterways as safe, efficient, and commercially viable as possible.

Through the 1997 Coast Guard Appropriations Act, the Coast Guard was directed to establish a process to identify minimum user requirements for new Vessel Traffic Service (VTS) systems in consultation with local officials, waterway users and port authorities, and to review private / public partnership opportunities in VTS operations.

The Coast Guard convened a National Dialogue Group (NDG) comprised of maritime and waterway community stakeholders to identify the needs of waterway users with respect to Vessel Traffic Management (VTM) and VTS systems. The NDG was intended to provide the foundation for the development of an approach to VTM that would meet the shared government, industry, and public objectives of ensuring the safety of vessel traffic in U.S. ports and waterways, in a technologically sound and cost effective way.

From the NDG came the development of the ***Ports and Waterways Safety Assessment (PAWSA) Waterway Risk Model,*** and the ***PAWSA workshop process***. PAWSA is a disciplined approach designed to identify major waterway safety hazards, estimate risk levels, evaluate potential mitigation measures, and set the stage for the implementation of selected risk reduction strategies.

The process involves convening a select group of waterway users and stakeholders and facilitating a structured workshop agenda to meet the risk assessment objectives. A successful workshop requires the participation of professional waterway users with local expertise in navigation, waterway conditions, and port safety. In addition, stakeholders are included in the process to ensure that important environmental, public safety, and economic consequences are given appropriate attention as risk interventions are identified and evaluated.

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

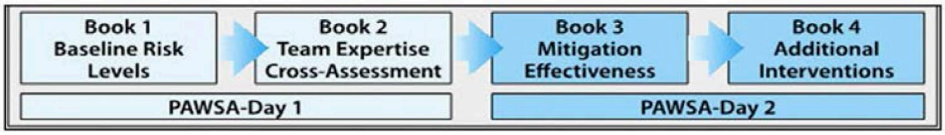
1) Provide input when planning for projects to improve the safety of navigation,
2) Further the Marine Transportation System (MTS) goals of improved coordination and cooperation between government and the private sector, and involving stakeholders in decisions affecting them,
3) Foster development and/or strengthen the roles of Harbor Safety Committees within each port, and
4) Support and reinforce the role of Coast Guard Sector Commanders/Captains of the Port (COTP) in promoting waterway and VTM activities within their geographic areas of responsibility.

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

PAWSA Waterway Risk Model and Workshop process

The PAWSA Waterway Risk Model includes variables dealing with both the causes of waterway casualties and their consequences. In the Waterway Risk Model, risk is defined as a function of the probability of a casualty and its consequences. The diagram below shows the six general risk categories, and corresponding risk factors, that make up the Waterway Risk Model.

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



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

Workshop activities include a series of discussions about the port/waterway attributes and the vessels that use the waterway, followed by completion of workbooks to establish baseline risk levels, evaluate the effectiveness of existing risk mitigations, and identify additional risk intervention strategies to further reduce risk in the port / waterway. Workbook 1 is used to numerically evaluate the baseline risk levels using pre-defined qualitative risk descriptions for pre-defined risk factors. Workbook 2 is used to assess the expertise of participants with respect to the risk categories in the model. Those expertise assessments are used to weight inputs obtained during the other steps in the workshop process. Workbook 3 is used to evaluate how effective the existing mitigation strategies are at reducing risks, and to determine whether the risks are well balanced. For those risk factors in which it is determined that the risk is not balanced by existing mitigations, participants use workbook 4 to identify additional risk intervention strategies and then evaluate how effective those new strategies could be at reducing risks.

Houston/Galveston/Texas City PAWSA Workshop

A PAWSA workshop was held in Houston, Texas on 15-16 January, 2020 to assess navigation safety within the ports of Houston, Galveston, and Texas City. The workshop was attended by 30 participants representing waterway users, stakeholders, environmental interest groups, and Federal, State and local regulatory authorities. The purpose of the workshop was to generate collaborative discussions between waterway users, stakeholders and members of the Houston-Galveston maritime community. Coast Guard Sector Houston-Galveston sponsored the workshop.

Participants discussed the quality of vessels and their crews that operate on the waterway; the volume of commercial, non-commercial and recreational small craft vessel traffic using the waterway, navigational and waterway conditions that mariners encounter when transiting the assessment area, and the potential environmental impacts that could result from a marine casualty or incident on the waterway.

Over the two-day workshop, the participants discussed and then numerically evaluated 24 risk factors in the PAWSA Waterways Risk Model.

Baseline risk levels were first evaluated using pre-defined qualitative risk descriptions for each risk factor. Participants then discussed existing risk mitigation strategies, evaluated how effective those mitigation strategies were at reducing risk, and then determined if the risks were balanced. For those risk factors that were not balanced by existing mitigations, or where there was no consensus that risks were balanced, the participants engaged in further discussions to identify further risk mitigation strategies and evaluated the effectiveness of those new strategies. The results of the baseline risk level survey, existing risk mitigation strategies, additional risk intervention strategies, and participant comments and observations are outlined in this report.

The primary goal of a PAWSA workshop is to improve coordination and cooperation between government agencies and the private sector. A PAWSA workshop is intended to involve stakeholders in decisions affecting them, and provide the Coast Guard and members of the waterway community with an effective tool to evaluate risk and work toward long-term solutions tailored to local circumstances.

In support of these goals, this report should be viewed as a starting point for continued dialogue within the Houston/Galveston maritime community. The Coast Guard will use this PAWSA report, together with other information, to determine whether, and to what extent, regulatory or other actions are needed to address navigation safety risk. Any rulemaking efforts will follow Coast Guard public notice and comment rulemaking procedures to allow for public participation in the process.

The United States Coast Guard, Marine Transportation Systems Directorate and Coast Guard Sector Houston/Galveston, extend a sincere appreciation to the workshop participants for their contributions to the Houston/Galveston PAWSA workshop. Their expertise was critical to the success of the workshop, and their recommendations will greatly assist the Coast Guard as it continues to work with all Houston/Galveston stakeholders to further improve safe and efficient navigation within the Greater Galveston Bay port complex.

Section 1: Houston-Galveston PAWSA - Assessment Area

The geographic bounds of the waterway assessment area included the Houston Ship Channel from the Sidney Sherman Bridge (Interstate 610) outbound to the sea buoy. The assessment area extends southward to include the Ports of Galveston and Texas City. The scope of the area also includes portions that extend as far north as the Interstate 10 causeway near Old River.

At the workshop, the following nautical charts were displayed for reference and to annotate geographic locations associated with participant comments and observations:

- 11324
- 11325
- 11327
- 11328
- 11329

The annotated charts are included as appendix D to this report.

Section 2: Baseline Risk Levels

The first step in the workshop was to determine a baseline risk level value for each risk factor in the Waterway Risk Model. To accomplish this, participants discussed each of the 24 applicable factors in the Waterway Risk Model and selected a qualitative description for each risk factor that best described the conditions in the assessment area (workbook 1). These qualitative descriptions were assigned discrete values using numerical scales.

The table below is the baseline risk levels for the Houston study area determined by the participants. 1.0 represents low risk (best case), 9.0 represents high risk (worst case), with 5.0 being the mid-risk value. Risk values highlighted in red (values at or above 7.7) denote very high baseline risk levels. Risk values highlighted in green (values at or below 2.3) denote very low baseline risk levels.

Baseline Risk Levels					
Vessel Conditions	**Traffic Conditions**	**Navigational Conditions**	**Waterway Conditions**	**Immediate Consequences**	**Subsequent Consequences**
Deep Draft Vessel Quality	Volume of Commercial Traffic	Winds	Visibility Impediments	Personnel Injuries	Health and Safety
4.7	8.6	2.3	8.4	8.9	9.0
Shallow Draft Vessel Quality	Volume of Small Craft Traffic	Water Movement	Dimensions	Petroleum Discharge	Environmental
3.9	7.2	4.5	8.4	9.0	8.3
Commercial Fishing Vessel Quality	Traffic Mix	Visibility Restrictions	Bottom Type	Hazardous Materials Release	Aquatic Resources
7.5	7.8	6.8	3.8	9.0	7.6
Small Craft Quality	Congestion	Obstructions	Configuration	Mobility	Economic
8.7	8.2	5.2	9.0	9.0	9.0

Section 3: Team Expertise Cross-assessment

The second step in the workshop was the completion of a team expertise cross-assessment (workbook 2). The team expertise cross-assessment was conducted early in the workshop process and was used to weigh the relative strengths of each team with respect to the six risk categories. The results of the team expertise cross-assessment was used to weight the inputs that each team provided in the other workbooks completed during the workshop.

After being presented with the concepts underlying the cross-assessment, each participant team was asked to present a self-assessment to the other teams. These presentations gave all teams a sense of where everyone thought they were strong – or perhaps not so strong. After all teams had spoken, each team then evaluated whether they were in the top, middle, or lower third of all teams present with respect to knowledge and expertise in the six risk category areas. The participants assessed their own and all the other participant teams' level of expertise for each of the six risk categories in the Waterway Risk Model.

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

Team Expertise -- Distribution

Risk Category	Top 1/3	Mid 1/3	Lower 1/3
Vessel Conditions	35%	34%	31%
Traffic Conditions	44%	32%	24%
Navigational Conditions	38%	39%	24%
Waterway Conditions	39%	40%	21%
Immediate Consequences	34%	37%	29%
Subsequent Consequences	27%	40%	33%
All Categories Average	36%	37%	27%

Section 4: Existing Risk Mitigations

The third step in the workshop was for participants to evaluate the effectiveness of existing mitigation strategies in reducing the risk level for each risk factor. Workbook 3 is used for two purposes. First, after the participants describe the risk mitigation strategies that already exist to help reduce the risk level for their waterway, workbook 3 is used to evaluate the effectiveness of those strategies in reducing the risk level for each factor in the model. What results from that evaluation is the present risk level, taking into account those existing mitigations. Second, the participants decide whether the risk mitigation strategies already in place adequately balance the resulting risk level. If, for any given risk factor, there is consensus (defined as 2/3 of the workshop participant teams in agreement**)** that existing mitigations do adequately deal with those risks, then that risk factor is dropped from further discussion.

For risk factors show in green (Balanced) there was consensus that risks were balanced by existing mitigations.

For risk factors shown in red (Rising/No) there was consensus that risks were not balanced by existing mitigations.

For risk factors shown in yellow (Maybe) there was no consensus that risks were balanced by existing mitigations.

Mitigation Effectiveness												
Vessel Conditions		Traffic Conditions		Navigational Conditions		Waterway Conditions		Immediate Consequences		Subsequent Consequences	
Deep Draft Vessel Quality		Volume of Commercial Traffic		Winds		Visibility Impediments		Personnel Injuries		Health and Safety	
4.7	3.7	8.6	7.6	2.3	2.2	8.4	8.0	8.9	7.5	9.0	8.3
Balanced		Balanced		Balanced		Maybe		Balanced		Maybe	
Shallow Draft Vessel Quality		Volume of Small Craft Traffic		Water Movement		Dimensions		Petroleum Discharge		Environmental	
3.9	3.3	7.2	7.1	4.5	4.6	8.4	8.0	9.0	7.5	8.3	7.5
Balanced		Maybe		Rising		NO		Maybe		Maybe	
Commercial Fishing Vessel Quality		Traffic Mix		Visibility Restrictions		Bottom Type		Hazardous Materials Release		Aquatic Resources	
7.5	7.5	7.8	7.4	6.8	6.1	3.8	3.2	9.0	8.0	7.6	7.1
NO		Maybe		Maybe		Balanced		Maybe		Maybe	
Small Craft Quality		Congestion		Obstructions		Configuration		Mobility		Economic	
8.7	8.4	8.2	7.9	5.2	4.8	9.0	8.6	9.0	7.3	9.0	8.6
NO		NO		Balanced		Maybe		Maybe		NO	

Risk Factor	
Book 1 Score	Book 2 Score
Consensus Reached?	

	EXPLANATION
Book 1 Score	Level of risk - not taking into account existing mitigations
Book 3 Score	Level of risk - taking into account existing mitigations
Balanced	Consensus that risks are well balanced by existing mitigations
Maybe	No consensus that risks are well balanced by existing mitigations
Rising / NO	Consensus that existing mitigations DO NOT adequately balance risk

For the following 7 risk factors, there ***was consensus*** (defined as 2/3 of the workshop participant teams agreeing) ***that risks were balanced*** by existing mitigations.

Risk Factor	Risk Level with Existing Mitigations
Deep Draft Vessel Quality	3.7
Shallow Draft Vessel Quality	3.3
Volume of Commercial Traffic	7.6
Winds	2.2
Obstructions	4.8
Bottom Type	3.2
Personnel Injuries	7.5

For the following 11 risk factors, there ***was no consensus*** that risks were balanced, or not balanced, by existing mitigations.

Risk Factor	Risk Level with Existing Mitigations
Volume of Small Craft Traffic	7.1
Traffic Mix	7.4
Visibility Restrictions	6.1
Visibility Impediments	8.0
Configuration	8.6
Petroleum Discharge	7.5
Hazardous Materials Release	8.0
Mobility	7.3
Health and Safety	8.3
Environmental	7.5
Aquatic Resources	7.1

For the remaining six risk factors, there ***was consensus that risks were NOT balanced*** by existing mitigations.

Risk Factor	Risk Level with Existing Mitigations
Commercial Fishing Vessel Quality	7.5
Small Craft Quality	8.4
Congestion	7.9
Water Movement	4.6
Dimensions	8.0
Economic	8.6

Section 5: Additional Risk Intervention Strategies

The last step in the workshop process was to complete workbook 4, wherein workshop participants propose additional risk interventions. Participants suggested additional risk intervention strategies, and then evaluated how successful the proposed strategies would be at lowering risk levels. Additional mitigations were discussed for those risk factors where there was consensus that risks were not adequately balanced by existing mitigations (Rising/No) from the workbook 3 evaluation.

The risk intervention strategies proposed by the participants are listed in appendix C. The table below shows the expected level of risk if those strategies were to be implemented.

Additional Interventions					
Vessel Conditions	**Traffic Conditions**	**Navigational Conditions**	**Waterway Conditions**	**Immediate Consequences**	**Subsequent Consequences**
Deep Draft Vessel Quality	Volume of Commercial Traffic	Winds	Visibility Impediments	Personnel Injuries	Health and Safety
Balanced	Balanced	Balanced	Balanced	Balanced	Balanced
Shallow Draft Vessel Quality	Volume of Small Craft Traffic	Water Movement	Dimensions	Petroleum Discharge	Environmental
Balanced	Balanced	Balanced		Balanced	Balanced
			8.0 3.6		
Commercial Fishing Vessel Quality	Traffic Mix	Visibility Restrictions	Bottom Type	Hazardous Materials Release	Aquatic Resources
Balanced	Balanced	Balanced	Balanced	Balanced	Balanced
Small Craft Quality	Congestion	Obstructions	Configuration	Mobility	Economic
Balanced		Balanced	Balanced	Balanced	
	7.9 4.6				8.6 3.7

The following shows the results of the workbook 4 evaluations for those risk factors that were not balanced by existing mitigations, or where there was no consensus that risks were balanced, or not balanced, by existing mitigations. Due to workshop time constrains, workbook 4 was not completed for the Economic risk factor.

Risk Factor	Risk Level with Existing Mitigations	Risk Level with Proposed Mitigations
Congestion	7.9	4.6
Dimensions	8.0	3.6
Economic	8.6	3.7

This Page Intentionally Left Blank

Appendix A

Workshop Participants

Participant	Organization
David Foret	The ACTion Group
Tom Marian	Buffalo Marine Service
Brian Darnell	Cheryl K
Greg DeLong	Enterprise Products
John Temperilli	Garner
Steven Huttman	G&H Towing
Robyn Sarvis	G&H Towing
Marcus Maher	Houston Pilots
John Taylor	Houston Mooring
Nate Hough	Kirby Inland Marine
Bill Jenko	Non-VTS Users
Keith Hunter	Orion Marine
Hayden Simpson	Port of Houston Authority
Johnathan Barrer	Port of Houston Authority
Marcus Woodring	Port of Houston Authority
Brett Milutin	Port of Galveston
Jason Hayley	Railport Texas City
Stephen Byrnes	Shell
Ron Galloway	Shrimpers
Maria Aponte	Texas Department of Transportation (TXDOT)
John Suayan	Texas Department of Transportation (TXDOT)
Craig Kartye	Texas General Land Office
James Prazak	Tricon Energy
Tricia Campbell	US Army Corps of Engineers
Matt Fonville	US Coast Guard
Ryan Gilbert	US Coast Guard
Sarah Rousseau	US Coast Guard
Michael Stevenson	USCG Vessel Traffic Service
Alberto Hernandez	USCG Vessel Traffic Service
Robert Hawn	West Gulf Maritime Association

This Page Intentionally Left Blank

Appendix B

Participant Observations- Trends in the Port and Existing Risk Mitigations

The workshop participants are local subject matter experts and these comments capture their opinions and analysis, providing a general sense of the ideas discussed during the workshop. These comments provide various perspectives representing widely different interests and should not be construed to represent the views of or statements by the United States Coast Guard.

Deep Draft Vessel Quality

(Vessels 1600 Gross Tons and higher engaged in commercial trade)

Trends/Observations:

- As part of the quality checks, many of the facilities in Houston, Galveston, and Texas City vet all ships (bulk, liquid and bulk liquefied petroleum gas) for every voyage that comes to the port. These quality checks include deep dives into the history of the ships such as the history of ownership. Part of the evaluation assesses the quality of the crew. Lastly, it is a requirement that a SIRE[1] inspection had to have been accomplished within the past six months.
- SIRE inspections is the main tool that is used by many facilities to assess the quality of deep draft vessels and their crews.
- There are numerous programs geared to regulations: Vetting, Port State Control[2], COI applications, and USCG Title 46, Subchapter M – Towing Vessel Inspection Regulations.[3]
- Regarding interactions with vessels in load programs, a common occurrence is that many captains have their hands tied attempting to maneuver around some of the more slower-moving vessels in this category. While many of the Captains are reluctant to override those systems, the general feeling is that this would be necessary at times in order to maneuver the ship safely.
- It has been noted that trim can be beneficial on some vessels. If the ships come out flat, having some trim improves maneuverability.
- Chemical petroleum carriers have put trim rules in effect.
- Bulk carriers do not go through many of the same inspection processes as tankers. There is additional scrutiny of tank vessels and the tank bulk petroleum industry. Crew level proficiency is generally lacking for many of the bulk carriers.
- There is a general trend toward smaller crews in these vessels. As a result of general crew reduction, there appears to be an increase in ATVs versus ships.

[1] SIRE Inspection: https://www.ocimf.org/media/84968/SIRE-Factsheet-May-2018.pdf
[2] USCG PSC regulations: https://www.dco.uscg.mil/Our-Organization/Assistant-Commandant-for-Prevention-Policy-CG-5P/Inspections-Compliance-CG-5PC-/Commercial-Vessel-Compliance/Foreign-Offshore-Compliance-Division
[3] USCG Subchapter M: https://www.govinfo.gov/content/pkg/CFR-2016-title46-vol5/pdf/CFR-2016-title46-vol5-chapI-subchapM.pdf

- Lone Star Harbor Safety Committee (HSC) created a Mariner Guide to Navigating the Houston-Galveston Area Waterways[4] compiling much useful information**.** The Lone Star HSC also provides a means to share vessel issues that occurred in other ports.
- The Rules and safety committee has an internal system that runs information.
- There are roughly 8,300 piloted ship movements annually in the upper ship channel. Roughly 5,000 of those movements are tankers.

Existing Mitigations:

- SIRE Inspections
- Vetting
- Port State Control
- COI application
- USCG Subchapter M – Towing Vessel Inspection Regulations
- Vessel Traffic Service (VTS)
- Electronic Notice of Arrivals
- Mariner Guide to Navigating the Houston-Galveston Area Waterways
- Trim Rules
- Rules and safety committee information

Additional Mitigations:

- Risks determined to be balanced by existing mitigations.

Shallow Draft Vessel Quality

(Vessels less than 1600 Gross Tons engaged in commercial trade)

Trends/Observations:

- The vast majority of shallow-draft vessels are "brown-water" /inland tows. Approximately 12,000 tows transit the Houston Ship Channel each month.
- Crew proficiency for shallow draft vessels has increased dramatically.
- In the last several years, the fleet has become younger. There has been a lot of recapitalization.
- Coast Guard inspection standards, Title 46, Subchapter M, currently covers the now mandatory inspections requirements for towing vessels of a certain type.
- Regarding the vessel-to-horsepower ratio issue, the older equipment is normally a smaller horsepower. The new best practices specifying larger horsepower concerning barrels to horsepower ratio are in the tanker management assessment program. Although this is not a mandated rule, it's an industry standard that many people follow.
- The general trend is that there are more mariners retiring than are being recruited.

[4] Mariner Guide to Navigating the Houston-Galveston Area Waterways: http://www.houston-pilots.com/documents/pdf/mariners_guide91117b.pdf

- The number of vessel incidents are dropping compared to the number of near misses being reported.
- The standard of training changed dramatically. This process is now taking between 18 and 20 months. In general, companies that train individuals to stand navigation watches are investing no less than $150,000. This is the amount to train an individual from the first day until that person is able to stand a watch on their own.
- Shallow draft also goes through the Lone Star HSC. Shallow draft also uses the Gulf Intracoastal Canal Association (GICA)[5] which helps with any obstacles or any shutdowns.
- In addition to GICA, which is regional, there is also the American Waterways Operators (AWO)[6] which is national, and the Lone Star HSC which is local. All three of these organizations have pooled their resources and they have been able to take information. They fund and organize Brown Water University which is an annual event that takes place with the Houston Pilots. They also deal with infrastructure issues. With regards to the portion of the Gulf Intracoastal Canal within the scope of this study, these organizations vigilantly watch to ensure that it is properly dredged. They also give advice and notice to the mariners on issues.
- There is a requirement to have quarterly stats within the safety management system that is being reinforced by the Lone Star HSC.
- There are highly complex machines regulated with Environmental Protection Agency (EPA) Tier 2, Tier 3, and Tier 4 engines.[7] There are a lot more sensors and complex system components.
- It has been noted that a newer fleet does not necessarily translate into having a lower risk regarding vessel quality. While it is typical for new vessels to have more complex systems, often times, critical vessel functionality may overly rely on complex components which serve as single points of failure. Modernized systems generally add additional complexity which doesn't always add a greater confidence or reliability in the system.

Existing Mitigations:

- Lone Star HSC
- GICA
- AWO
- Port Coordination Team (PCT) calls
- Notice to Mariners
- Quarterly Statistics Requirement
- EPA Regulation of Tier 2, Tier 3, and Tier 4 engines
- Information on near misses

[5] GICA: https://www.gicaonline.com/
[6] The American Waterways Operators: https://www.americanwaterways.com/
[7] Domestic Regulations for Emissions from Marine Compression-ignition (Diesel) Engines: https://www.epa.gov/regulations-emissions-vehicles-and-engines/domestic-regulations-emissions-marine-compression

Additional Mitigations:

- Risks determined to be balanced by existing mitigations.

Commercial Fishing Vessel Quality

Trends/Observations:

- The number of commercial fishing vessels has decreased, whereas the number of shallow draft vessels has increased by a factor of ten.
- Within the area, there are more people leaving the commercial fishing industry than those being hired. Most of those remaining within the industry fall into the older age demographic.
- Many of the oyster vessels are more active in the Houston/Galveston region from November to May. Many of these vessels are from Louisiana.
- The main fisheries in the area are oysters and shrimp.
- In general, the quality of commercial fishing vessels has gone up. Most crews are generally experienced fishermen.
- Unlike other professional mariners, commercial fishers do not have to receive a Coast Guard document or a captain's license. Other mariners have expressed issues with the communication barrier with commercial fishermen as well as disregard for the rules of the road.
- The U.S. Coast Guard conducts outreach with the fishing vessel fleets. A dedicated fishing examiner is assigned to MSU Texas City.

Existing Mitigations:

- USCG Subchapter M – Towing Vessel Inspection Regulations
- USCG Subchapter T and K - Passenger Vessel Inspection Regulations[8]
- Coast Guard outreach fishing vessel fleets

Additional Mitigations:

- Not evaluated.

Small Craft Vessel Quality

Trends/Observations:

- Virtually all of the sailing clubs, boating clubs, the marinas, and the yacht clubs have very active training programs for their members. The shallow draft industry, invited Texas Mariners Cruising Association (TMCA)[9] and other groups to come into their training center and USCG WWM, USCG VTS, and Inland Towing representatives have made presentations to the TMCA.

[8] USCG Subchapter T: https://www.govinfo.gov/content/pkg/CFR-2012-title46-vol7/pdf/CFR-2012-title46-vol7-chapI-subchapT.pdf
USCG Subchapter K: https://www.govinfo.gov/content/pkg/CFR-2012-title46-vol4/pdf/CFR-2012-title46-vol4-chapI-subchapK.pdf
[9] TMCA: https://www.texasmariners.com/

- The Lone Star HSC put in a tremendous amount of effort to develop the Mariner Guide to Navigating the Houston-Galveston Area Waterways. There's a relatively small section that relates to recreational boating.

Existing Mitigations:

- Active training programs for members
- Mariner Guide to Navigating the Houston-Galveston Area Waterways

Additional Mitigations:

- Not evaluated.

Volume of Commercial Traffic

Trends/Observations:

- The 15 minute notice is very critical for calls to be made in order to check into the VTS 15 minutes beforehand. Currently, calls are being made when they actually hit the zone which creates an issue with possible collision or congestion.
- The inland towing industry has developed a valet system for tows transiting the I-10 Causeway as most inland tugs cannot safely transit under the bridge. The retractable wheelhouse vessels act as a buffer. The number of available retractable wheelhouse towing vessels may occasionally become a controlling factor limiting barge movements above/below the causeway.
- Notifications, GICA, Marine Safety Information Bulletins (MSIB), and VTS Advisories are utilized to disseminate information notifying the brown-water fleet to avoid certain areas or to adopt special practices. There is generally great communication to help with the volume, especially after incidents in which a port is closed and in the process of re-opening.
- There were previous incidents with gantry cranes. Consequently, whenever there is a gantry crane, it is always listed and spoken over the radio.

Existing Mitigations:

- Inland towing valet system
- PCT
- GICA
- Gantry crane awareness
- Dredge meetings advertised
- Local notice to mariners
- No meeting or overtaking in the Bolivar Buoy Line
- Traffic management for visibility restricted ships

Additional Mitigations:

- Risks determined to be balanced by existing mitigations.

Traffic Mix

Trends/Observations:

- It is common for inland tows to not call certain vessels and ask for permission to overtake. This is a serious issue and has been brought up in various Lone Star HSC meetings. One of the participants proposed changing the barge lane process so that there is also a dedicated lane for all vessels other than barges.
- The Lone Star HSC's Mariner Guide encompasses all of the mariners and provides an understanding of all the issues that each segment faces.

Existing Mitigations:

- Mariner Guide to Navigating the Houston-Galveston Area Waterways

Additional Mitigations:

- Not evaluated.

Congestion

Trends/Observations:

- Delayed departure of vessels from shore side terminals cause's congestion issues alongside negatively impacting safety and schedules.
- VTS is monitoring to help mitigate the issue.
- The pilots talk to the tugs to ensure that they have line handlers.
- Oorganizations such as Port Bureau[10] have port improvement programs to reduce the port's turnaround time.

Existing Mitigations:

- VTS
- Pilots ensure tugs have line handlers
- Port Bureau

Additional Mitigations:

- See Appendix C.

Winds

Trends/Observations:

- Wind forecasts are accurate and timely. Winds can exceed 20 knots at least twice a month.
- National Oceanic and Atmospheric Administration (NOAA) is part of the PCT.
- NOAA alerts concerning hazardous wind conditions are well forecasted and broadcast by the VTS.

[10] Greater Houston Port Bureau: https://txgulf.org/

- Towing vessels outbound from the upper Houston Ship Channel are interested in wind conditions on the bay as they approach Morgan's Point and lose protection from the wind provided by nearby landmasses.
- Increased wind speed during the winter season appear to correlate with increased groundings near Buoy 20. Buoys in this area are often struck and reported off station.
- Vessels of between 900 and 1100 feet are restricted in sustained winds above 20 knots. Vessels exceeding 1100 feet are restricted in sustained winds above 15 knots.

Existing Mitigations:

- NOAA's land-based sensors
- Some vessel types have wind restriction

Additional Mitigations:

- Risks determined to be balanced by existing mitigations.

Water Movement

Trends/Observations:

- Heavy rains increase currents on the San Jacinto River impacting maneuverability in the fleeting area.
- New drainage systems put in place after recent hurricanes to reduce flooding in downtown Houston have increased the volume of water that flows into the Houston Ship channel during storms. Prior to the new drainage, the surge of floodwaters into the channel was slackened by way of natural runoff into surrounding wetlands. There is potential for this issue to worsen with the installation of flood tunnels.
- The release of water from Lake Conroe and Lake Houston Dams has created instances of strong current and wave action down the Jacinto River.
- Hurricane Imelda created wave action that led to a breakaway of 14 loaded dangerous liquid barges that impacted the Interstate 10 corridor.
- Northern fronts can push water out of Clear Lake leaving some recreational vessels sitting on bottom. Currents can exceed 5 knots during this time.
- The NOAA ports[11] current meter is being installed at the I-610 Bridge on the upper channel.
- There are a plethora of tugs and assist vessels scattered throughout the port. They are always ready and have provided assistance any time they were needed.

Existing Mitigations:

- NOAA's land-based sensors
- NOAA ports current meter
- Harris County Flood Control District, National Weather Service.
- Additional Tugs and assist vessels

[11] PORTS: https://tidesandcurrents.noaa.gov/ports.html

Additional Mitigations:

- Not evaluated.

Visibility Restrictions

Trends/Observations:

- Fog "season" is typically November through April.
- The Galveston-Bolivar ferries run in all conditions of visibility.
- Fog can be thick at the Galveston-Bolivar Ferry crossing during early morning and late evening passages.
- Fog conditions at Galveston Entrance Channel can last for several days and are cleared by subsequent weather events.
- Daytime restrictions on vessel movement due to low visibility negatively impact deep draft vessels limited to daylight movement only.
- RAVEN GPS-based guidance, assisted steering systems, and other electronic tools enhance the safety or the ability to navigate during low visibility. The electronics enable an additional margin of safety. There is business pressures from overseas to transition into a 24 hour port.
- A potential mid-bay camera with additional sensors for wind, visibility, humidity and other predicting factors. However, there are some technological challenges with powering the camera in the middle of the bay during low visibility.
- Proposed mid-bay camera and sensors.

Existing Mitigations:

- PORTS
- RAVEN and Electronic tools

Additional Mitigations:

- Not Evaluated.

Obstructions

Trends/Observations:

- Aids to Navigation knockdowns can leave behind debris or hidden obstructions below the waterline.
- Bridge maintenance and port development projects can limit or shutdown vessel traffic movement creating conflict amongst waterway stakeholders.
- Operations in Texas City involving large Roll On/Roll Off (RORO) vessels can block the channel for up to a day.
- Vessel movement restrictions near the Highway 146 Bridge construction affect recreational boaters.
- Impending Beltway Bridge construction on Houston Ship Channel will create vessel movement restrictions.
- RORO operations within the Bayport Ship Channel restrict movement in the turning basin.
- Ocean cable reels in Carpenter's Bayou pose a risk to navigation.

- The Texas General Land Office (GLO) does not have a vessel removal program but a vessel documentation program. They do not have money to remove vessels, with the exception of a few high impact events in which federal money was provided.

Existing Mitigations:

- VTS and PCT communications of obstructions
- The GLO's vessel documentation program

Additional Mitigations:

- Risks determined to be balanced by existing mitigations.

Visibility Impediments

Trends/Observations:

- Nighttime visibility in the Houston Ship Channel above Morgan's Point is adversely affected by light pollution arising from shoreside background lighting.
- Lighting at Seawolf Park and along Texas City Bayou can impede visibility of passing vessels.
- Vessels anchored in Bolivar Roads Anchorage areas impede visibility through the use of deck lights and often obstruct the use of the Galveston Bay Entrance Range B.
- Light pollution from cruise ships is substantial.
- The USCG Research and Development Center has been working on a lot of focus optics for Raytheon. Some of the LED ranges were able to mitigate some of the background lighting pollution.
- Lumens studies are being conducted to make the optic more focused, especially when dealing with some of the ranges. Directional LEDs are being used inside of lanterns instead of incandescent lamps. A couple of these lanterns have been replaced with directional LEDs in order to increase the background or to change the light to green. This is being slowly implemented as the ranges are being rebuilt.

Existing Mitigations:

- Ranges being replaced with directional LEDs

Additional Mitigations:

- Not evaluated

Dimensions

Trends/Observations:

- The Intercostal Waterway (ICW) between mile markers 345 to 355 is narrow. There is a high number of groundings and knockdown of Aids to Navigation.
- The shifting of limited dredge resources to address unanticipated shoaling create backlogs to planned dredge maintenance.
- The Houston and Galveston-Texas City pilots' rules define daylight restrictions for each class of ship. Many of these restrictions impose control measures based upon vessel size.

- VTS Houston/Galveston manages bunkering operations at specified Restricted Berths.
- With new dock constructions, wider berths are imposed in order to have a bigger docking pocket. There are waivers in place for existing docks that do accommodate wide bodies. However, anything being constructed as a new build falls under a completely different set of rules.
- The USACE publish their hydrographic surveys online. This can be downloaded as either a .pdf or as an XYZ file, then imported into PPUs or ECDIS units.
- VTS Summaries include tow configuration, enabling piloted vessels to make better informed decisions on overtaking and meeting head on.
- When transiting around a bend, security calls are a standard and are required.
- Because the I-10 Bridge near the San Jacinto River was built in a previous time when there were smaller vessels, the air draft is restricting the size of vessels that can transit under the bridge.
- The widths between piles offer protection for the bridge. However, it should be noted that the normal protections for a bridge, like fendering and dolphin systems, have been damaged since Hurricane Harvey. It will take some time before these protections are properly repaired. As a result, the USCG has had to work with the waterway users to implement temporary restrictions/operating parameters to decrease risk to the unprotected bridge structures.

Existing Mitigations:

- Current projects underway to dredge
- The pilot rules define daylight restrictions for each class of ship
- Construction of wider berths
- USACE's Online Hydrographic Surveys
- VTS Summaries with tow configurations
- Security Calls

Additional Mitigations:

- See Appendix C.

Bottom Type

Trends/Observations:

- There is a mix of sand and mud alongside the channels.
- There are some areas with hard bottom types near the entrance to Morgan's Point. Riprap have been dumped there and tows are notified to not push in and conduct crew changes in that area.
- Underneath the Fred Hartman Bridge is the old construction of the Baytown Tunnel. There should not be any tows pushing in within this area.
- Due south of the Interstate 10 corridor, there is a large pipeline corridor that runs parallel to the interstate line. In the San Jacinto waterway, adjacent to that bank, there is a lot of old sunken barges and submerged

material. This is a non-navigable area; however, it's still covered by water and there is still high use in that area.

Existing Mitigations:

- Current projects underway to dredge

Additional Mitigations:

- Risks determined to be balanced by existing mitigations.

Configuration

Trends/Observations:

- A large buildup of new construction and new docks in the vicinity of Shell/Stolthaven/Enterprise makes for a dangerous area.
- Near the I-10 Bridge on the San Jacinto River is another area that continues to be an issue. The nature of the bridge is that it is too low. It is the major east-west artery of the Gulf Coast and a densely-travelled route to/from Houston.
- The I-10 Bridge is located near one of the busiest barge servicing facilities. The bridge is near the entrance to the San Jacinto River where there are new barge fleeting areas. It's next to an area where all of the aids to navigation are too crowded. Also worth noting, the I-10 Bridge is next to the Old River which is where hundreds of barges are fleeted within the area.
- There have been several mast/antenna strikes on the Interstate 610 Bridge. There are two 45-degree turns in the vicinity.
- The Battlefield is an area in which four waterways converge: the San Jacinto River, Old River, Carpenter's Bayou, and Buffalo Bayou (the Upper Houston Ship Channel).
- There could potentially be a configuration issue on Clear Creek for recreational vessels. There is construction with the bridge within that area. The final configuration may have a greater impact once the fenders are installed. The bigger boats are currently having some issues turning under the bridge.
- There is a steerage issue near the BOSTCO and Exxon facilities south of the San Jacinto River.

Existing Mitigations:

- Current projects underway to dredge
- The pilot rules define daylight restrictions for each class of ship
- Construction of wider berths
- USACE's Online Hydrographic Surveys
- VTS Summaries with tow configurations
- Security Calls

Additional Mitigations:

- Not evaluated.

Personnel Injuries

Trends/Observations:

- A minimum of three ferries are typically operating on the Galveston-Bolivar route. From February through Labor Day, the average number of ferries running at a time is four to five. On certain holidays, such as the 4th of July, Memorial Day, or Easter, all six ferries will run simultaneously.
- The maximum capacity for ferries are roughly 600 passengers. Ferries typically run from 250 to 400 on a single trip.
- Cruise ships run on every Saturday and Sunday. Cruise ships will split up during the weekday so that there are cruises running on at least two to three days out of the workweek.
- Cruise ships average anywhere from approximately 3,800 to 4,500 passengers. The Royal Caribbean Oasis will enter service with a capacity of 6000.
- Roughly 23 – 24 days within a month are covered with scheduled cruises.
- A mass casualty exercise was conducted near Kemah.
- Annual exercises are conducted with TSA. Several full-scale active shooter exercises have been conducted. Some exercises have been conducted with fires, explosives, and IEDs in the terminals.

Existing Mitigations:

- USCG responds to all reported marine casualties
- Mass casualty exercise
- Annual security exercises
- Coast Guard random inspection checks

Additional Mitigations:

- Risks determined to be balanced by existing mitigations.

Petroleum Discharge

Trends/Observations:

- The port receives bulk tankers carrying in excess of 40,000 DWT of petroleum.
- Many of the best salvage companies in the world are headquartered within the Houston/Galveston area.
- There are regulations in place for prevention.
- Facility inspectors conduct full-fledged annual inspections of safety equipment and practices, including regulations which aim to reduce the impact of oil spills. Additionally, they conduct spot checks at least once a year on all facilities and transfer monitors. Inspectors observe cargo transfer operations in real time to ensure practitioners are in compliance with regulations.
- The USCG relies completely on third party organizations to conduct and provide records for pipeline testing.

Existing Mitigations:

- High quality Salvage companies
- Facility inspections
- Third party testing of pipes

Additional Mitigations:

- Not evaluated.

Hazardous Materials Release:

Trends/Observations:

- Port receives bulk carriage vessels for chemicals in excess of 40,000 DWT.
- There are regulations in place for prevention.
- Facility inspectors conduct full-fledged annual inspections of safety equipment and practices, including regulations which aim to reduce the impact of oil spills. Additionally, they conduct spot checks at least once a year on all facilities and transfer monitors. Inspectors observe cargo transfer operations in real time to ensure practitioners are in compliance with regulations.
- There is a large dependence on third-party organizations to verify that their pipes have been tested.
- The Harris County Pollution Control Services Department and Houston Fire Department are involved with response to a hazardous chemicals release.

Existing Mitigations:

- Air monitoring
- Harris County Pollution Control Services Department
- Houston Fire Department
- Facility inspections
- Third party testing of pipes

Additional Mitigations:

- Not evaluated.

Mobility:

Trends/Observations:

- PCT calls are conducted for waterway closures due to marine casualties. The PCT alerts the industry and works through issues to facilitate a rapid re-opening.

Existing Mitigations:

- PCT calls
- Area contingency plan[12]

[12] Area Contingency plan: https://www.glo.texas.gov/ost/acp/houston/sectorhoustongalveston_acp.pdf

- Response Plan

Additional Mitigations:

- Not evaluated.

Environmental:

Trends/Observations:

- Galveston Bay is a critical estuary.
- The dioxins and furans that come out of the San Jacinto River eventually flow into the Gulf of Mexico. Although they become diluted, these chemicals affect everything that touches the water. Dioxins and furans can bond with soil particles; currents distribute these sediment particles everywhere.
- The oyster fishermen have been uprooted because of the spills. This has been presented as a major issue with the Texas Parks and Wildlife Department.[13]
- The Harris County Pollution Control Department (Emergency Response section) is being phased in and there are linkages being put in place with other service providers, universities, and the 6th Civil Support Team in Austin. This is to enable a more robust air response mechanism. This will be addressed in the area contingency plan.
- NOAA has a GIS system, Environmental Resource Management (ERMA), which utilizes different layers to better analyze spill trajectories and spill forecasting.
- Pre-planning efforts are being conducted to identify specific geographic locations that are sensitive to oil spills as to develop tactical plans to address those areas.[14]

Existing Mitigations:

- Booming strategy
- Harris County Pollution Control Services Department
- Area contingency plan
- ERMA

Additional Mitigations:

- Not evaluated.

Aquatic Resources:

Trends/Observations:

- Brown shrimp are more abundant in the spring and white shrimp more abundant in the fall.
- Brown shrimp arrive from January through February and lay their eggs on the beach. Once hatched, they burrow into the bay and grow big enough to be caught by the May timeframe.

[13] Texas Parks and Wildlife Department: https://tpwd.texas.gov/
[14] Environmentally Sensitive Areas: https://www.glo.texas.gov/ost/responsemaps/texas/texasesi/galveston/index.html

- Live bait season runs from December to May 15th. During live bait season, fishermen are only allowed to catch 200 pounds a day, and half of the catch must be kept alive for live baiting. During this season, fishermen are limited to what they can catch. Fishermen during this season are limited to using a 32-foot net.
- Brownie season runs from May to July 15th in which the entire catch can be dead. Fishermen during this season are limited to using a 32-foot net.
- Shrimping operations are shut down for one month, from July to August, to allow the small shrimp to move into the bay and the remaining brown shrimp to leave the bay.
- Big net season runs from August 15th to December. During this season, there are no restrictions on net size or the amount of time spent fishing. However, big net season coincides with hurricane season.
- The sports fishermen catch black drum, red fish, and trout. Commercial fishermen are not allowed to keep any of the sports fishing catch or freshwater catfish.

Additional Mitigations:

- Not evaluated.

Economic:

Trends/Observations:

- If there is a closure, the local impact is roughly $100 million daily. The national impact that Houston has is $802 billion annually. So on a national level, this equates to $2.1 billion a day, $90 million an hour, or $1.5 million a minute.
- This region contributes up to 20 percent of the Texas GDP. If Texas was a nation, its economy would be number 12, between Canada and Russia.
- I-10 is the major interstate highway that connects California to Florida. Consequently, this has a great impact locally as well as nationally.
- There is effort to diversify cargos; many of the railways have more capacity.
- There are a number of widening projects in the queue.

Existing Mitigations:

- Cargo Diversification
- Port Coordination Teams (PCT)
- Widening projects

Additional Mitigations:

- See Appendix C.

.

This Page Intentionally Left Blank

Appendix C

Workshop participants identified, discussed, and evaluated additional risk intervention strategies to further reduce risks. The recommended additional risk intervention strategies should not be construed to represent the views of or statements by the United States Coast Guard.

Additional Risk Intervention Strategies

Congestion:

- Mitigation Strategy 1: Reduce risk of collision and un-saturate radio channels. Increase vessel spacing through a vessel spacing plan and/or coordinated morning and/or afternoon orders.
- Mitigation Strategy 2: Reduce inefficient moves via a Port-wide transparency of information system tool for all phases of operation at a vessel port call to facilitate better documentation and optimization of vessel rotation. (e.g. Pronto pilot)
- Mitigation Strategy 3: Increase the size of usable space and/or create space. Encourage and make better use of existing deep water ports (e.g. LOOP). Build new deep water ports.
- Mitigation Strategy 4: Reduce inefficient moves by creating a fleeting strategy for 24 and 48 hour staging areas while vessels are enroute. For example, when the vessel is 48 hours out, it is placed on line up and is confirmed when 24 hours out.
- Mitigation Strategy 5: Reduce crowding and inefficient use of waterway by exploring possible ways to meter out the load (reduce peaks, fill in valleys) and enable a 24 hour port.

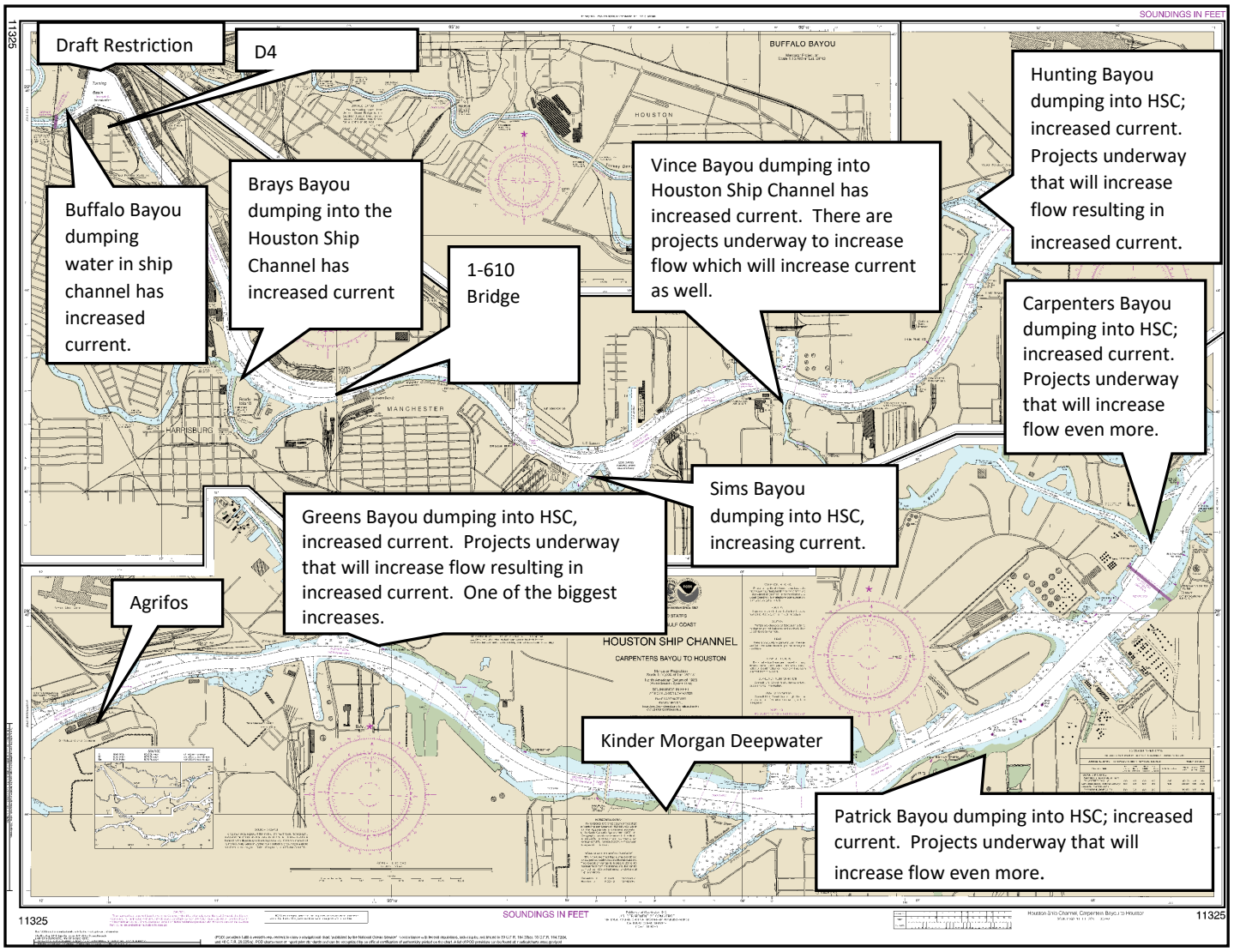
Dimensions:

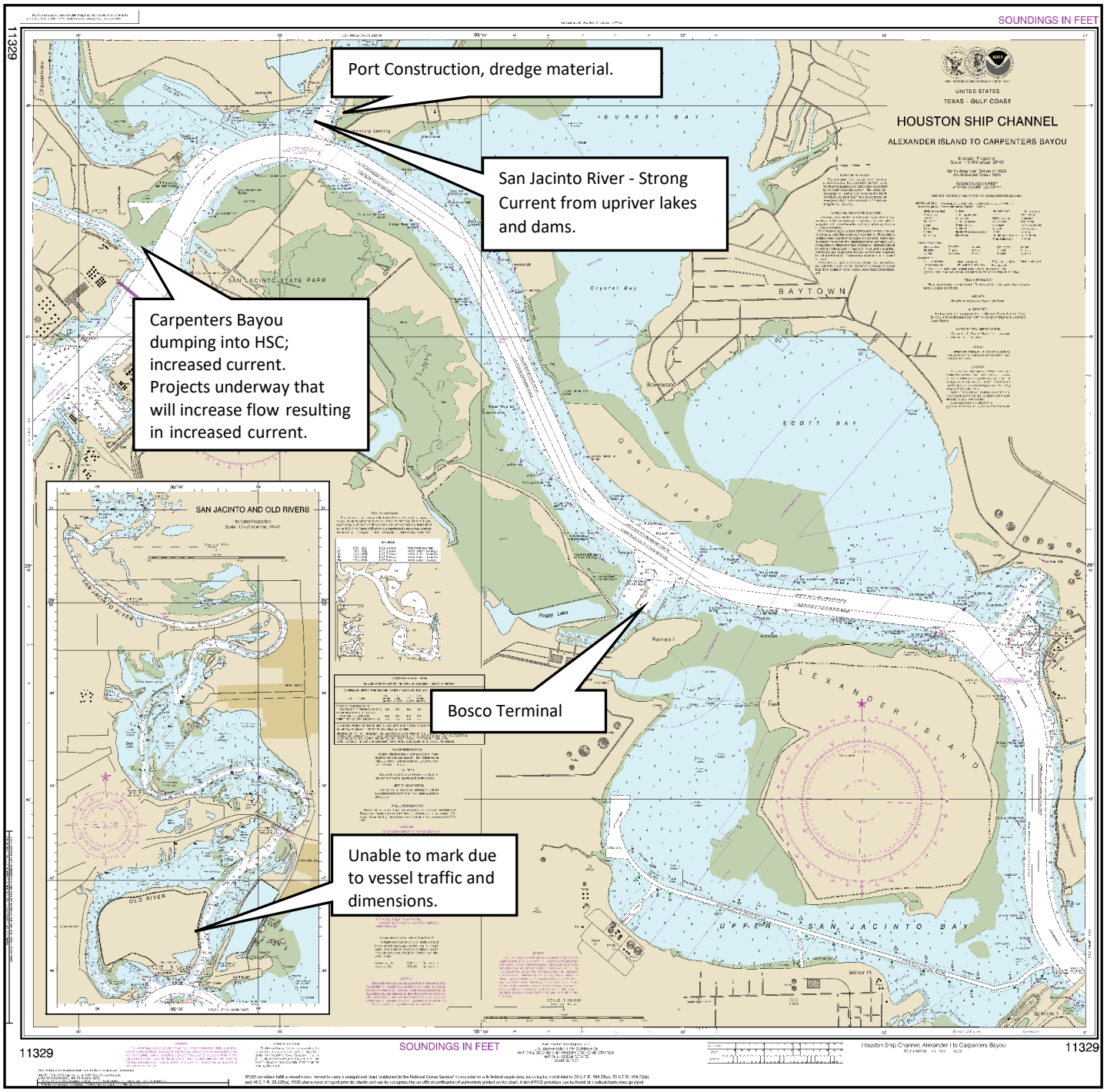
- Mitigation Strategy 1: Reduce or avoid groundings, channel closings, economic impacts. Widen and deepen from the turning basin down.
- Mitigation Strategy 2: Shorten the transit of larger vessels (e.g., container ships). Move the container port/terminal to the south, closer to the gulf.
- Mitigation Strategy 3: Maintain an efficient flow of traffic as vessel size and quantity increase in response to greater capacity. Meet industry demand. Plan for the future by identifying additional anchorages, passing lanes, bypass lane, restrictions (e.g., daytime nav), and/or extenuating factors to maintain safe navigation.
- Mitigation Strategy 4: Remove or adjust daylight navigation restrictions. Create more capacity and/or space by widening and deepening the channel.
- Mitigation Strategy 5: The narrowness of Intracoastal waterway (ICWW) from mile marker 345-365 results in bottlenecks on Houston Ship Channel and ICWW, collisions, groundings, and AtoN knockdowns. Alleviate the bottlenecks to reduce collisions, groundings, and AtoN knockdowns. Dredge and widen the ICWW from mile marker 345-355.

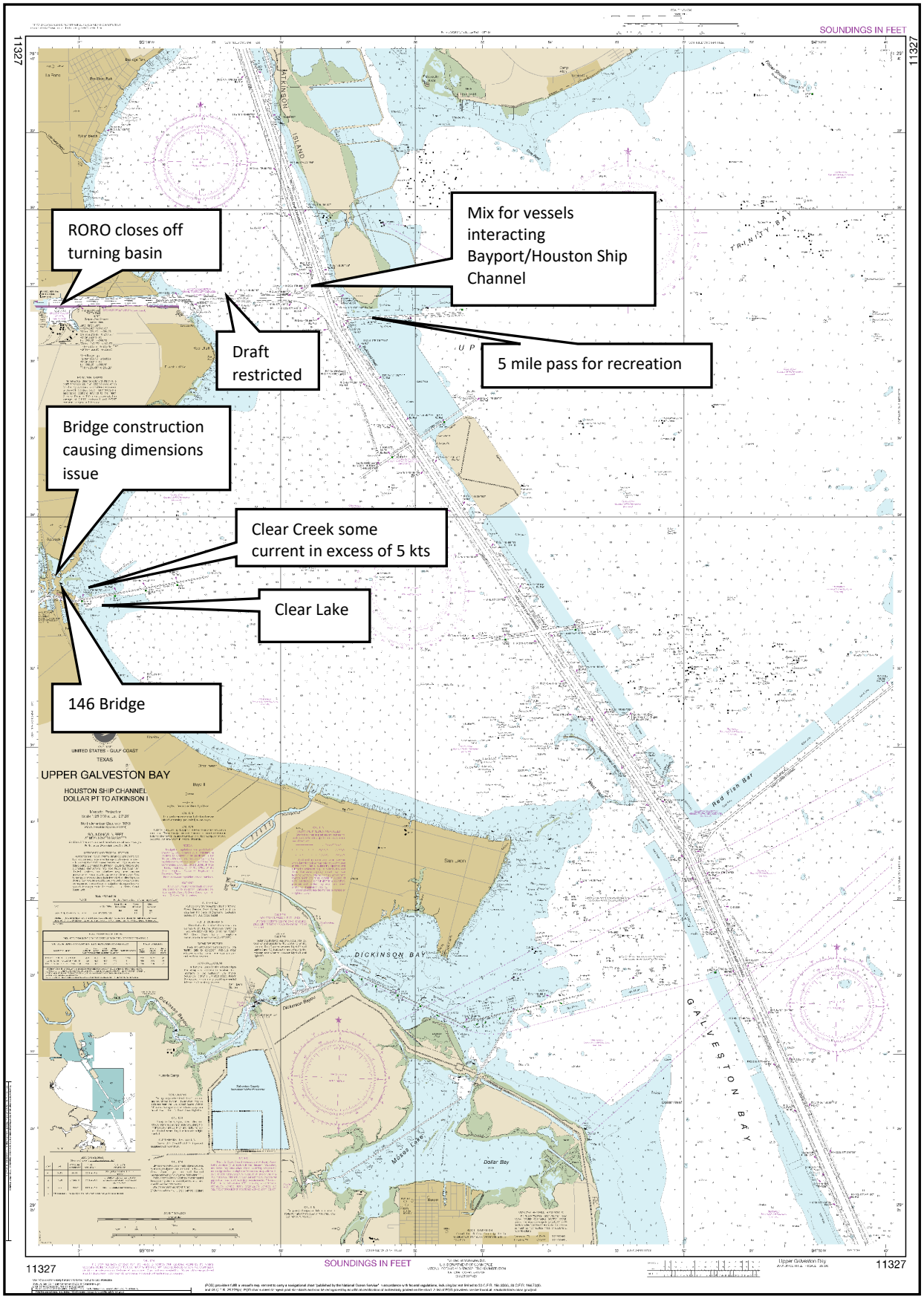
Economic:

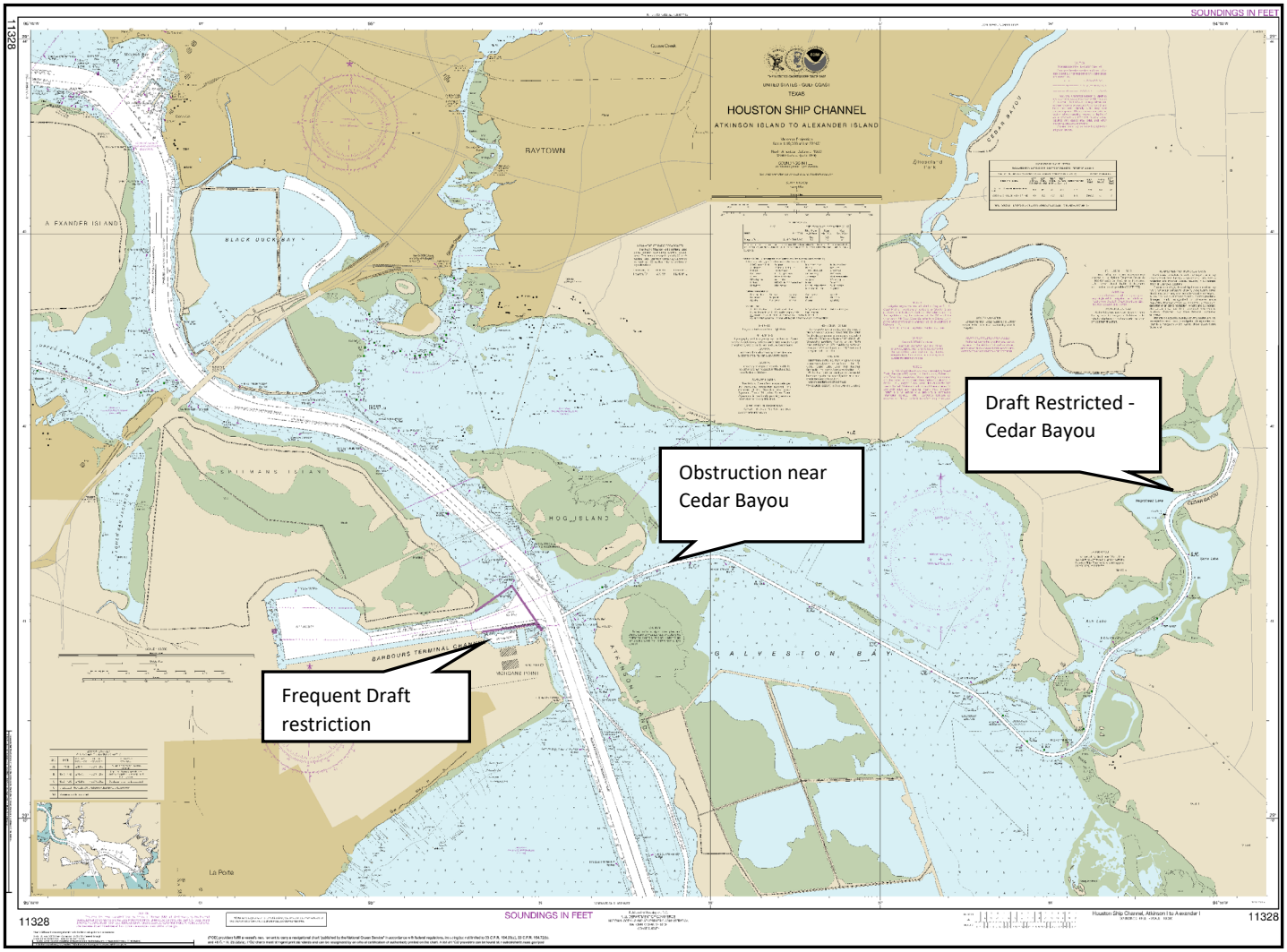
- Mitigation Strategy 1: Increase port stakeholder education, engagement, and understanding of the Port Coordination Team and its role to keep commerce moving after an incident. Area resumption of trade plan; a plan to restore commerce.
- Mitigation Strategy 2: The goal is to keep commerce moving. Ensure and encourage companies to review and update their continuity plans especially after major incidents such as ITC. Company resumption of trade plan; a plan to restore company.
- Mitigation Strategy 3: The goal is to keep commerce moving through salvage and removal plans. Mandate, through regulatory enforcement and exercises, that ships have a local salvage company on call to immediately clear a capsized or sunken vessel from the channel.
- Mitigation Strategy 4: Increased unplanned closures and marine casualties as a result of loss of VTS functionality and value to Houston - Galveston area. Support VTS and ensure its continued viability. Identify VTS as a strategic economic asset. Private sector lobbies to preserve the proper VTS support and funding.
- Mitigation Strategy 5: Keep commerce moving through salvage and removal plans. Make Houston/Galveston an all-weather, 24 hour port.

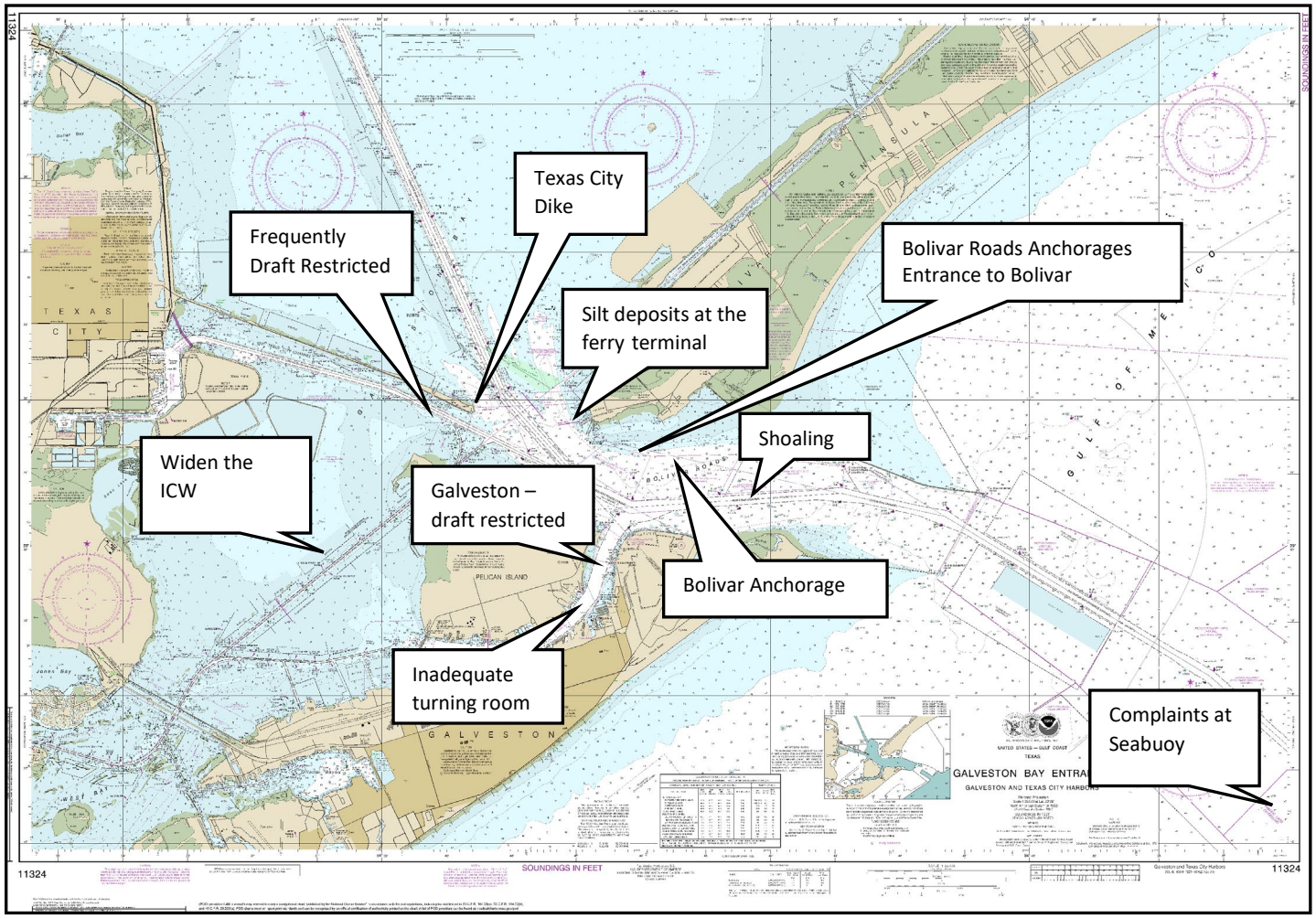
This Page Intentionally Left Blank


Draft Restriction
D4
Buffalo Bayou dumping water in ship channel has increased current.
Brays Bayou dumping into the Houston Ship Channel has increased current
1-610 Bridge
Vince Bayou dumping into Houston Ship Channel has increased current. There are projects underway to increase flow which will increase current as well.
Hunting Bayou dumping into HSC; increased current. Projects underway that will increase flow resulting in increased current.
Carpenters Bayou dumping into HSC; increased current. Projects underway that will increase flow even more.
Sims Bayou dumping into HSC, increasing current.
Greens Bayou dumping into HSC, increased current. Projects underway that will increase flow resulting in increased current. One of the biggest increases.
Agrifos
Kinder Morgan Deepwater
Patrick Bayou dumping into HSC; increased current. Projects underway that will increase flow even more.
BUFFALO BAYOU
HOUSTON
MANCHESTER
HARRISBURG
HOUSTON SHIP CHANNEL
CARPENTERS BAYOU TO HOUSTON
SOUNDINGS IN FEET
11325


Port Construction, dredge material.
San Jacinto River - Strong Current from upriver lakes and dams.
Carpenters Bayou dumping into HSC; increased current. Projects underway that will increase flow resulting in increased current.
Bosco Terminal
Unable to mark due to vessel traffic and dimensions.
SOUNDINGS IN FEET
11329
HOUSTON SHIP CHANNEL
ALEXANDER ISLAND TO CARPENTERS BAYOU
SAN JACINTO AND OLD RIVERS
BAYTOWN
SCOTT BAY
UPPER SAN JACINTO BAY
ALEXANDER ISLAND
SAN JACINTO STATE PARK
BURNET BAY
Houston Ship Channel, Alexander I to Carpenters Bayou


SOUNDINGS IN FEET
11327
RORO closes off turning basin
Mix for vessels interacting Bayport/Houston Ship Channel
Draft restricted
5 mile pass for recreation
Bridge construction causing dimensions issue
Clear Creek some current in excess of 5 kts
Clear Lake
146 Bridge
UNITED STATES - GULF COAST
TEXAS
UPPER GALVESTON BAY
HOUSTON SHIP CHANNEL
DOLLAR PT TO ATKINSON I
DICKINSON BAY
GALVESTON BAY
TRINITY BAY
ATKINSON ISLAND
Red Fish Bar
Dollar Bay
SOUNDINGS IN FEET
11327


SOUNDINGS IN FEET
HOUSTON SHIP CHANNEL
ATKINSON ISLAND TO ALEXANDER ISLAND
RAYTOWN
HOG ISLAND
GALVESTON BAY
Draft Restricted - Cedar Bayou
Obstruction near Cedar Bayou
Frequent Draft restriction
11328
SOUNDINGS IN FEET
11328


Texas City Dike
Frequently Draft Restricted
Bolivar Roads Anchorages Entrance to Bolivar
Silt deposits at the ferry terminal
Shoaling
Widen the ICW
Galveston – draft restricted
Bolivar Anchorage
Inadequate turning room
Complaints at Seabuoy
TEXAS CITY
PELICAN ISLAND
GALVESTON
BOLIVAR PENINSULA
GULF OF MEXICO
GALVESTON BAY ENTRA
GALVESTON AND TEXAS CITY HARBORS
SOUNDINGS IN FEET
11324

This page left intentionally blank

Appendix E

References

American Canoe Association
http://www.americancanoe.org/

The American Waterways Operators
http://www.americanwaterways.com/

Environmental Protection Agency
https://www.epa.gov/regulations-emissions-vehicles-and-engines/domestic-regulations-emissions-marine-compression

Gulf Intracoastal Canal Association (GICA)
https://www.gicaonline.com/

International Convention of Standards of Training, Certification and Watchkeeping (STCW)
http://www.imo.org/en/About/conventions/listofconventions/pages/international-convention-on-standards-of-training,-certification-and-watchkeeping-for-seafarers-(stcw).aspx

International Marine Contracting Association (IMCA) Standards
https://www.imca-int.com/

International Tanker Owners Pollution Federation (ITOP)
http://www.itopf.com/

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

Mariner Guide Navigating the Houston-Galveston Area Waterways
http://www.houston-pilots.com/documents/pdf/mariners_guide91117b.pdf

National Oceanic and Atmospheric Administration, National Ocean Service
https://oceanservice.noaa.gov/

Offshore Vessel Inspection Database (OVID)
https://www.ocimf-ovid.org/

Oil Company International Marine Forum (OCIMF)
https://www.ocimf.org/

Greater Houston Port Bureau
https://txgulf.org/

PORTS
https://tidesandcurrents.noaa.gov/ports.html

Recreational Boating Safety - Accident Statistics
http://www.uscgboating.org/statistics/accident_statistics.php
Ship Inspection Report Program (SIRE)
https://www.ocimf.org/sire/

SIRE
https://www.ocimf.org/media/84968/SIRE-Factsheet-May-2018.pdf

State Specific Boating Safety Requirements
http://www.americasboatingcourse.com/lawsbystate.cfm

Texas General Land Office
https://www.glo.texas.gov/ost/index.html

Texas Mariners Cruising Association
https://www.texasmariners.com/

Texas Parks and Wildlife Department
https://tpwd.texas.gov/

U.S. Army Corps of Engineers - Regulatory Policies
http://www.usace.army.mil/Missions/

U.S. Army Corps of Engineers - Vessel Transit Statics
http://www.navigationdatacenter.us/

U.S. Coast Guard - Navigation Rules and Regulations
http://www.navcen.uscg.gov/?pageName=navRuleChanges

USCG Port State Control Regulations
https://www.dco.uscg.mil/Our-Organization/Assistant-Commandant-for-Prevention-Policy-CG-5P/Inspections-Compliance-CG-5PC-/Commercial-Vessel-Compliance/Foreign-Offshore-Compliance-Division

U.S. Coast Guard – Domestic Vessel Inspection Regulations
http://www.ecfr.gov/cgi-bin/ECFR?page=browse

U.S. Coast Guard - Vessel Traffic Services
https://www.navcen.uscg.gov/?pageName=vtsLocations

U.S. Coast Guard Auxiliary Requirements for Recreational Boats
http://www.cgaux.org/boatinged/classes/2011/bss.php

This Page Intentionally Left Blank

Appendix F

Abbreviations and Acronyms

ACP	Area Contingency Plan
AIS	Automated Identification System
ANPRM	Advance Notice of Proposed Rulemaking
ATON	Aids to Navigation
BNM	Broadcast Notice to Mariners
BWI	Boating While Intoxicated
COTP	Captain of the Port
EPA	Environmental Protection Agency
MARAD	Maritime Administration
MTS	Marine Transportation System
MTSRU	Marine Transportation System Recovery Unit
NDG	National Dialogue Group
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic Atmospheric Administration
OSRO	Oil Spill Response Organization
PAWSA	Ports and Waterways Safety Assessment
PFD	Personal Flotation Device
PSC	Port State Control
PORTS	Physical Oceanographic Real-Time System
RNA	Regulated Navigation Areas
STCW	Standards of Training Certification of Watchkeeping
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
VHF	Very High Frequency
VMRS	Vessel Movement Reporting System
VTM	Vessel Traffic Management
VTS	Vessel Traffic Service

This Page Intentionally Left Blank

U.S. Department of Homeland Security
United States Coast Guard

Commander
United States Coast Guard
Sector Houston Galveston

13411 Hillard Street
Houston, TX 77034
Staff Symbol: s
Phone: (281) 464-4802
Email: jason.e.smith2@uscg.mil

16670
30 March 2021

MEMORANDUM

From: J. E. SMITH
Sector Houston-Galveston

Reply to
Attn of:

To: Navigation Center

Subj: TRANSMITTAL OF PAWSA REPORT FOR PORTS OF HOUSTON/GALVESTON

Ref: (a) COMDTINST 16003.2B, Marine Planning to Operate and Maintain the MTS and Implement National Policy

1. As per Navigation Center's (NAVCEN) 29 March 2021 decision to delegate final Ports and Waterways Safety Assessments (PAWSA) signature authority to respective Captain of the Ports as per reference (a), I am submitting the enclosed final PAWSA report for Houston / Galveston, which I approve, for the PAWSA workshop that took place 15-16 January 2020.

2. I understand that this report will be reviewed by NAVCEN one final time before being posted to the public archive on www.navcen.gov in two weeks.

#

Encl: Final Report of PAWSA for Ports of Houston and Galveston (15-16 Jan 2020)

02 Apr 2021

FIRST ENDORSEMENT

From: M.W. Glander
NAVCEN

To: File

1. NAVCEN received PAWSA report from COTP Houston/Galveston and conducted a final review. Report is approved for posting without further comment.

2. Final PAWSA report will be posted at https://navcen.gov/?pageName=pawsaFinalReports.