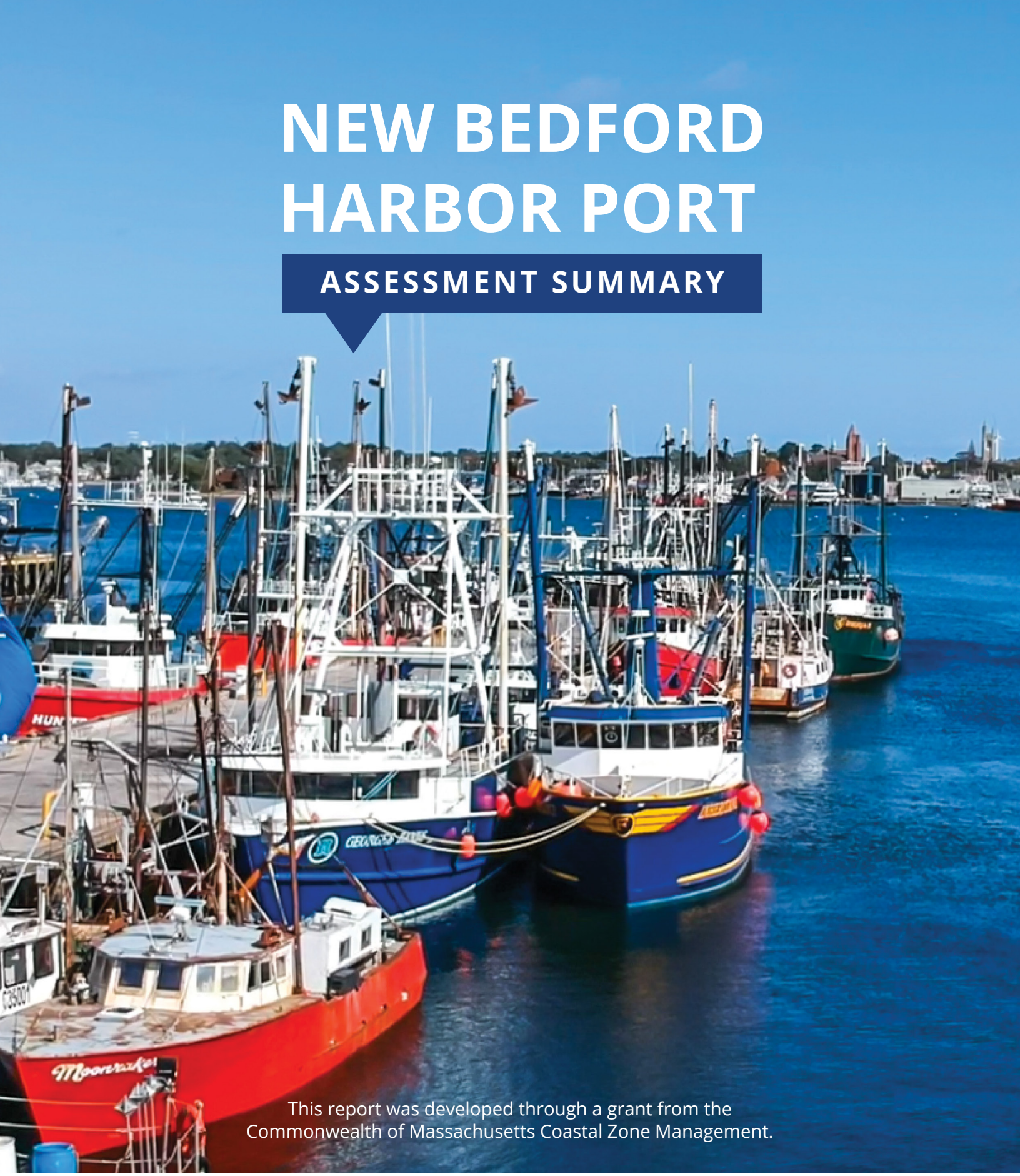
NEW BEDFORD HARBOR PORT

ASSESSMENT SUMMARY



This report was developed through a grant from the Commonwealth of Massachusetts Coastal Zone Management.

PORT OF NEW BEDFORD
America's #1 Fishing Port

Fairhaven
Massachusetts

KLA

Foth

FACTS ABOUT THE PORT OF NEW BEDFORD

NO. 1

MOST VALUABLE COMMERCIAL FISHING PORT IN THE US

20 YEARS

THE LENGTH OF TIME THE PORT OF NEW BEDFORD HAS HELD THAT #1 SPOT

1 MILLION LBS

THE AVERAGE AMOUNT OF SEAFOOD THAT ENTERS AND EXITS THE PORT DAILY

$11.6 BILLION

THE ANNUAL ECONOMIC VALUE OF THE PORT

INTRODUCTION

The New Bedford/Fairhaven Harbor has been the nation's most valuable commercial fishing port for twenty years running and is the second busiest commercial harbor in the Commonwealth of Massachusetts. The Port is one of only a handful of full-service, marine industrial working waterfronts on the east coast, and is an important port of call for commercial fishermen fishing out of Gloucester, Plymouth, Cape Cod, and the Islands. Commercial fishermen throughout the state utilize the Port's offloading services to sell their catch into the market.

While considered a safe harbor due to the presence of the United States Army Corps of Engineers owned and maintained hurricane barrier, the New Bedford/Fairhaven Harbor is not protected against heavy winds and high tides that exacerbate flooding and wave action during severe storm events and spring tides. The New Bedford/Fairhaven Harbor is also not immune to sea level rise. The stability and condition of municipal coastal infrastructure are integral to the economic value of the Port, as well as the continuity and efficiency of business operations for all vessel owners, crews, and associated users.

Dozens of commercial fishing vessels utilize the New Bedford and Fairhaven-owned and managed piers and New Bedford's South Terminal on a daily basis. The efficiency of business and safety of personnel are directly connected with the integrity of pier infrastructure. Natural deterioration of this infrastructure and the connecting roadways and utilities over time, if left unrepaired, leads to fewer spaces for vessels to dock, a greater number of vessels tied to one another (which places greater strain on the piers), and safety concerns.

This natural deterioration combined with the impacts of climate change increase the rate of degradation of the Port's coastal infrastructure, as more frequent storms, wind, and flooding events cause additional damage to municipal infrastructure.

With the majority of the Designated Port Area (DPA) man-made bulkhead, there have not been substantial erosion impacts observed. Over the past several years, the US Army Corps of Engineers has mitigated flooding due to storm surge and sea level rise at king tides by closing the hurricane barrier at an increasing frequency. *This is not a sustainable practice* for flooding relating to tides and sea level rise.

Through a grant from Coastal Zone Management, the New Bedford Port Authority and Town of Fairhaven assessed the current conditions of seven (7) key assets in the harbor. This report summarizes that assessment and provides recommendations to enhance resilience of assets in the port for owners, users, and other key waterfront stakeholders.

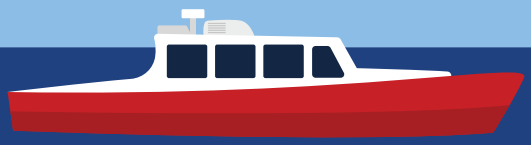
THE SEVEN ASSETS ASSESSED:

- Coal Pocket Pier
- Homer's Wharf
- Leonard's Wharf
- Pier 3
- Steamship Pier
- South Terminal
- Union Wharf

WHAT IT MEANS TO BE A DESIGNATED PORT AREA (DPA)

Designated Port Areas (DPAs) were created "to promote and protect water-dependent industrial uses" at 10 ports throughout Massachusetts that have the right mix of physical and operational features to support "commercial fishing, shipping, and other vessel-related marine commercial activities and/or for manufacturing, processing, research, and production activities that require marine transportation or need large volumes of water for withdrawal or discharge."

The New Bedford/Fairhaven Harbor is one of these DPA's and as such the State works with the City and Town to preserve and enhance the capacity of the harbor to support these industrial uses.



KEY CHARACTERISTICS OF THE PORT

Historic & Cultural Destination

Thousands of recreational boaters and tourists each year visit to see this historic working waterfront and maritime culture close up.

Global Seafood Hub

Each year, workers in the Port of New Bedford harvest, offload, process, and distribute hundreds of millions of pounds of seafood landed in the Atlantic as well as in foreign waters.

Driving the Blue Economy

The Port of New Bedford founded the *New Bedford Ocean Cluster*, a network of maritime businesses, scientists, and technology entrepreneurs working to innovate and advance the blue economy locally and globally.

Most Protected Port on the East Coast

The New Bedford Hurricane Protection Barrier extends across the harbor and consists of a 4,500-foot-long earthfill dike with stone slope protection. The Hurricane Barrier protects about 1,400 acres in New Bedford, Fairhaven, and Acushnet from tidal flooding associated with hurricanes and coastal storms, though its ability to continue to do that effectively while not disrupting maritime business will be challenged in a changing climate.

IMPACTS TO PORT INFRASTRUCTURE

The ability of any port to thrive and effectively support economic activity is directly dependent on the condition of the coastal infrastructure- piers, docks, etc., as well as the infrastructure that connects it to the community- roads, utilities, etc. The conditions of all this infrastructure vary depending on age, material type, location, maintenance levels, and changing climate conditions. All port infrastructure is also subject to the harsh marine environment including corrosion from saltwater and deicing salts and constant wet and dry cycles that accelerate the rate of decline.

When it comes to the overall condition of the nation's port infrastructure, the American Society of Civil Engineers (ASCE) has graded it a B- citing the ongoing harsh marine conditions, the age- many are close to or more than a century old; and the significant funding gap that exists to replace or repair this infrastructure. The ASCE 2021 Report Card sites a "funding gap of over $12 billion for waterside infrastructure … with additional billions needed for landside infrastructure".[1]

[1] 2021 Report Card for America's Infrastructure; The American Society of Civil Engineers; accessed on June 17, 2021

CLIMATE CHANGE & THE PORT

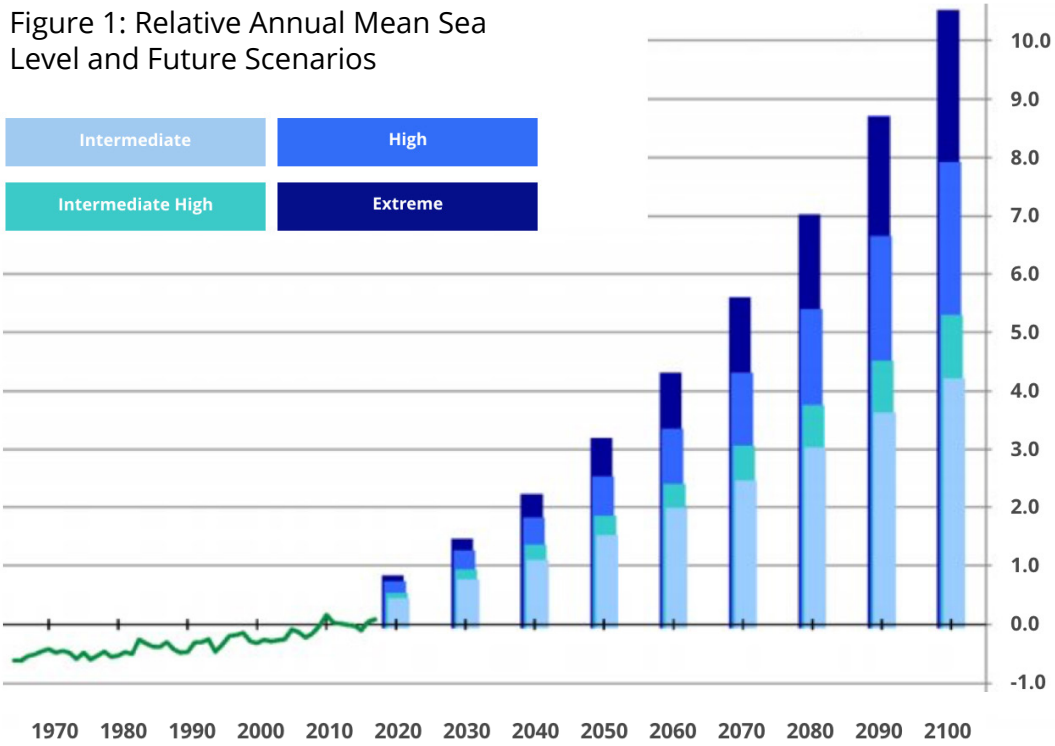
The climate in Massachusetts and New Bedford is already changing. Burning fossil fuels to power our homes and vehicles and keep our economy running emits greenhouse gases. We have increased greenhouse gases in our atmosphere to a level that has led to disruptions to the Earth's climate. As a result, we are experiencing hotter days, more extreme storms, and rising seas bringing high tides further inland. These impacts are only projected to intensify in the future.

Of particular importance to the Port of New Bedford are the effects of sea level rise (SLR) and storm surge on the resilience of infrastructure and business operations.

SEA LEVEL RISE

Resilient MA—a State resource that compiles the latest climate data—has modeled SLR under four emission scenarios. While the extent and rate of SLR depends on reducing greenhouse gas, the State recommends planning for sea level rise under a high emission scenario under which we would experience the following increases in sea level from a 2010 baseline:

Figure 1: Relative Annual Mean Sea Level and Future Scenarios



FLOOD RISK

Flood risk modeling based on these projections indicate an increased risk of flooding along the shore of the New Bedford Harbor. While the Port of New Bedford is fortunate to be protected from routine storm surge by a hurricane barrier, SLR projections present a daily threat and make it essential to take steps to protect the harbor's infrastructure. Of particular importance to the Port of New Bedford are the effects of SLR and storm surge on the resilience of infrastructure and business operations.

Mean Higher High Water *(Preliminary Projections)*

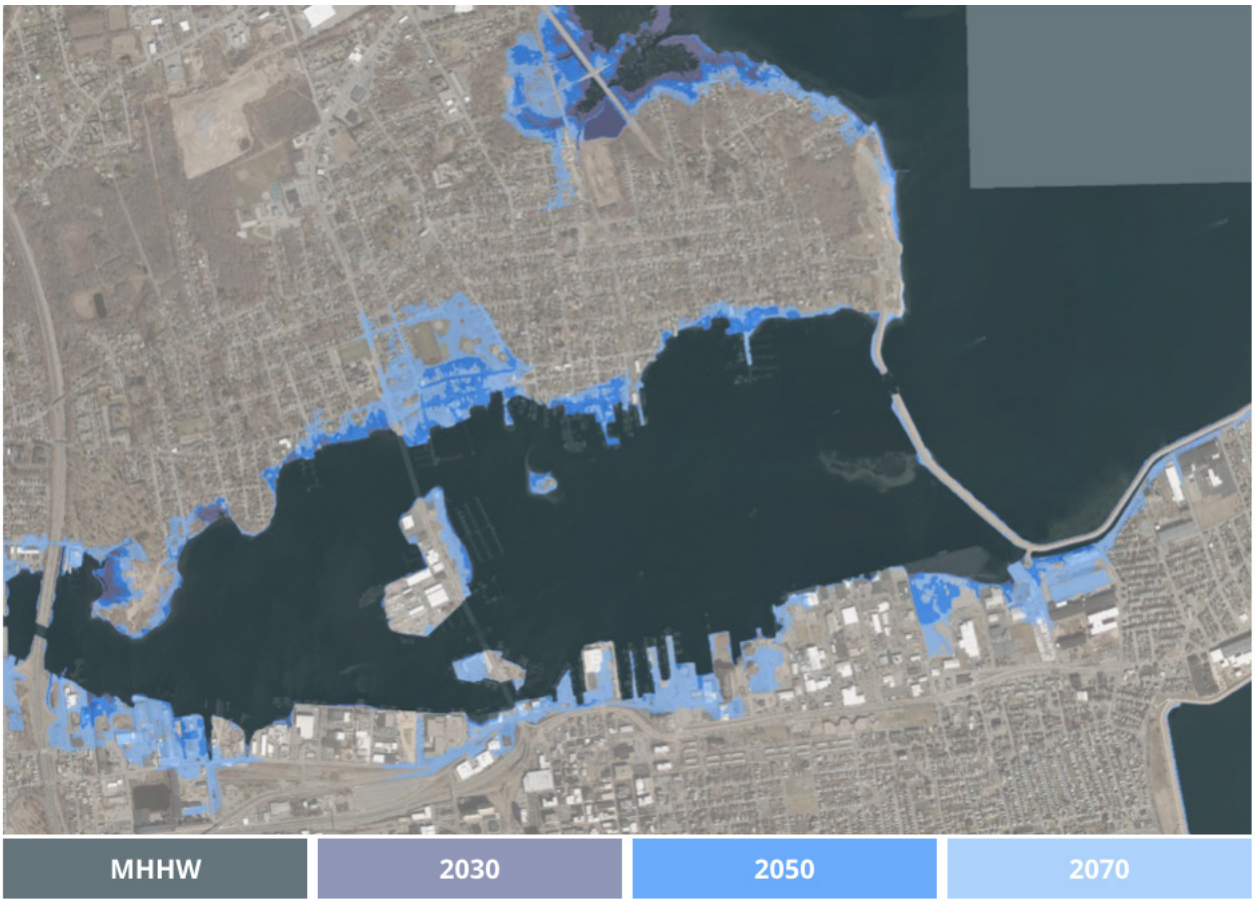


Figure 2. Created using the Massachusetts Coast Flood Risk Modeling (MC-FRM) tool, this map shows land area in the Port of New Bedford and in the Town of Fairhaven that will be underwater in a given year based on the mean higher high water (MHHW) level.

While SLR projections are important for long-term planning for daily coastal inundation, sea level rise coupled with storm events, such as hurricanes, create greater flooding risks and damage potential for coastal communities. With the frequency and intensity of storms rising, it is essential to plan for the impacts of storm surge. Even with the hurricane barrier, damage from storm surge is possible. The modeling used to develop the NB Resilient Design Guidelines, which was referenced for this project, incorporates data from thousands of storms to be able to model the effect of factors such as waves, wind, tides, and storm surges. The pictures below illustrate the potential for flooding. Note that for cases with a probability <10% (e.g., a severe hurricane is forecast), the hurricane barrier gate would normally be closed and flooding would be reduced. For cases with a probability >10%, flooding would occur as shown.

Coastal Flood Exceedance Probability

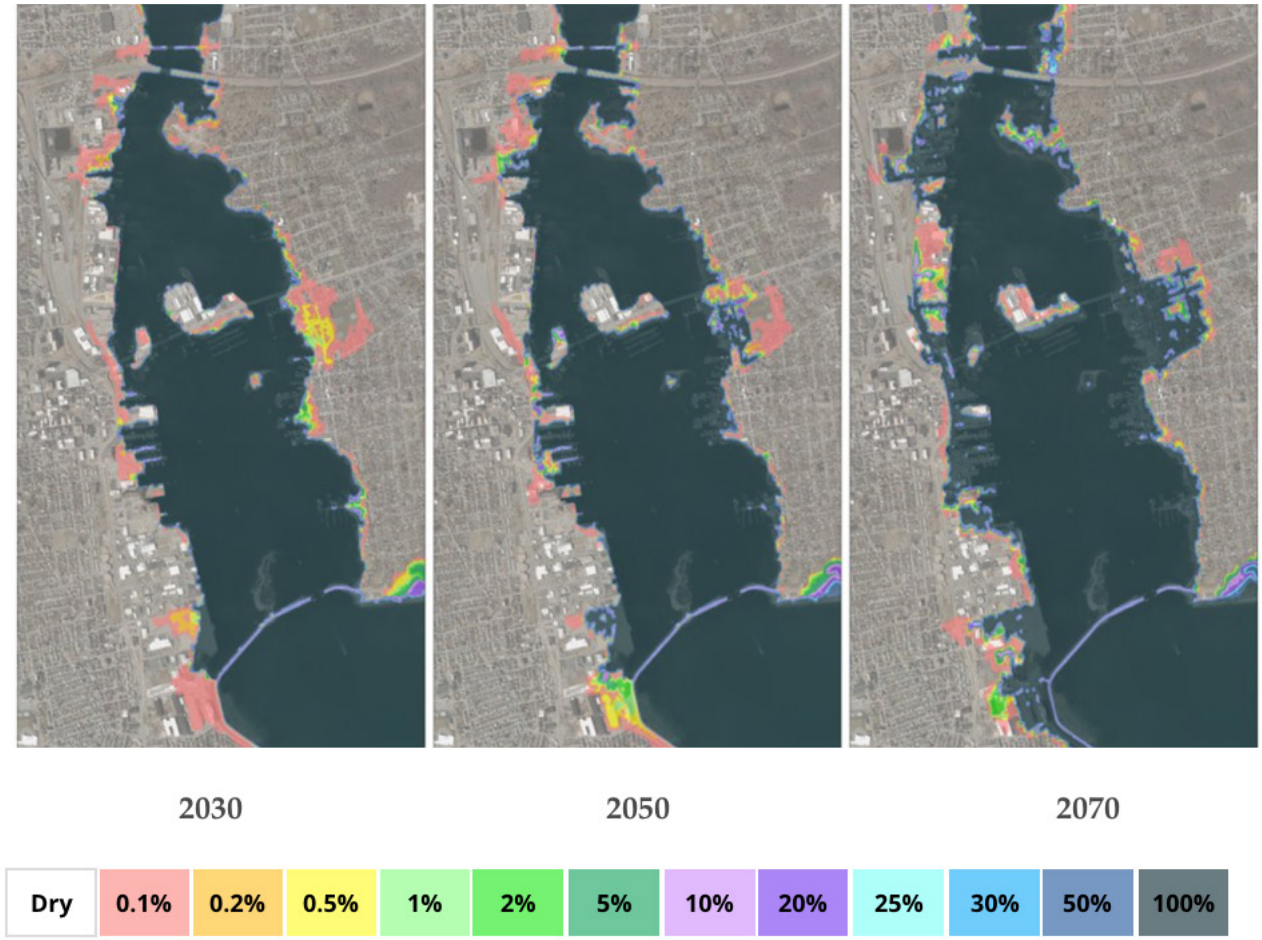
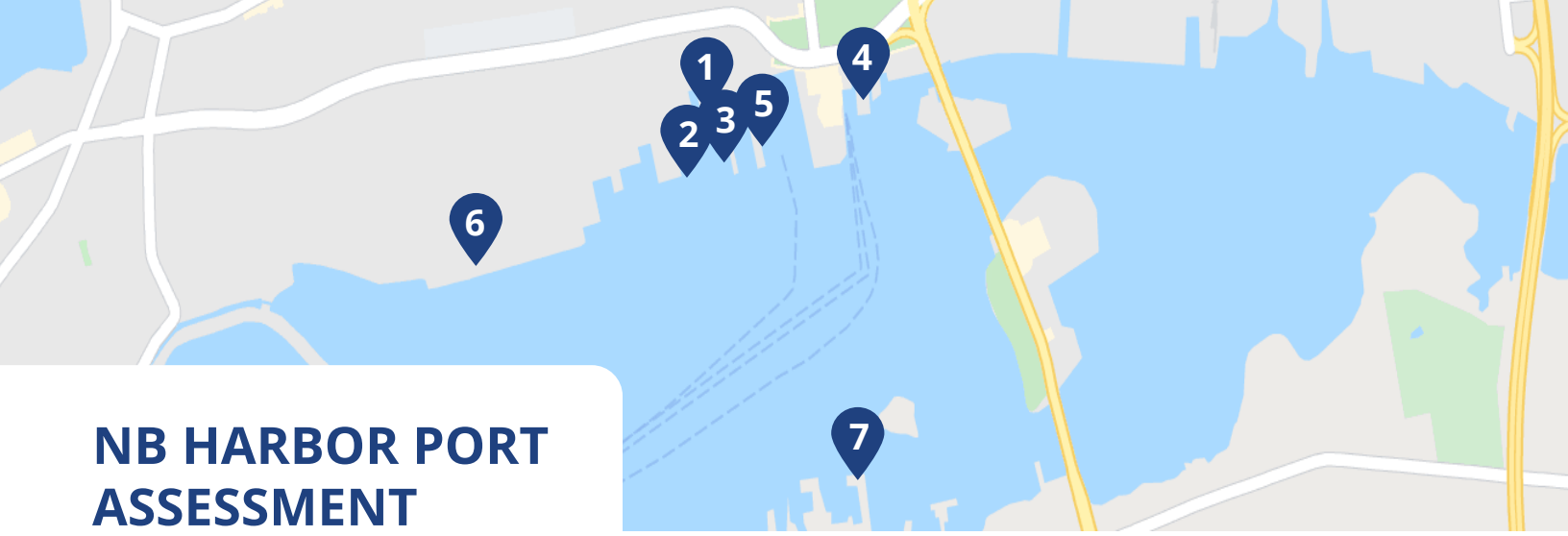


Figure 3. The annual probability of flooding in the years 2030, 2050, and 2070. By 2070 -- and even 2050 -- there is significant land area that will likely flood once a year.



NB HARBOR PORT ASSESSMENT

In early 2021, New Bedford Port Authority hired Foth Infrastructure & Environmental, LLC and Fathom Resources, LLC to perform underwater and topside structural inspections and assessments of the marine infrastructure at the municipally owned and managed piers in New Bedford and Fairhaven, as well as New Bedford's South Terminal. The results of these infrastructural assessments were then considered in relation to projected sea level rise and flooding events due to climate change. Specific resilience upgrades have been identified for each asset in this section. Additionally, Foth identified the following long-term resilience recommendations for all assets. Resilient design guidelines should be implemented whenever possible, and improvements should include measures to reduce damage due to regular flooding from storm events and heavy precipitation. Careful consideration of increased MHHW elevations and management of hurricane barrier closures will be required to ensure continuous operation of the Port facilities. Design elevations for rehabilitation or reconstruction projects should be set to preserve operations at the facility to the greatest extent possible over the anticipated useful life of the structure.

GOOD	SATISFACTORY	FAIR	POOR	SERIOUS	CRITICAL
No visible damage	Limited minor to moderate deterioration but no overstressing	All primary structural elements are sound but minor to moderate deterioration	Advanced deterioration on widespread portions of structure but does not reduce load-bearing capacity	Advanced deterioration that may significantly affect load-bearing capacity	Very advanced deterioration that has resulted in localized failure of structure bearing capacity

1 COAL POCKET PIER

Originally Built: 1850s, Replaced: 2018
Current Condition (2021): **GOOD**

- Average Elevation (NAVD88): 5.6 ft

Needs:

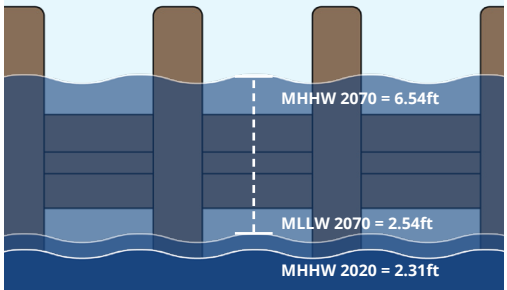
No short-term needs.
Structure was replaced in 2018, so is in good condition.

Mid-Term
Cross-bracing on seven (7) bents below the boardwalk will need repair.

Long-Term
The remaining 283 LF-of granite wall along the shoreline will need to be replaced.

THE IMPACTS OF SEA LEVEL RISE ON COAL POCKET PIER

Elevation: 5.6 ft



Every day has two tidal cycles that range from the Mean Higher High Water (MHHW) level to a Mean Lower Low Water (MLLW) level. This illustration is attempting to show the range of the tide in 2070.

2 HOMER'S WHARF

Originally Built: 1974
Current Condition (2021): **SERIOUS**

- Average Elevation (NAVD88): 6.0ft
- Due to the serious condition of Homer's Wharf, it has been slated for immediate replacement.

Needs:

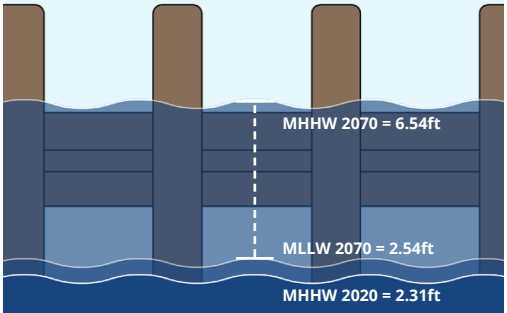
Short Term (0-5 years)
Full structural replacement.

Mid-Term (5-15 years)
Standard maintenance and repair requirements for new structure.

Long-Term (15-50 years)
Long-term needs depend on continuous maintenance and repair of new structure.

THE IMPACTS OF SEA LEVEL RISE ON HOMER'S WHARF

Elevation: 6 ft



Every day has two tidal cycles that range from the Mean Higher High Water (MHHW) level to a Mean Lower Low Water (MLLW) level. This illustration is attempting to show the range of the tide in 2070.

An investment in a repair right now makes no sense for Homer's and Leonard's because the structures need replacement. Replacement plans should consider present day projections for sea level rise for 2070. Setting the top of the wharf at 8ft above NAVD88 provides 1.5ft of freeboard for the projected sea level rise of about 4.23ft anticipated by 2070.

3 LEONARD'S WHARF

Originally Built: 1974
Current Condition (2021): **SERIOUS**

- Average Elevation (NAVD88): 6.0ft
- Due to the serious condition of Leonard's Wharf, it has been slated for immediate replacement.

Needs:

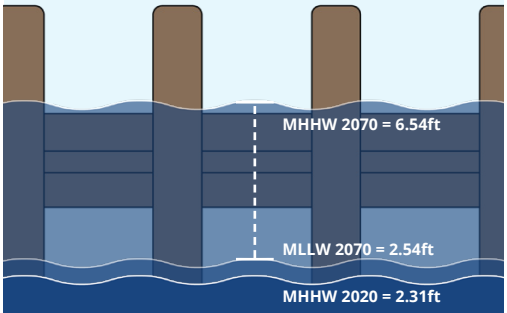
Short Term (0-5 years)
Full structural replacement.

Mid-Term (5-15 years)
Standard maintenance and repair requirements for new structure. .

Long-Term (15-50 years)
Long-term needs depend on continuous maintenance and repair of new structure. .

THE IMPACTS OF SEA LEVEL RISE ON LEONARD'S WHARF

Elevation: 6 ft



Every day has two tidal cycles that range from the Mean Higher High Water (MHHW) level to a Mean Lower Low Water (MLLW) level. This illustration is attempting to show the range of the tide in 2070.

4 PIER 3

Originally Built: 1977
Current Condition (2021): **POOR**

- Average Elevation (NAVD88): 5.3ft

Needs:

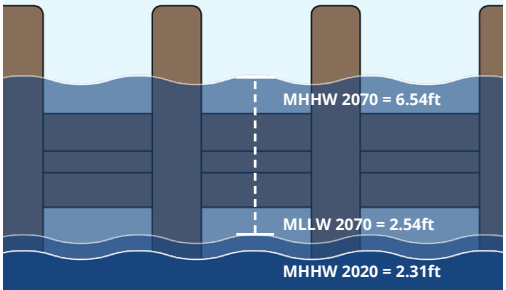
Short Term (0-5 years)
Localized repair of holes in steel plating at 65 locations.

Mid-Term (5-15 years)
Localized tie rod repairs and replacement of fendering system will be required. .

Long-Term (15-50 years)
Full structure replacement required. 1,312LF of new bulkhead, plus cap, fendering, etc.

THE IMPACTS OF SEA LEVEL RISE ON PIER 3

Elevation: 5.3 ft



Every day has two tidal cycles that range from the Mean Higher High Water (MHHW) level to a Mean Lower Low Water (MLLW) level. This illustration is attempting to show the range of the tide in 2070.

Pier 3: A present day investment of about $3.1 million combined with ongoing maintenance should allow for another 20-30 years of use. In 2040, the structure of the pier and current (2040) assessment of sea level rise projections would then be used to prepare a replacement plan for the structure.

5 STEAMSHIP PIER

Originally Built: 1977
Current Condition (2021): **FAIR**

- Average Elevation (NAVD88): 6.2ft

Needs:

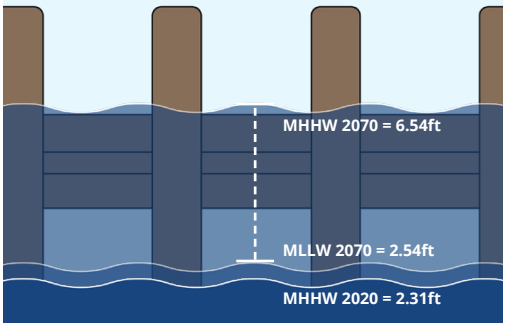
Short Term (0-5 years)
Localized repair of 25 piles in severe condition.

Mid-Term (5-15 years)
Localized repair of 36 piles in advanced condition.

Long-Term (15-50 years)
Long-term needs depend on continuous maintenance and repair of new structure.

THE IMPACTS OF SEA LEVEL RISE ON STEAMSHIP PIER

Elevation: 6.2 ft



Every day has two tidal cycles that range from the Mean Higher High Water (MHHW) level to a Mean Lower Low Water (MLLW) level. This illustration is attempting to show the range of the tide in 2070.

6 SOUTH TERMINAL

Originally Built: 1960
Current Condition (2021): **FAIR**

- Average Elevation (NAVD88): 5.9ft

Needs:

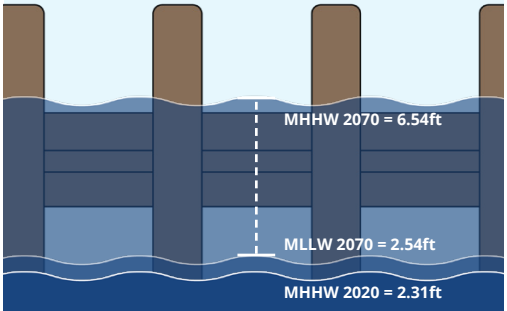
Short Term (0-5 years)
Localized repair of holes in steel plating at 73 locations.

Mid-Term (5-15 years)
Toe repairs will be required along a portion of cell 7, grout bags recommended.

Long-Term (15-50 years)
Replacement will be required within 15-30 years.

THE IMPACTS OF SEA LEVEL RISE ON SOUTH TERMINAL

Elevation: 5.9 ft



Every day has two tidal cycles that range from the Mean Higher High Water (MHHW) level to a Mean Lower Low Water (MLLW) level. This illustration is attempting to show the range of the tide in 2070.

7 UNION WHARF

Originally Built: 1845
Current Conditions (2021):
North Side: **POOR**
East/West/South Side: **N/A, recently replaced**

- Average Elevation (NAVD88): 5.2ft

Needs:

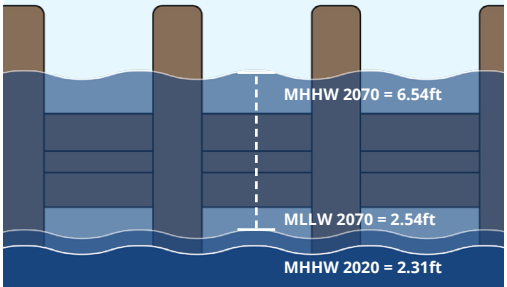
Short Term (0-5 years)
Significant upgrades of the east, west, and south sides were recently completed at the site, but immediate reconstruction of the northern seawall is recommended. Monitoring inspections should be completed for the recently reconstructed sections per the Operations and Maintenance Manual.

Mid-Term (5-15 years)
Standard maintenance and repair requirements for new structure.

Long-Term (15-50 years)
Long-term needs depend on continuous maintenance and repair of new structure.

THE IMPACTS OF SEA LEVEL RISE ON UNION WHARF

Elevation: 5.2 ft



Every day has two tidal cycles that range from the Mean Higher High Water (MHHW) level to a Mean Lower Low Water (MLLW) level. This illustration is attempting to show the range of the tide in 2070.

RESILIENCE RECOMMENDATIONS

To develop the resilience recommendations for the seven assets, Foth referred to the NB Resilient Design Guidelines for New Bedford Harbor completed in June 2020, the Resilient MA Climate Change Clearinghouse website, and the New Bedford Fairhaven Coastal Viewer. All of these tools are free and available to the public.

	Coal Pocket Pier	Homer's Wharf	Leonard's Wharf	Pier 3	Steamship Pier	South Terminal	Union Wharf
Resilience Upgrade	The structure has been recently reconstructed, so no major upgrades are recommended. Future repairs should focus on minimizing damage from frequent flooding and maintaining operations on the pier.	New Design Elevation set at 8ft NAVD88, which places the finished deck ~1.5ft above MHHW for 2070, with the goal of maintaining continuous operations on the pier as sea levels rises. Incorporate resilient design features into the replacement structure.	New Design Elevation set at 8ft NAVD88, which places the finished deck ~1.5ft above MHHW for 2070, with the goal of maintaining continuous operations on the pier as sea levels rises. Incorporate resilient design features into the replacement structure.	New Design Elevation TBD - should be re-assessed in 2050, pending rehabilitation plan selected.	Elevation should be reassessed in 2050. This structure can be repaired and will not require a full replacement, so consideration should be given to methods for raising the elevation of the entire structure and incorporating resilience design upgrades.	New Design Elevation TBD - should be re-assessed in 2050, pending rehabilitation plan selected.	While most of the structure has been reconstructed in recent years, the north side of the structure still needs reconstruction. Future repairs should focus on minimizing damage from frequent flooding and maintaining operations on the pier.

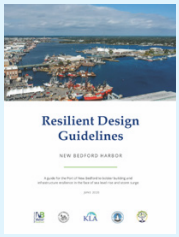
Long-Term Resilience Recommendations

Since the entire study area is within the New Bedford Hurricane Barrier flood protection zone, resilient design guidelines should be implemented whenever possible and improvements should include measures to reduce damage due to regular flooding from storm events and heavy precipitation.

Careful consideration of increased MHHW elevations and management of hurricane barrier closures will be required to ensure continuous operation of the Port facilities. Design elevations for rehabilitation or reconstruction projects should be set to preserve operations at the facility to the greatest extent possible.

RESOURCES

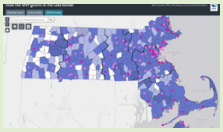
The following resources have been valuable for the Port of New Bedford and can be leveraged by various communities to enhance the resilience of port infrastructure throughout the Commonwealth.



NB Resilient Design Guidelines for New Bedford Harbor

Recognizing the effect sea level rise and storm surge could have on the Port's infrastructure and operations, the City of New Bedford partnered with the Town of Fairhaven and the New Bedford Port Authority to create localized Resilient Design Guidelines. The guidelines are intended for developers, businesses, residents, and City/Town staff members that are living or working in and around the Port of New Bedford. Whether for a public planning project, developing or redeveloping in the area, or looking to upgrade an existing structure, the guidelines provide resources and strategies on how to increase the resilience of the Port's many assets and keep it a thriving economic hub. These guidelines can be utilized and leveraged by other cities and towns as well.

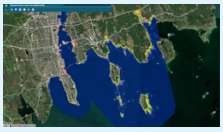
LEARN MORE >



Resilient MA Climate Change Clearinghouse Website

In September 2016, Governor Baker signed a comprehensive climate change Executive Order, committing the administration to work across the state to plan and prepare for the impacts of climate change. This website is a one stop shop for local governments and regional agencies provides the most up to date climate data, maps, and reports to support local action.

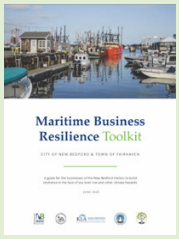
LEARN MORE >



New Bedford/Fairhaven Coastal Viewer

With sea levels already rising and projections that the trend will continue, it is increasingly important to begin making resiliency enhancements to new and existing infrastructure around the Port. The Woods Hole Group created an interactive coastal viewer tool for the Port of New Bedford that allows users to explore the mean higher high water tidal benchmark, probability of inundation, and the 1% depth of inundation for present day, 2030, 2050, and 2070.

LEARN MORE >



Maritime Business Resilience Toolkit

Businesses will be uniquely affected by climate change as their bottom line depends on their ability to maintain their operations in a changing climate. Climate change may cause power outages, inconstancies in the supply chain, flooding of mechanical components, interruptions and closures of business operations, and higher costs for insurance, maintenance, and repairs. To prepare for these risks, the City of New Bedford partnered with the Town of Fairhaven to create a Maritime Business Resilience Toolkit. The Toolkit provides both short- and long-term solutions for businesses to prepare for the effects of sea level rise and storm surge.

LEARN MORE >