Climate Ready Oil Spill Preparedness and Response Workshop

Summary Report

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Contents

Acronym List

Table 1: Acronyms

Acronym	Definition
ACM	Area Committee Meeting
CBA	Community Benefit Agreement
DPA	Designated Port Area
EV	Electric Vehicle
EPA	Environmental Protection Agency
ESI	Environmental Sensitivity Index
EOEEA	Massachusetts Executive Office of Energy and Environmental Affairs
FEMA	Federal Emergency Management Agency
GIS	Geographic Information System
GRS	Geographic Response Strategy
IMO	International Maritime Organization
MBTA	Massachusetts Bay Transportation Agency
MassDEP	Massachusetts Department of Environmental Protection
MEMA	Massachusetts Emergency Management Agency
MOSPRA	Massachusetts Oil Spill Prevention and Response Act
MVP	Municipal Vulnerability Preparedness
RMC	Resilient Mystic Collaborative
NOAA	National Oceanic and Atmospheric Administration
NRC	National Response Center
OSW	Offshore Wind
PCB	Polychlorinated Biphenyls
RRT	Regional Response Team
RMAT	Resilient MA Action Team
SLR	Sea Level Rise
VOC	Volatile Organic Compounds

Climate Ready Oil Spill Preparedness and Response Workshop Summary Report

This report summarizes the discussion and synthesizes key themes from the May 18, 2023, Climate Ready Oil Spill Preparedness and Response Workshop sponsored by the Massachusetts Department of Environmental Protection (MassDEP). Findings from this workshop will be integrated into the final project report: *Evaluating and Adapting Oil Spill Preparedness and Response Capabilities for a Changing Climate.*

Introduction

In May 2023, a one-day workshop was planned and facilitated by MassDEP, with contractor support from Nuka Research, and Resilience and Foresight Services. The workshop brought together a diverse group of participants in an in-person, future-focused setting to explore the intersection of climate change and hazards, localized climate-adaptation efforts, and decarbonization initiatives with marine oil spill risks and response capabilities. Through group-based discussions, participants identified emerging risks, innovative solutions, and future opportunities for collaboration to ensure the continued protection of Massachusetts' communities and coastlines from future marine oil spills.

Objectives

Workshop objectives were to:

- Introduce/review Massachusetts climate projections and impacts with oil spill prevention and response partners
- Leverage oil spill prevention and response expertise to anticipate plausible impacts and emerging risks related to climate change and oil spills
- Identify options to continue to reduce oil spill risk today and in the future
- Discuss implications and opportunities for the Massachusetts Oil Spill Prevention and Response Act (MOSPRA) program to facilitate climate preparedness initiatives in line with Massachusetts policies and targets.

Background

The 2023 MassDEP Climate Ready Oil Spill Preparedness and Response Workshop is part of a larger climate change project and was built upon findings from a 2021 Threat Assessment Report titled: *Evaluating and Adapting Oil Spill Preparedness and Response Capabilities for a Changing Climate*. The 2021 report highlights that climate change, hazards, and policy are changing Massachusetts' oil spill risk, prevention, and response. As a national leader in climate policy and action, Massachusetts has established initiatives to reduce carbon emissions, adapt to climate change, enhance climate resilience, and implement hazard mitigation plans. These initiatives are essential to address the current and future effects of climate change and may have both positive and negative influences on oil spill risk, prevention, and response activities.

To evaluate these impacts, the climate component of the threat assessment focused on four questions:

- How might a changing climate and associated hazards impact oil infrastructure, vessel and storage tank exposure, and safety?
- How might a changing climate and associated hazards impact oil spill preparedness and response capacity?
- How might actions and directions stemming from decarbonization strategies impact the transportation and storage of fossil fuels throughout the state?
- How might local and state adaptation efforts change the risk landscape and receiving environment for potential spills?

The answers to each question above formed the basis for creating a series of plausible future-based scenarios that guided discussions throughout the May 2023 workshop.

Approach

Workshop Format

The Climate Ready Oil Spill Preparedness and Response Workshop followed a highly interactive process utilizing strategic foresight methods to identify and discuss future changes to oil spill risk, preparedness, and response due to climate change, climate adaptation, and decarbonization. The workshop was designed to understand how regional and global climate trends and policies could impact oil spill risk, prevention, and response, based on present and future conditions in the three local harbors. Invitees included local, state, federal, and private sector oil spill prevention and response experts and leaders in regional and local climate adaptation and mitigation.

Selection of Focus Harbors & Integration of Local Expertise

The quantitative threat assessment component of our research looked at two key metrics to evaluate threats:

(1) Vessel Traffic Density
(2) Marine Transportation of Petroleum Products

Boston Harbor, New Bedford Harbor, and Vineyard Haven Harbor were selected as focus areas for the workshop because of relatively high scores in terms of threat for one or both of these metrics. These harbors were also selected because each has different port conditions and environmental risks, a range of population demographics, and unique climate change policies.

Once the three harbors were identified, additional research and local interviews were conducted. Research included in-depth analysis of local and regional planning documentation, climate risk, adaptation and resilience reports and strategies, and local hazard mitigation plans. Interviews were held with climate change specialists and others responsible for the development of resilience strategies, including municipal, port, and non-profit staff. These interviews provided an opportunity to discuss the potential threats and implications of climate

change for oil spills from the perspective of those who are deeply involved in local climate work, but less engaged in oil spill planning, prevention, and response efforts. Interviewees provided insights into hyper-local climate threats, local and regional climate plans and proposals, and opportunities and barriers related to climate adaptation and mitigation in their communities. Interviewees were also asked to imagine and describe changes to their harbors and communities in the next 10 years if current climate plans were implemented. This research grounded the workshop scenarios in realistic conditions and plausible futures based on local knowledge, current and anticipated challenges, and existing plans. Interviewees were also invited to attend the workshop.

See Table 2 for a snapshot of background information compiled for each harbor and Appendix A for a more complete summary of this information.

Table 2: Snapshot of Background Information for Each Harbor

	Vineyard Harbor	New Bedford Harbor	Boston Harbor
Oil Spill Risk & Response	• Home to island's only year-round ferry and most densely trafficked harbor • Bulk oil transported to VH by tug and barge, and by truck on passenger ferries. • Seasonal differences in fuel/heating oil transport • Single GRS with objective of protecting Lagoon Pond.	• Home to largest fishing fleet in MA, and nation's top grossing port • Vessel traffic increasing with massive offshore wind investments. • Disproportionately high incidence of "mystery" spills, and most active MassDEP spill response trailer. • MOSPRA spill reduction efforts include outreach campaign and bilge pump-out programs. • Long-term options being considered include permanent waste oil storage and treatment.	• Highly industrialized area home to seven federally regulated petroleum terminals • Nearby major railways/truck routes, for transport of petroleum from terminals • Historical spills include truck rollovers, mystery spills, hull breeches • Future plans of condo development, bringing thousands of new residents
Climate Change Risk & Resilience	• Sea levels rising faster than global average • 1,126 buildings in 100-year flood zone • Low-lying buildings and main arteries already subject to coastal flooding. • Communities are part of the MVP program,	Climate risk assessments completed by City & Port of New Bedford, and Town of Fairhaven. • Resilience /adaptation efforts underway include nature-based and grey solutions. • Existing hurricane barrier will mitigate	• Population includes high density of environmental justice communities. • Growing demand for justice related to sea level rise and industrial pollution. • Ambitious "Resilient East Boston Harbor" plan could result in 40%

	Vineyard Harbor	New Bedford Harbor	Boston Harbor
	actively working to mitigate risks. • 2022 Vineyard Way Climate Strategy aims to decarbonize by 2040 (10 years before state target) • Operations and maintenance for offshore Vineyard Wind project to be developed and centered in Vineyard Haven	some future impacts but may not withstand all future storms. • New Bedford will be a hub for Offshore Wind development, and related innovation efforts. •	of industrialized shoreline transformed to green infrastructure/ nature-based solutions. • Recent exercise facilitated by Resilient Mystic Collaborative engaged oil storage facilities & local residents to evaluate social impacts of 100-year storm, and critical infrastructure failures. • Belle Isle Marsh exceptionally fragile; target of restoration investment.

Pre-Workshop Survey

Prior to the workshop, registrants were prompted to complete a short survey asking them to (1) summarize one question, challenge, or opportunity relating to the impacts of extreme weather, temperatures, or flooding on oil spill preparedness, response, and recovery; and (2) identify one question, challenge, or opportunity related to the use and transport of alternative fuels/power sources in Massachusetts and their associated impacts on marine emergency prevention and response. Feedback from this survey was incorporated into workshop materials and supplemented participant discussions and exercises. Survey results are summarized in Table 3.

Table 3: Survey Results

Impacts of extreme weather, temperatures, or flooding on oil spill preparedness, response, and recovery	Use and transport of alternative fuels/power sources and their impacts on marine emergency prevention and response
Challenge of protecting tank farm facilities from risks	Challenge of measuring risks associated with alternate fuels
Challenge of navigating guidance restricting development in flood zones	Challenge of responding to risks associated with alternate fuels
Challenge of responding to multiple spills during large flooding events	Challenge of developing the appropriate infrastructure for alternate fuels

Impacts of extreme weather, temperatures, or flooding on oil spill preparedness, response, and recovery	Use and transport of alternative fuels/power sources and their impacts on marine emergency prevention and response
Opportunity to improve multi-agency communications	Challenge of replacing existing, outdated infrastructure and technology
Opportunity to expand mutual aid offerings	Opportunity to revisit training requirements for responders
Opportunity to improve damage assessment procedures after extreme weather events	

Overview

The workshop began with a welcome and introduction from Julie Hutcheson (MassDEP's Marine Oil Spill Prevention & Response Program Coordinator). Elise DeCola (Nuka Research) then presented on MOSPRA program elements and accomplishments. Katie McPherson (Resilience & Foresight Services) introduced the group to brainstorming methods that would be applied throughout the day and discussed the use of strategic foresight as a tool for anticipating future risks relative to workshop scenarios. She then provided a summary of the potential implications of climate change on current and future oil spill prevention and response activities based on research conducted to date.

Next, participants engaged in a series of group exercises based on plausible future climate conditions that could play out in the next 5-10 years in each of the three harbors. Groups were organized by harbor, and each was given three future scenario cards relating to:

- Sea Level Rise (SLR) and Coastal Flooding
- Extreme Weather
- Climate Adaptation

Scenarios were established using Massachusetts climate projections for each region, Resilient Massachusetts[1] design guidelines and recommendations for resilience planning, feedback from interviews with local municipal and port staff, and information from climate and hazard mitigation plans for each community. Groups discussed the implications of the plausible climate conditions and adaptations on oil spill risk, planning, and response described in each scenario. Their findings were recorded and mapped on an Impact / Certainty Matrix.

Part one of the workshop concluded with each group identifying possible solutions and actions to be taken to prepare for the potential impacts they identified in the previous discussion.

[1] MA Climate Change Clearinghouse (mass.gov)

After lunch, participants engaged in the workshop's second group session, which began with a presentation on decarbonization policy, trends, and targets relevant to marine transportation and oil spill risk.

After the presentation, groups were provided with a series of current trends and indicators related to decarbonization. Each group considered a localized trend related to:

- Decarbonization Technologies (including electrification and autonomous vessels)
- Alternative Marine Fuels, Storage and Transportation
- Massachusetts Policy and Targets (i.e., Offshore wind, electric vehicles, etc.)

Groups used a Futures Wheel to consider how these trends may evolve in their harbor and how they might impact the landscape of local marine safety and oil spill risk, prevention, and response over time.

The day concluded with a group discussion to capture any remaining participant feedback, followed by a hot wash session that brought together key findings from the first two sessions for an informal discussion on the combined impacts of climate hazards and decarbonization.

GIS Data Viewer

Nuka Research custom-developed a GIS Data Viewer (Figure 1) for the workshop, which was an essential tool to guide scenario development and to support the facilitation of several workshop discussions. Data sources for the GIS Data Viewer included Resilient MA, NOAA, and MassGIS, which, when combined, provided a holistic and comprehensive collection of information relative to each harbor.

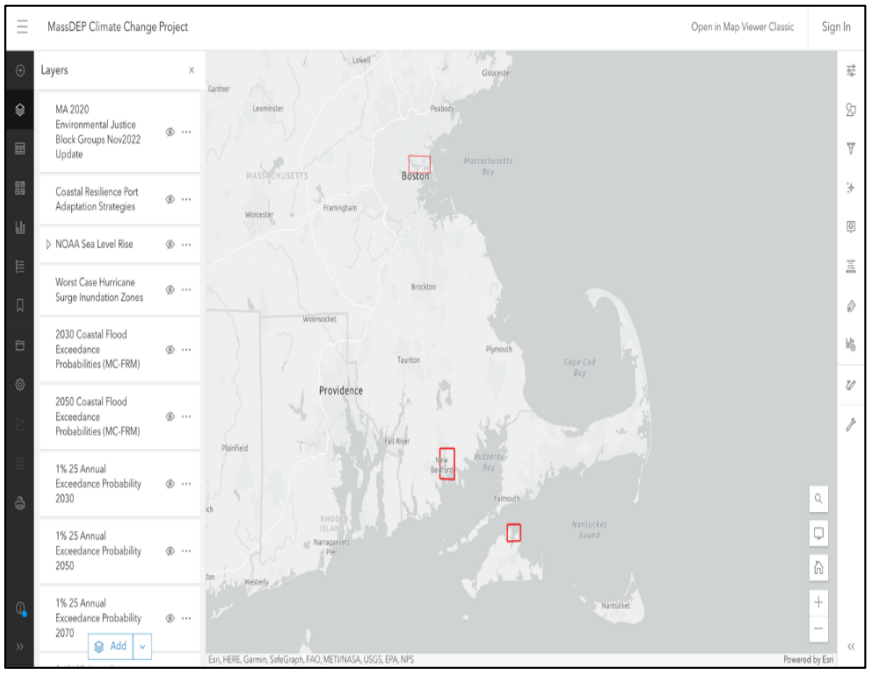

Figure 1: ArcGIS Data Viewer

The viewer integrated 29 GIS layers into a user-friendly portal. To enhance the viewer's usability and cater to different scenarios and discussions, the main portal was divided into three distinct map viewers, one for each of the three harbors. Each group was then able to interact with and manipulate the layers accordingly, allowing them to analyze the overlay of data onto satellite imagery. The viewer helped groups actively engage with the data, foster insightful discussions, develop scenario-based assessments, and engage in analysis for the exploration of relative challenges and opportunities. Figure 2 provides a snapshot of the Boston Harbor GIS Data Viewer showing the coastal flood exceedance probability values derived from the Massachusetts Coast Flood Risk Model for sea level rise and coastal storm simulations, for the year 2030.

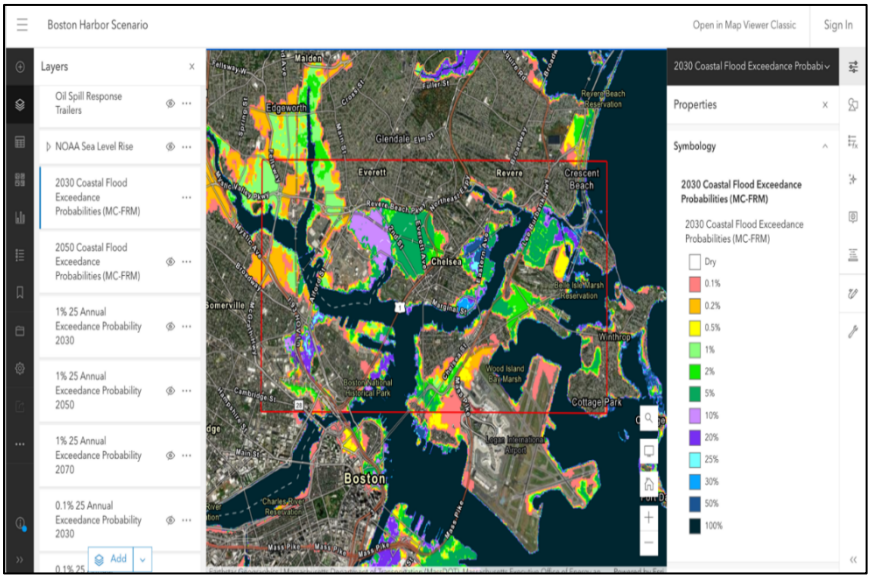

Figure 2: Boston Harbor GIS Data Viewer

Summary of Workshop Proceedings

Opening Plenary: The Future is not like the Past

After providing context on MassDEP's climate change and oil spill research to date and introducing participants to the discipline of strategic foresight, the opening plenary shared specific examples of how foresight can enable proactive identification of risks and opportunities in the face of complex and uncertain future conditions.

To demonstrate, participants engaged in a hindsight exercise to identify factors that have led to a global increase in cargo shipping incidents. Participants identified a broad range of social, technological, environmental, economic, and political (STEEP) factors that combined to influence this trend. They then discussed how this type of holistic multi-factor analysis could be utilized to anticipate how current STEEP trends could interact and evolve to create both risks and opportunities for oil spill prevention and response in the future.

The presentation concluded with a general overview of the effects of climate change and climate adaptation on risks associated with oil spill prevention and response. The high-level impacts of climate change are illustrated in Figure 3, while a summary of findings on the possible impacts of climate change and climate adaptation on oil spill risk and response are listed in Figure 4 and Figure 5. The next step in the workshop process was to apply these findings at the local level to understand how different climate impacts and adaptations could influence spill risk and response within each of the harbors.

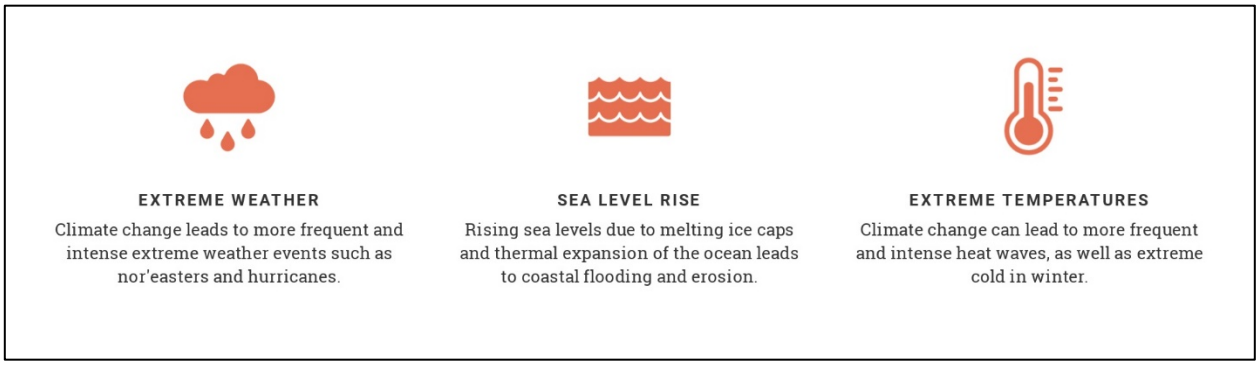

Figure 3: Effects of Climate Change

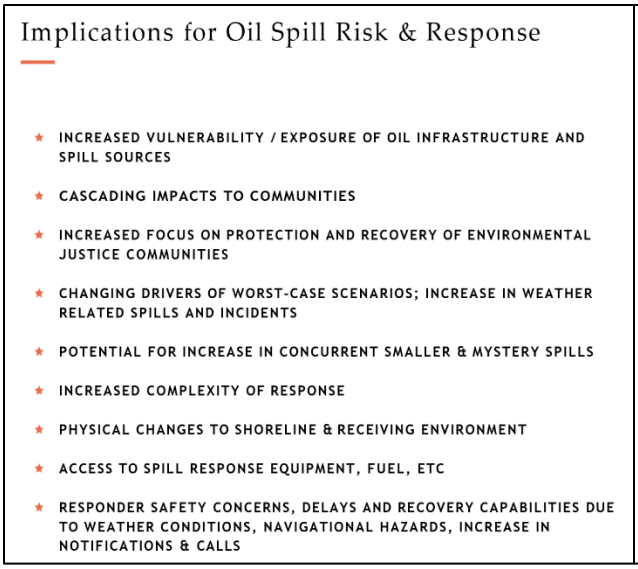

Figure 4: Impacts of Climate Change on Oil Spill Risk and Response

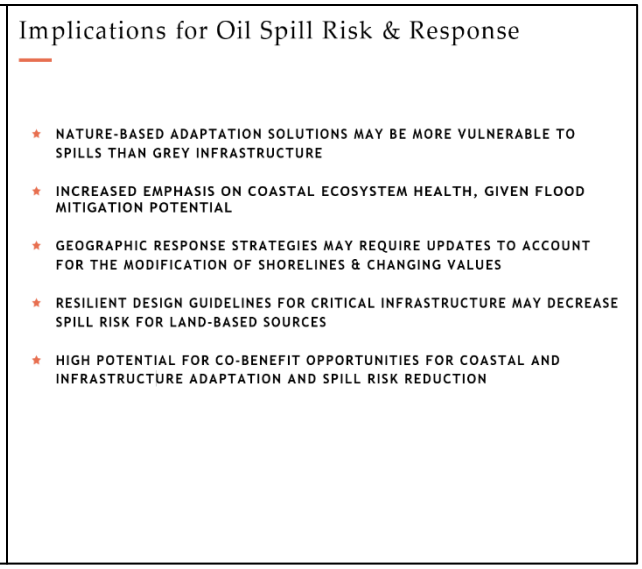

Figure 5: Impacts of Climate Adaptation on Oil Spill Risk and Response

Exercise 1 (a): Horizon 2033: Plausible Scenarios for Oil Spill Risk, Prevention & Response

The first exercise utilized a strategic foresight approach to challenge participants to imagine themselves as oil spill prevention planners and/or responders in the year 2033. Participants were assigned to groups aligned with one of the three harbors. Current-state contextual

information for each harbor set the foundation for discussions about the future. Current state snapshots can also be found in Appendix A. This included information such as:

- Local Environmental and Economic Conditions
- Port Activity and Vessel Traffic
- Oil Spill Prevention, Planning, and Risk
- Climate Change Projections and Plans

In addition to current-state information, each group was given three future scenario cards describing speculative but plausible future conditions within their harbor. Figure 6 provides an example of a Future Scenario Card. Scenarios included plausible localized data, projections, and impacts related to:

- Sea Level Rise and Coastal Flooding
- Extreme Weather & Storm Surge
- Local Climate Adaptation & Resilience

Groups were instructed to review their card and encouraged to explore additional climate data, GIS maps, and local Geographic Response Strategies (GRS), then apply their own knowledge and imagination to identify how the factors described in each scenario could influence oil spill risk, prevention, preparedness, and response in their harbor.

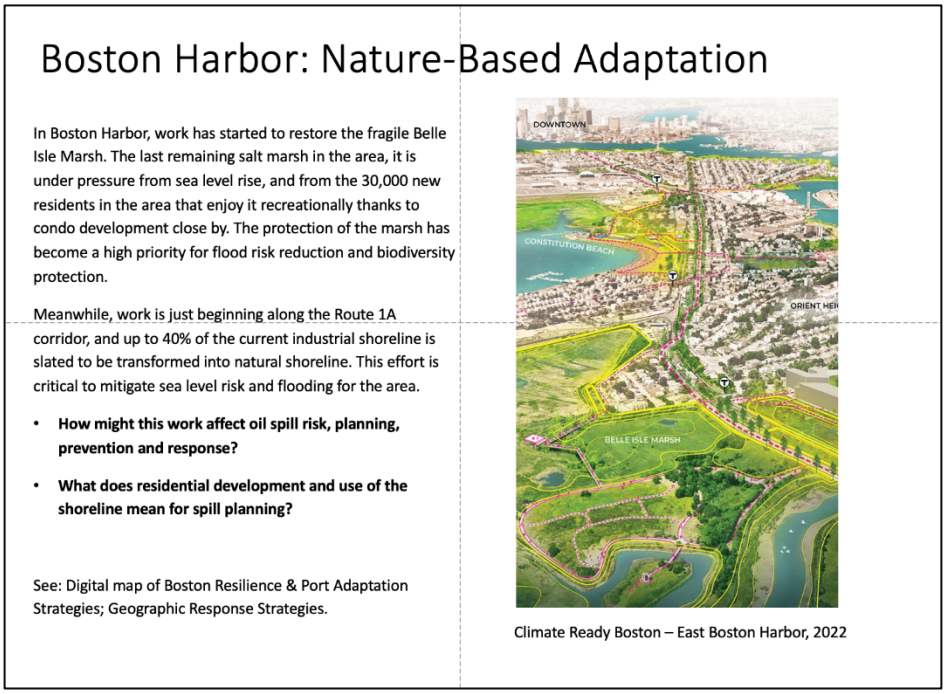

Figure 6: 2033 Future Scenario Card, representing plausible elements of climate adaptation and resilience in Boston Harbor

Table 4 highlights some of the unique elements of the scenario cards for each group.

Table 4: Summary of 2033 Future Scenario Cards (plausible, speculative futures derived from plans, projections and interviews)

	East Boston Harbor	New Bedford Harbor	Vineyard Haven Harbor
Sea Level Rise & High Tide Flooding	• Sunny Day flooding reached 35 days in 2030, projects to 100 days by 2050 • More frequent flooding and disruption of Massachusetts Bay Transportation Agency (MBTA) stations, rail lines, and major transportation routes, including those routes used for tanker trucks leaving marine terminals.	• Increased closure of the hurricane barrier for non-storm/high tide flood events. • Evaluation of options to reduce closures of hurricane barrier and allowing flooding to occur with greater frequency. • New construction at Port in line with resilient design guidelines; historical piers remain at risk.	• Sunny Day flooding reached 14 days in 2030, projects to 135 days by 2050. • Critical infrastructure in high-risk areas have limited options for retreat. • Growing concern about the health and function of salt marshes and wetlands in flood-prone areas.
Extreme Weather & Storm Surge	• Extreme weather leads to increased calls to the National Response Center (NRC) about spills • Evacuation of residents living in high-risk areas around the Designated Port Area • Shoreline infrastructure and roads are more frequently damaged	• Increased intensity of storms has caused infrastructure damage inside the hurricane barrier • Recreational and fishing vessels encounter navigational issues due to extreme weather events	• More frequent Nor'easters • Oak Bluffs Harbor is at risk, with its future viability unclear • Increase in ferry cancellations • Supply chain delays and increased cost of goods
Climate Adaptation & Local Resilience	• Restoration underway for Belle Isle Marsh • 30,000 new residents in the area rely on marsh access for recreation/nature • Route 1A corridor adaptations underway • 40% of current industrial shoreline slated to be 'greened' using nature-based solutions	• Significant investment in nature-based solutions for SLR/Flooding, including the New Bedford Riverwalk • Port Resilient Design Guidelines applied to new construction • Infrastructure funding gap remains for some. • Investment in wind energy	• Bylaws preventing new development in floodplain • Vineyard Wind Community Benefit Agreement (CBA) investment in resilient port • Raise the Lagoon Pond causeway • 30% growth in aquaculture

Exercise 1 (b): Mapping Impact and Certainty

Groups then identified factors and impacts within their 2033 scenarios that could influence oil spill risk, prevention, and response activities. Participants used the GIS portal and other reference materials to identify each potential impact. Each group's findings were recorded, discussed, and then located on an Impact and Certainty Matrix, as shown in Figure 7. This approach considered both positive and negative impacts and allowed for different perspectives to weigh in on future priorities.

In summary, for those areas of high certainty and high impact, actions should be evaluated and prioritized in the near term. When issues are identified as having high impact, but medium or low certainty, more work may be required to understand risk and opportunity or where additional monitoring may be needed to see how trends play out in the future. Areas of low impact and low certainty are easy to address and may be worth investing in, though the level of investment should be balanced against the investment needs of any high and medium impact and certainty issues. A snapshot of the results of this exercise are summarized in greater detail on the next page.

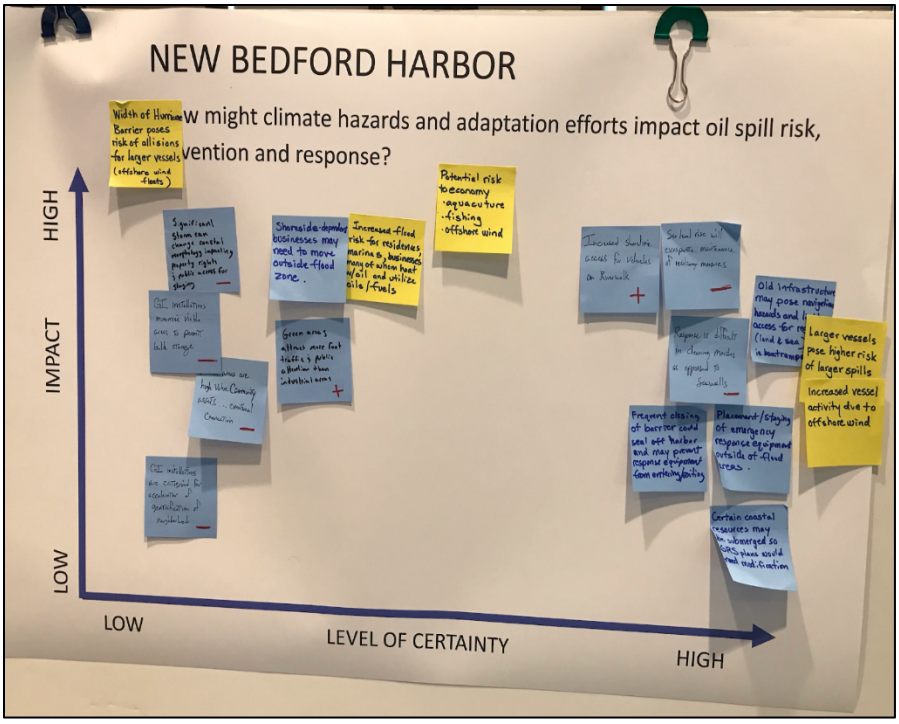

Figure 7: Certainty and Impact Matrix mapping the possible implications of climate change on oil spill risk and response in New Bedford Harbor

Exercise 1 Discussion: The Future of Oil Spill Risk and Response for Boston, New Bedford, and Vineyard Haven Harbors

Group discussion of the Impact and Certainty matrices resulted in the identification of five high level categories related to Oil Spill Risk, Prevention, Preparedness & Response:

- Access
- Response Measures & Coordination
- Vessel Traffic & Navigation
- Socio-economic Factors
- Infrastructure Integrity & Resilience

Issues identified as part of these categories were not mutually exclusive to either risk or response, and discussions at each table highlighted the complex and compounding challenges associated with various factors. Table 5 summarizes issues identified under each category.

Table 5: Impacts/Influences of Climate Hazards for Oil Spill Risk, Prevention, Preparedness and Response

Access	• To responders for equipment, fuel, and vessel staging areas • To assess and respond to spills when roads, boat launches, and infrastructure are flooded/damaged • To petroleum storage facilities • To out-of-state responders due to potential closures of Logan Airport during a major storm • To/from New Bedford harbor with more frequent closures of the hurricane barrier, impacting spill response speed and capacity • Opportunity for improved access to Acushnet River shoreline due to new riverwalk in New Bedford • Responder access to Vineyard Haven hospitals in an emergency
Response Measures & Coordination	• Clean-up of natural/restored shorelines and marshes is more complex than for rip rap/seawalls • Clean-up does not always happen in marshes – it can be more damaging than the spill • Complications from flooding and storm surge carrying oil inland; authority for clean-up of debris, standards for safe return home • Need to stock and stage flood protection equipment and sandbags as a spill prevention measure • Shoreline changes may negate the ability to implement GRSs • Environmental Sensitivity Index (ESI) data may not be up-to-date/aligned with new/restored shorelines
Vessel Traffic & Navigation	• In most cases increasing, leading to fewer dock /anchorage locations, and overcrowding of marinas and ports • Navigational challenges for responders related to increased debris from storm surge/extreme weather events • Construction-related traffic issues in/around new port facilities, Offshore Wind (OSW) • Risk of allisions with New Bedford's hurricane barrier as vessels grow in size.

Socio-Economic Factors	• Greater focus and concern for health and protection of restored shorelines and marshes, meaning increased public and political interest in spill impacts, response, and recover • Population growth leads to increased focus on risk as more people are at risk of large spills (in urban areas) • Food, fuel, responders, and spill response equipment are all reliant on supply chains that may be damaged post-flooding/storm • Risks to aquaculture, fishing, and OSW economies from large spills
Infrastructure Integrity & Resilience	• Potential for increased risk of spills from fuel storage facilities located in flood zones • Siting of new fuel facilities is limited/more challenging as shorelines transform from grey to green • Old /abandoned infrastructure poses navigational challenges • Flooding of businesses and residences that utilize different oils leads to more mystery/land-based spills entering marine environment • Resilient and green infrastructure implementation may be an opportunity to integrate resilience to oil spills • Impact of risk to marine and land infrastructure if New Bedford's hurricane barrier is damaged (i.e., allision) or breached during storm surge

To conclude the first exercise, groups worked together to identify future opportunities and actions to address evolving risks. These discussions were based on four guiding questions.

1. What is already happening today that should continue or grow to reduce risk and ensure preparedness?
2. What are the indicators of future risk or opportunity that we should monitor?
3. What could we be doing today to be prepared for the future?
4. What does climate-ready oil spill response look like in 2030 and beyond?

Figure 8 shows notes from the Boston Harbor group discussion.

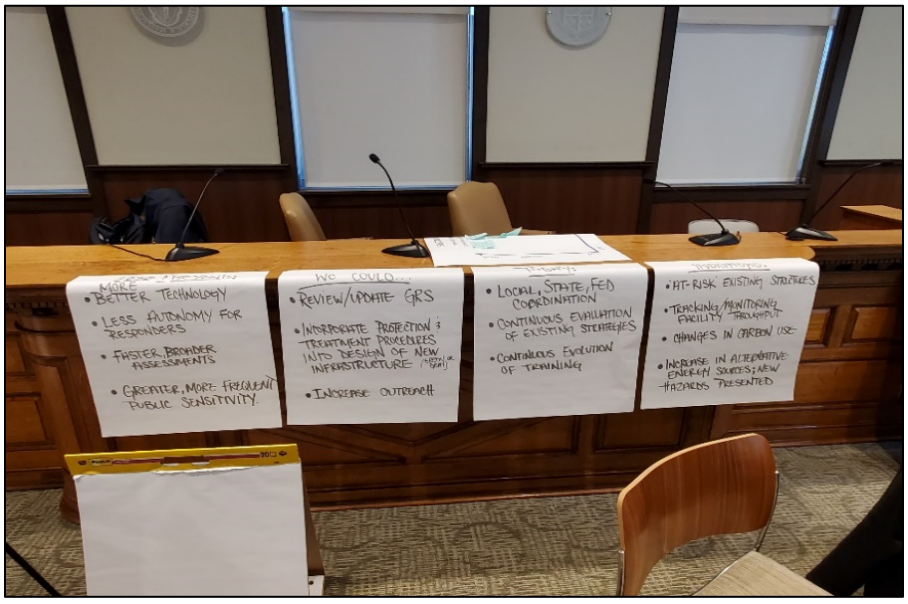

Figure 8: Discussion results from the Boston Harbor focus area

Each group then documented and presented their observations, which are summarized in Table 6 below.

Table 6: The Future of Oil Spill Risk and Response

	East Boston Harbor	New Bedford Harbor	Vineyard Haven Harbor
What is already happening today that should continue or grow to reduce risk and ensure preparedness?	• Local, state, & federal coordination of activities • Continuous evaluation of existing strategies • Continuous improvements to training offerings to adhere to evolving needs of communities	• Modeling & mapping of climate impacts • Development of climate-resilient infrastructure (i.e., new docks, Riverwalk) • More training for the right audience (i.e., workers & management related to climate change & oil spills) • Conversion to clean energy (including for vessels) • Building resilience of current electric grid	• Remove & secure spill sources • Drills & training • Projections of impacts & monitoring trends • Residential participation • Decreasing oil dependency & environmentally friendly solutions.
What are the indicators of future risk (R) or opportunity (O) that we should monitor?	• At-risk existing infrastructure (R) • Tracking/monitoring of petroleum throughput at bulk facilities (O) • Changes in carbon use • Increase in alternative energy; emergence of new hazards	• Development of offshore wind products (O) • Diversification of fishing fleets (O) • Tourism & implications for a changing waterfront (O) • Forecasting (O) • Policy – proactive (opportunity) vs. reactive (risk)	• Shoreline erosion (R) • Vessel traffic (R) • Uptake of alternative fuels (R/O) • Migration routes of animals/evolving habitats (R/O) • Water temperatures rising • Navigational hazards with SLR & marine debris (R) • Weather patterns & storm frequency (R)
What could we be doing today to be prepared for the future?	• Review & update GRS • Increase public outreach • Incorporate spill protection & treatment procedures into design of (adaptive) infrastructure (green or grey) • Increase outreach to communities & stakeholders	• Invest funding in resilient infrastructure • Education, awareness, & training for workers, permitting of projects, government, local volunteers • Improve data collection on weather& tides • Prevention & response technologies (for new hazard conditions)	• Modify tabletop exercises to incorporate climate change • Beach & coastline restoration • Explore new technologies for future possibilities • Increase regulation and oversight of new builds • Improve existing shoreline infrastructure • Invest in alternative fuels • Man-made reefs for protection
What does climate-ready oil spill response look like in 2030 and beyond?	• Better technology • Less autonomy for responders • Greater public sensitivity • Faster, broader assessments	• Different players in the response industry • Increased multidisciplinary coordination of activities • More proactive planning and preparations • Impacts from the continued erosion of coastline • Potential for increased navigational hazards (i.e., marine debris)	• Identified safe staging locations • Revised GRS's • Island-wide response plan • Mainland mutual aid • Improved communications • Less oil dependency • More flexibility & robust contingency plans • New tech/response equipment

Afternoon Session:: Evaluating the Implications of Decarbonization Trends, Policies, and Technologies on the Future of Risk and Response

The second half of the workshop focused on decarbonization trends, policies, targets, and technologies. It began with a summary presentation of policies and targets, including those set by the State of Massachusetts and by the International Maritime Organization (IMO). These policies and targets were then discussed in the context of potential changes to the nature of fuel use, emerging technologies, petroleum product storage and distribution, and changes in vessel traffic patterns – all factors that could influence the risk landscape over the next decades. Some of those changes are outlined in Figure 9.

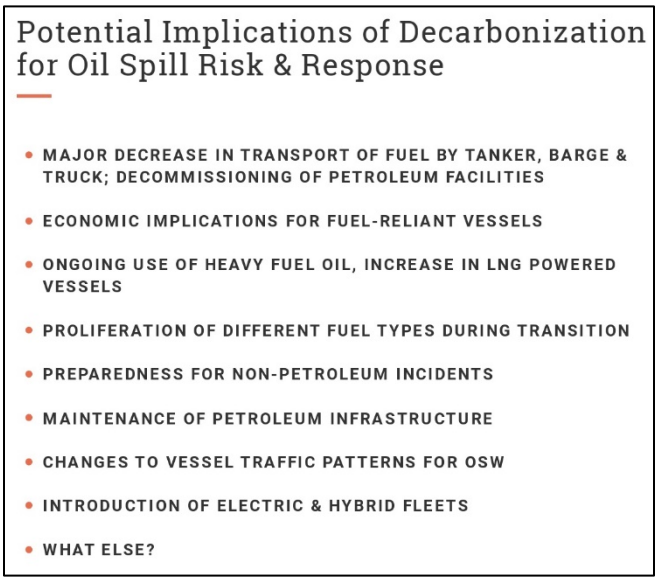

Figure 9: Potential Implications of Decarbonization for Oil Spill Risk and Response

The presentation emphasized that while a decline in oil consumption was ultimately a positive development in terms of oil spill risk reduction and climate change mitigation, the transition will also involve many changes that require consideration in terms of future planning, risk reduction, and response efforts. Following the presentation, participants were tasked with imagining how each change could play out on the ground (and in the water) within their assigned harbors.

Exercise 2: Horizon 2050: Futures Wheel – Mapping Future Impacts of Decarbonization Trends and Targets for Oil Spills and Marine Safety

For the second exercise, each group was given three scenario cards representing current trends related to decarbonization. Generally, these cards described trends such as:

- Changes in the bulk storage/transportation of conventional petroleum products
- The introduction of alternative fuels and electric and autonomous vessel technology for the marine industry,
- State of Massachusetts decarbonization targets for offshore wind, transportation, and buildings.

Figure 10 provides an example of a scenario card used for Boston Harbor.

Boston Harbor: Closure of Large Fuel Terminals

As of today, 2 of the 7 federally regulated facilities in Boston Harbor are slated for closure. Decommissioning has already begun on the Global Revere Terminal, and the sale of the Exxon Terminal is currently being negotiated.

Some stakeholders have questioned how many more facilities may close (given the State's targets), and where new types of fuel may be stored in the future.

There are health and safety concerns associated with the storage of alternative fuels. Many of the current fuel storage sites are close to Environmental Justice communities.

In the interim, EPA permits for existing oil storage facilities have required them to consider climate conditions.

- **How will a net-zero future impact terminal operations, safety and staff?**
- **If not here, where could future storage and bunkering of alternative fuels take place?**
- **What could all of this mean for risk and response?**

The State requires climate and disaster planning to prioritize environmental justice communities who are disproportionately impacted.

Figure 10: Decarbonization Trend Card - each group explored 3-4 trends in a local context. This trend relates to the storage and siting of fuel terminals in Boston Harbor, associated environmental justice priorities, and the potential siting of alternative fuels

Using a Futures Wheel (as shown in Figures 11 and 12), groups then undertook a rapid foresight exercise to identify potential implications of the trends highlighted above and anticipate their ripple effects over time. The intent of this exercise was to map the risks, opportunities, and consequences of these trends and identify ways each factor could influence the future of marine oil spill risk and emergency response.

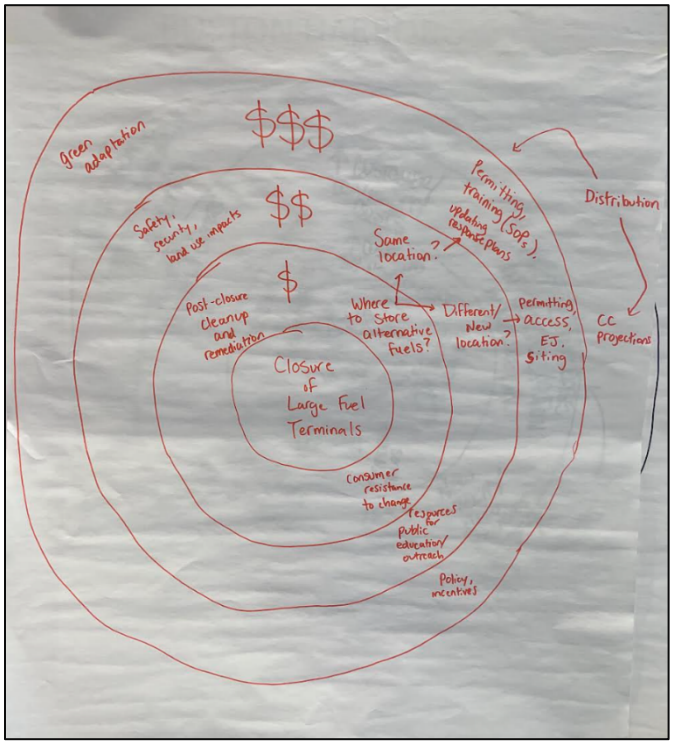

Figure 11: Futures Wheel evaluating implications for closing large fuel terminals in Boston Harbor.

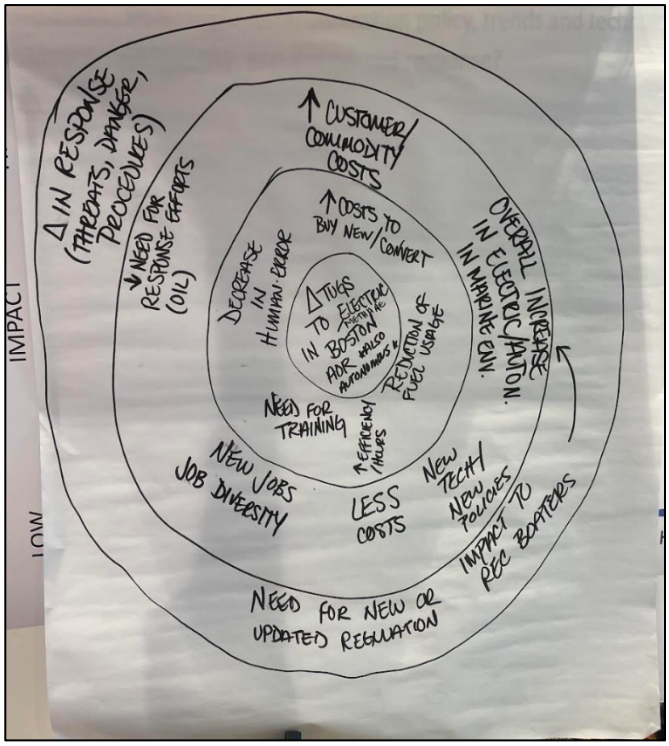

Figure 12: Futures Wheel illustrating the potential trajectory of opportunities and risks associated with the electrification of tugs in Boston Harbor

Exercise 2 Discussion

After completing their futures wheels, each group then presented their findings to the other participants. Each group's presentation was guided by two questions:

1. What priority issues came up for risk prevention, planning and response in the context of decarbonization?
2. What should we do today to prepare for changes that are coming in the near and longer term?

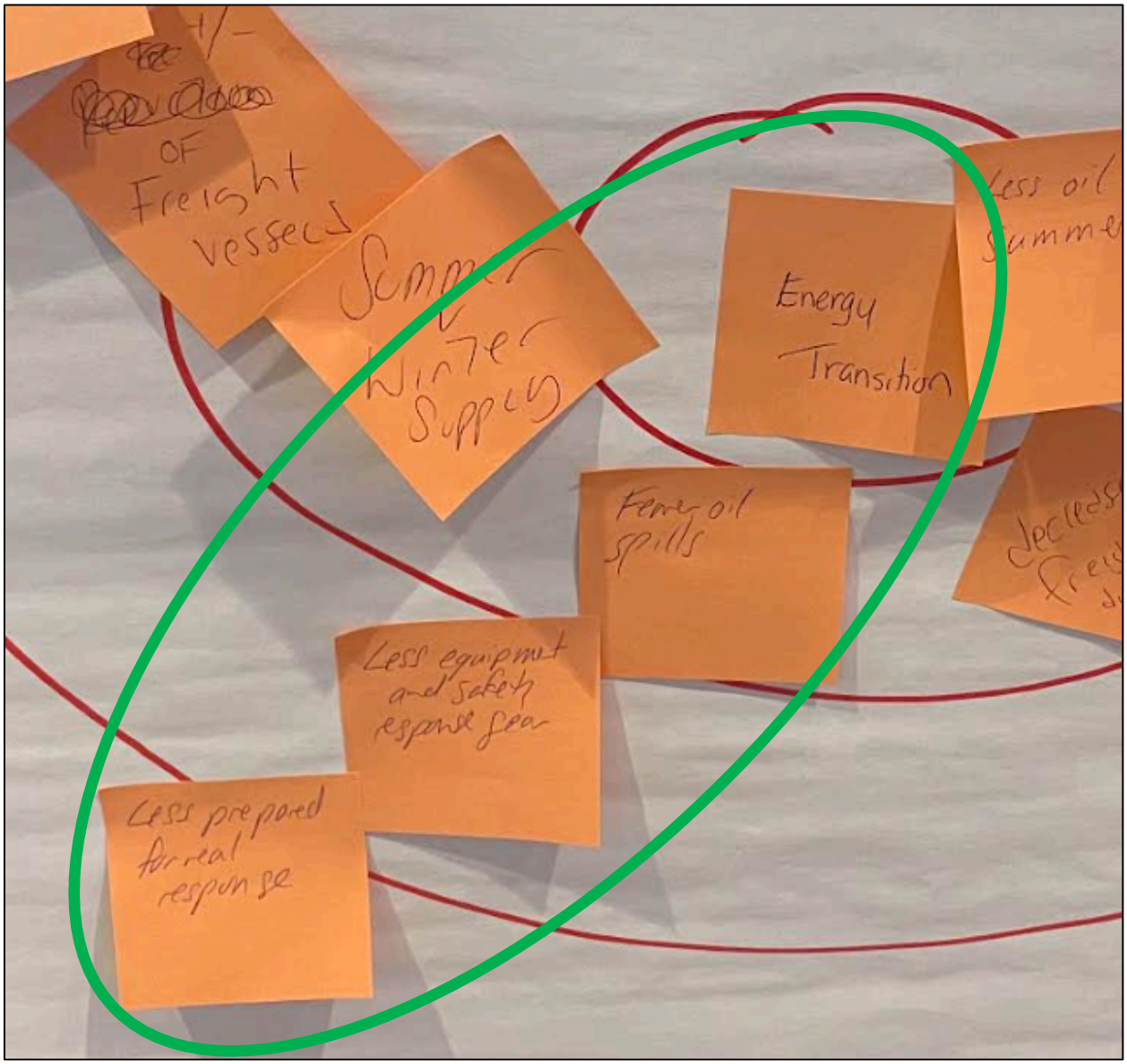

Figure 13: The use of a futures wheel helps to identify a range of consequences of trends and actions. For example, the highlighted trajectory of this futures wheel finds that there are likely to be fewer oil spills as a result of a transition away from petroleum

This discussion built on and integrated findings from Exercise 1a. In terms of priority issues, there were a number of common themes identified across each of the groups. These included:

- The potential for decreased risk of spills and improved health and safety of vessel operators through the adoption of electric vessels.
- The proliferation of personal drones adding to complications around risk, response, and the management and dissemination of public information
- Researching and communicating electric vehicle/vessel risks to promote evolving emergency preparedness and response training best practices
- First responder training, equipment, and standard operating procedures for electric vessels, vehicles, and alternative fuels
- Mutual aid and coordination in response to emergencies that have yet to be experienced or planned for
- Regulation of emerging technologies and new fuels
- Opportunities for the use of autonomous vessels and drones for spill monitoring, assessments, and emergency response
- Funding for/cost of transitioning vessels to electric or alternative fuels, and the associated changes in infrastructure requirements
- Increases in costs for consumers and users associated with the transition to alternative fuels, and the potential for providing incentives to offset these.
- Potential impacts to local marine wildlife habitats as a result of wind energy and/or new alternative fuel storage
- Shifting economy and job training, including for electric vessels and alternative fuels
- Risks related to climate effects, abandoned infrastructure, and the decommissioning of petroleum facilities and gas stations

While the decarbonization trends discussed by each group were less geographically specific in nature, there were a number of interesting differences in the perceived implications of decarbonization efforts for each harbor. These are summarized below.

New Bedford Harbor

At the New Bedford table, discussions focused on the growth of the offshore wind industry and its implications on the potential for future innovation and climate resilience opportunities, as well as concerns related to any increased risk resulting from the potential size and volume of vessels transiting the hurricane barrier. The group identified that, in the near term, larger service vessels and more infrastructure increases the risk of larger spills. The group also discussed the potential for organizational conflict over the increased competition for space within the harbor, and the risks associated with various disposal options for large releases from bigger service vessels. Lastly, the group discussed the trend of the electrification of tugs and ferries, which led to questions around the knowledge and skills necessary for piloting these new engine types. One potential risk (as identified in these discussions) is a shortage of skilled workers and a time lag in their associated training offerings, which could ultimately result in a reduction of the overall availability of these skilled workers. While the electrification of vessels would decrease spill risk overall, the

opportunity for near- and long-term improvements should focus on ensuring the availability of the appropriate training and education for staff and responders related to the operation and maintenance of new vessel types.

Vineyard Haven Harbor

For the Vineyard Haven group, discussion focused on an increase in electric vehicles (EVs) transiting on ferries, and how this is already creating challenges, given USCG regulations that prevent EVs from boarding ferries if they are damaged. The group discussed that ferry operators are concerned about the potential of EV fires on board and the lack of the necessary capabilities to respond to these incidents. The group also discussed the issue of EVs being stranded on the islands if damaged. In the near term, the group identified the need for an increase in responder training and investments in equipment to increase local capabilities to respond to EV fires, in addition to a need for continued work to address other related public safety concerns. For the longer term, the group identified that safely transported EVs could result in a significant decrease of fuels being transported to/from the Islands, resulting in the reduction of risks related to spills from the bulk transport of gasoline and diesel.

Boston Harbor

For the Boston Harbor group, discussion focused on the combination of the closure of bulk facilities, ongoing environmental Justice priorities, and the potential for new and alternative fuels to power vessels. This discussion led to questions about where fuel will be stored, the impacts of these changes to surrounding communities, and the potential for increased offshore storage. The group identified that, in the near-term, there is a need for additional considerations related to the regulation of alternative fuels, added training for crews and responders, and the integration of social and environmental justice considerations into planning for protection, prevention and response.

Closing Discussion: The Future of Oil Spill Risk and Response Starts Now

To close out the workshop, participants were asked to reflect on the full scope of discussions over the course of the day and summarize their outlook on and recommendations for the future of oil spill risk and response. Responses are summarized below:

- There is an opportunity and greater need to connect planning with response on a number of fronts.
    - Planning for marine decarbonization and new technologies should proactively consider risks and develop preparedness, training, and response protocols.
    - In the context of adaptation and climate hazards, there is an opportunity to explore how and if planning for adaptive shorelines could integrate oil spill prevention and response measures.

- Spill response agencies shared the need to start training staff for new fuels and vessel engine types, as well as considering the use of technologies in different ways. Keeping up with the pace of change was identified as a major challenge and an essential action.
- From federal agency representatives, there was an identified need for oil spill response planning in the context of large-scale disasters and for thinking differently about the allocation of resources, the deployment of boom at marinas, the use of volunteers, and response coordination when local fire departments were not available to support initial response efforts.
- Ferry operators identified that they are constantly training, and, in the future, there could be opportunities to integrate some new exercises into their training schedules focused on exploring changes to hazards, and additional response partners.
- Many participants highlighted the fact that new and different stakeholders in response need to be identified now to make sure there is familiarity and continuity for when response activities. Linked to changing stakeholders was the ongoing challenge and need to consider a growing public interest in the effort to protect natural resources and to seek opportunities for building trust and awareness (beyond responders) through education and outreach.
- Data integration and information were another common theme. This included a recommendation to make better use of existing drone technology to capture data for spill site monitoring, as well as ensuring that environmental data was updated for responders as shorelines and ecosystems changed. Ensuring that planning and response data is ground-truthed and mirrors what can be found on the shoreline will be a challenge as climate change and adaptation efforts speed up.

A key observation from this discussion was that many of the future conditions we have discussed are already underway, and there is an opportunity to act now, concurrently with these changes, to ensure a state of preparedness. This includes a need to address new issues that don't fit neatly into any single agency's authority or responsibility. The continuation of inter-agency collaboration and workshops like this are one way to identify those needs and continue to open pathways to implement preventative measures prior to an emergency.

Summary of Observations from Workshop

Workshop participants engaged in wide-ranging discussion sessions to brainstorm future changes to oil spill risk, preparedness, and response due to climate change and related policy, and identify potential recommendations for future climate hazards, adaptations, and decarbonization strategies. Although this workshop is a first step in determining how to address the issues and changes impacted by each of the above-mentioned factors, many of these issues/changes do not fall within the exclusive scope of MOSPRA, or any single agency. Because of this, participants repeatedly observed that similar interagency exercises need to continue to be held to further promote the interdisciplinary collaboration required to identify and address any of the related uncertainties and emerging risks related to climate change. It is also understood that existing oil spill preparedness and response programs and structures like MOSPRA, Area Committees, and the Regional Response Team (RRT) will only help provide additional opportunities to build on this workshop's discussions.

Throughout the workshop, participants did not shy away from discussing low certainty/high impact events and otherwise provocative issues, where clear solutions did not exist. In these discussions, groups specifically identified the need for increased collaboration and information sharing amongst oil spill and climate planners to improve future spill prevention and response planning efforts. Those efforts include continuing to protect existing facilities and infrastructure from oil spill and climate change impacts, ensuring the response community has the capabilities to respond to continuously evolving risks and incidents, and anticipating/planning for future impacts with the ongoing development of revised policies, plans, and procedures. Additionally, although not an explicit focus of this workshop, many of the issues and opportunities identified by each group were directly tied to a variety of social implications. From potential changes in political and public values, to the opportunity for increased education and outreach efforts, there was a general and widespread acknowledgement of the need for increased public engagement and community outreach in correlation with oil spill prevention and response activities, especially as it relates to those activities addressing the effects of climate change and decarbonization in environmental justice communities.

MOSPRA Program Recommendations

The Climate-Ready Oil Spill Preparedness and Response Workshop provided an opportunity for participants to learn from and engage with the research and analysis that MassDEP has been conducting over the past two years (through literature review, expert interviews, and an updated threat assessment). The workshop yielded a great deal of information, much of which directly relates, in some capacity, back to MOSPRA program activities. As MOSPRA continues to anticipate future climate hazards, adaptations, and decarbonization pathways, there are more opportunities to incorporate climate change considerations and uncertainties into planning for both ongoing program activities and potential future initiatives. These include:

- GRS Program Activities:
    - Incorporating summaries of climate hazards and resilience initiatives into GRS planning – both by considering the need to change or adapt existing GRS and

the potential need for new approaches, including building new GRS in collaboration with coastal resilience and green infrastructure projects
    - Considering the need to stage additional resources to increase response capabilities in areas of evolving risk
    - Utilizing data from RMAT to ensure each GRS and the overarching GRS databases are updated in consideration of shoreline changes resulting from climate hazards and adaptation efforts
    - Utilizing GRS training programs as an opportunity to tie local climate resilience experts and activities into GRS testing exercises
    - Exercising and evaluating GRS deployment in the context of climate hazards or complex scenarios involving alternative fuels, EV cargo, etc.

- Promoting Safe Decarbonization Strategies
    - Tracking the state of emerging marine fuels, fuel storage, and fueling locations, their associated risks, and the impacts of those risks for marine oil spill and emergency preparedness, response, and mitigation options
    - Identifying additional opportunities to accelerate the safe decarbonization of vessels, harbors, and marinas to decrease oil spill risk
    - Identifying ways to promote the safe and effective decommissioning of existing oil infrastructure
    - Identifying the limitations and challenges of siting alternative fuel facilities in congested areas and those areas with transforming shorelines

- Building Connections:
    - Continuing to facilitate ongoing discussions related to climate initiatives at Area Committee and RRT meetings, and at other forums
    - Exploring opportunities to collaborate with MEMA, FEMA and local emergency management agencies in the integration of oil spill response during large scale/multi-hazard disaster planning and exercise efforts, particularly for those events with significant coastal impacts
    - Comparing and connecting MOSPRA programs to state and local climate adaptation and decarbonization efforts to look for potential synergies
    - Sharing the outcomes of this work with partners to identify future collaboration and mutual aid opportunities, especially in areas of high complexity and uncertainty, and for those initiatives with unclear responsibility
    - Facilitation of additional workshops, potentially at the regional or local level and with enhanced community involvement (including a focus on Environmental Justice communities)

Appendix A: Summary of Harbor Risks and Resilience Efforts

2023 Snapshot: Vineyard Haven Harbor

Oil Spill Risk & Response

Vineyard Haven Harbor is the gateway to the Vineyard, with the island's only year-round ferry service and many other essential services located on or near the water. It is the most densely trafficked harbor on Martha's Vineyard, with a combination of ferries, tug/barges, pleasure crafts, government vessels, and fishing vessels frequently traversing the area. Bulk oil is transported by tug and barge to Martha's Vineyard through a fuel facility on the Vineyard Haven shoreline. Fuel and oil for vehicles, airplanes, homes, and businesses is transported to the island by tanker trucks loaded onto vehicle ferries.

Vineyard Haven's oil spill risks are highly seasonal. Summer (high season) sees increased ferry traffic, more recreational boating activity, more cars on the roads (tourists and seasonal residents), and increased flights to and from the island. Gas and diesel deliveries (for transportation) peak during this time, as does aviation fuel. Conversely, Winter is much quieter in terms of overall activity. During these Winter months, Martha's Vineyard sees an increase in home heating oil fuel deliveries.

In the past, the majority of oil spills in Vineyard Haven Harbor have been related to recreational boating incidents, or parked vehicles leaking fuel into the waterways.

Key vulnerabilities in this area include:

- local beaches and shorelines that are important economically and ecologically,
- the growing aquaculture industry, and
- the supply chains and vessel traffic (should a major spill and clean up disrupt local marine transportation to and from Vineyard Haven Harbor).

There is a single GRS for Vineyard Haven Harbor. The primary objective of this GRS is to boom off the area under the Lagoon Pond bridge to keep oil out of Lagoon Pond. If the bridge over-washes, this tactic will fail.

Climate Change Risk & Resilience

Martha's Vineyard, like all coastal islands, is highly vulnerable to climate change. Sea level is rising faster here than the global average, in part due to the subsidence of the land itself. The 2021 Duke County Hazard Mitigation Plan identifies Nor'easters, Hurricanes, Winter Storms, Severe Rainstorms and Coastal Flooding among the highest risk hazards for the island. These events can cause damage from wind and flooding and can lead to an acceleration of erosion processes that threaten coastal ecosystems, infrastructure, and nearby homes. Across the Island, there are 1,126 buildings in the 100-year flood zone – a number that is set to rise with sea level and more frequent severe storms. Several homes have already been relocated or abandoned given their proximity to these eroding cliffs and shorelines. Low-lying coastal roads and buildings are already subject to regular flooding, including the 5-Corners intersection, which is a through-point to the island's Hospital and Steamship Authority.

Both Tisbury and Oak Bluffs are part of the Municipal Vulnerability Preparedness (MVP) Program and are actively working to implement climate plans that protect and reduce risk to residents, businesses, infrastructure, and ecosystems. MVP community assessments have informed the 2021 Duke's County Hazard Mitigation Plan, and were the foundation for "The Vineyard Way," a highly participatory and ambitious plan led by the Martha's Vineyard Commission, and aimed at "… reducing greenhouse gas emissions, managing the impacts of climate change, and creating a healthier and more resilient community for everyone." The Vineyard Way establishes ambitious targets to decarbonize transportation and buildings earlier than the State target of 2050.

Operations and maintenance for Vineyard Wind, the first major offshore wind project to be developed, will be centered at Vineyard Haven Harbor. The project is intended to support accelerated decarbonization of Martha's Vineyard and employ a significant number of residents. New port infrastructure is being developed at Vineyard Haven Harbor to support these operations and the maintenance for this project.

2023 Snapshot: New Bedford Harbor

Bordered by the City of New Bedford (population 95,315) and the Town of Fairhaven (population 16,072), historical New Bedford Harbor is home to the largest fishing fleet in Massachusetts, and the top "Port in the nation based on dollar value and landing"[2], generating over $11 billion in economic value annually. In addition to the resident fishing fleet, vessels based out of regional harbors rely on the facilities at New Bedford Harbor to offload and process their catch. Today, with the growth of the offshore wind industry, the Port of New Bedford and surrounding communities are on the precipice of significant transformation. Recently, the New Bedford Marine Commerce Centre (a multi-purpose facility designed to support the construction, assembly, and deployment of offshore wind projects, and the handling of bulk, break-bulk, container shipping, and large specialty marine cargo) has been developed at the site of the former Sprague Oil Facility. Initiatives like the New Bedford Ocean Cluster aim to guide future development initiatives and increase commercial cooperation to balance the needs of local fishing fleets, with new and growing opportunities in the offshore wind and aquaculture industries.

Oil Spill Risk & Response

With its large fishing fleet, growing offshore wind industry, and fuel transportation to and from the Islands, there are a multitude of spill risks in New Bedford Harbor. Over the past several years, New Bedford Harbor has consistently experienced a disproportionately high incidence of harbor spills – many from "mystery" sources. Because of this, New Bedford's MassDEP oil spill response trailer sees more action than any of the other coastal communities.

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[2] *NB Resilient: New Bedford's Plan for Community Climate Action + Resilience*, https://s3.amazonaws.com/newbedford-ma/wp-content/uploads/sites/39/20200312103857/NB-Resilient-Plan-Final-3-20.pdf p 9

In recent years, MOSPRA has funded an outreach campaign to reduce oily bilge releases, and the pump out of bilge water to remove fishing vessel pollution risks. Long-term options are also being considered, and include a range of more permanent solutions, such as mobile or stationary waste oil storage and treatment.

Climate Change Risk & Resilience

The working waterfront of New Bedford stands in contrast to the residential and commercial Fairhaven waterfront. Since its completion in 1966, a hurricane barrier has protected the harbor from serious storm surge and flooding. The barrier was constructed to protect against the threats of its time. In 2011, FEMA deemed the wall sufficient to withstand a 100-year flood event;[3] however, projections show that the severity of a 100-year event is worsening. Port and City officials have warned that the hurricane barrier alone is not enough to protect the harbor from future storms. In recent years, the barrier has been closed in response to high tide (non-storm related) events, a practice that causes disruption to Port users. Climate Risk Assessments completed by the Port and City of New Bedford, and the Town of Fairhaven, have identified the need for additional storm mitigation measures inside the barrier given the trajectory of sea level rise, coastal flooding, and extreme weather hazards.

New Bedford Harbor is also home to an EPA superfund site. Billions of dollars have been invested in the clean-up of the harbor, including the dredging and removal of materials contaminated with Volatile Organic Compounds (VOCs) and Polychlorinated Biphenyls (PCBs). In addition, intertidal remediation provides for saltmarsh plantings that should also serve as critical sea level rise mitigation. Other nature-based adaptation efforts are being planned for in areas of the shoreline (where feasible), including shorelines south of the hurricane barrier, while much of the working waterfront will likely require hard infrastructure to be redesigned or raised to overcome these changing risks.

2023 Snapshot: East Boston Harbor

Oil Spill Risk & Response

The Boston Harbor Focus Area includes Chelsea Creek, Mystic River, and Belle Isle Marsh. This highly industrialized area is home to seven federally regulated petroleum terminals. Of these seven, the Global Chelsea terminal was sold in 2022, and there is ongoing negotiation in the sale of at least one other terminal. Major railways and truck routes, including Route 1A, transport petroleum from these marine terminals to towns/cities throughout Massachusetts and beyond. As of 2022, EPA permits for these facilities have required them to integrate climate risks into pollution prevention activities and plans, utilizing the best available climate science (such as the Massachusetts Coastal Flood Risk Model).

[3] Town of Fairhaven Municipal Vulnerability Preparedness Program: Community Building Workshop Report, https://www.fairhaven-ma.gov/sites/g/files/vyhlif7541/f/pages/fairhaven_mvp_summary_of_findings_apr2020.pdf, p 12.

The designated port area (DPA) is surrounded by densely populated environmental justice communities[4], meaning that residents here are disproportionately impacted by environmental disasters and pollution[5]. Future plans for the area include several proposals for residential condo development, bringing tens of thousands of new residents to the area.

Climate Change Risk & Resilience

Belle Isle Marsh is the only Salt Marsh in Boston Harbor and is exceptionally fragile. Significant work is being done to rehabilitate the Marsh and enhance its' effectiveness as flood protection infrastructure. The Marsh is highly valued for its recreational potential, given the otherwise limited access to nature and ongoing development plans in the surrounding area.

MassPort, the City of Boston, and Resilient Mystic Collaborative (RMC) have done significant work to understand and plan for the implications and risks related to critical infrastructure failure associated with climate change. The City of Boston's 'Resilient East Boston Harbor' plan targets roughly 40% of the current industrialized shoreline for proposed green infrastructure development and the implementation of other nature-based solutions. In 2021, RMC worked with state and federal partners to develop a scenario for a 100-year storm in 2050. The exercise engaged all seven petroleum facilities to consider the cascading effects of such a storm, and then evaluate the storm's potential impacts on any surrounding environmental justice communities.

[4] Staff interview discussion with Resilient Mystic Collaborative.

[5] 2050 Decarbonization Plan.

Appendix B: Workshop Participants

Individual	Organization
Chancery Perks	City of New Bedford Office of Environmental Stewardship
Heather M Atwood	Global Remediation Services
Andrew Jones	Massachusetts Department of Environmental Protection
Cathy Kiley	Massachusetts Department of Environmental Protection
Dan Crafton	Massachusetts Department of Environmental Protection
John Hanrahan	Massachusetts Department of Environmental Protection
Julie Hutcheson	Massachusetts Department of Environmental Protection
Steve Mahoney	Massachusetts Department of Environmental Protection
John Duponte	Moran Environmental Recovery
William Whitmore	National Oceanic and Atmospheric Administration
Stephen Lehmann	National Oceanic and Atmospheric Administration (Retired)
Gordon Carr	New Bedford Port Authority
John Regan	New Bedford Port Authority
Elise DeCola	Nuka Research and Planning Group
Olivia Norton	Nuka Research and Planning Group
Sam Butler	Nuka Research and Planning Group
Katie McPherson	Resilience and Foresight Services
Alison Fletcher	Steamship Authority
Bridget Sullivan	Steamship Authority
Britany Mckibben	United States Coast Guard Sector Boston
Andrew Robles	United States Environmental Protection Agency, Region 1

Individual	Organization
Ila White	United States Environmental Protection Agency, Region 1
Karen Way	United States Environmental Protection Agency, Region 1
Lina Takahashi	United States Environmental Protection Agency, Region 1
Sherry Banks	United States Environmental Protection Agency, Region 1

Appendix C: Pre-Workshop Interviewees

Name	Organization	Role
Liz Durkee	Martha's Vineyard Commission	Climate Change Coordinator
Ben Robinson	Town of Tisbury	MVC Commissioner and Tisbury Planning Board Coordinator
Catherine McCandless	City of Boston	Climate Change and Environmental Planning Project Manager
Julie Wormser	Mystic River Collaborative	Senior Policy Advisor
Catherine Pedemonti	Mystic River Collaborative	Environmental Resiliency Manager
Gordon Carr	Port of New Bedford	Director
Michele Paul	City of New Bedford	Director of Resilience and Environmental Stewardship