

Port of Oakland Sea Level Rise Assessment

Storms, Flooding, and Sea Level Defense
Conference

December 3, 2019



Port of Oakland 101



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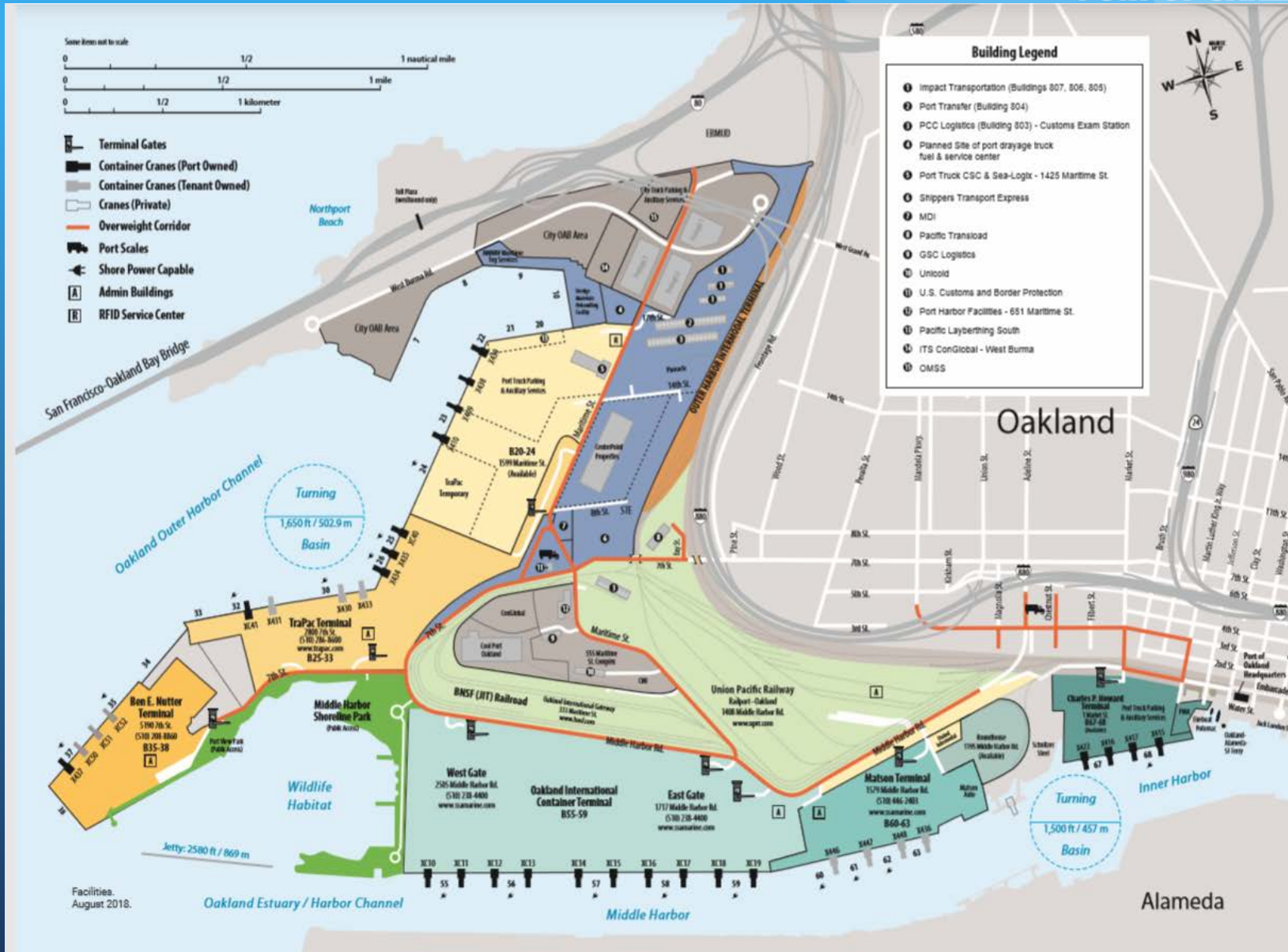


- Top 10 highest volume container port in U.S.
- 12th busiest cargo airport in the U.S.
- 33rd busiest passenger airport in the U.S.
- 20 miles of waterfront (maritime, aviation and real estate), utilities, public parks and habitat

Maritime Area



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Collaborative Efforts to Date



- *Oakland/Alameda Focus Areas Shoreline Resilience Study, 2016*
- *Oakland Local Hazard Mitigation Plan, 2016*
- *Oakland Sea Level Rise Road Map, 2017*
- *Middle Harbor Enhancement Project, 2018*
- *Preliminary National Flood Insurance Rate Maps, effective 2018*
- *Resilient By Design, 2017-18*
- *Adapting to Rising Tides (BCDC), Ongoing*



AB691 SLR Adaptation Report

Port of Oakland Completed:

- Impact of SLR on public trust lands
- Maps showing SLR (and storm surge) for 2030, 2050, and 2100
- Financial cost of SLR (cost of inaction and action)
- Plan to protect and preserve natural and manmade resources
- Collaboration with stakeholders



Efforts to Date - Overview

SLR Assessment Tasks:

- 1.A • Assessment of SLR Impacts: Inventory
- 2 • SLR Mapping
- 1.B • Assessment of SLR Impacts: Vulnerability Assessment
- 3 • Estimation of Financial Costs
- 4a • Development of Adaptation Strategies
- 4b. • SLR Assessment Plan

Inventory

Identifies critical assets (necessary for business/ operational continuity)

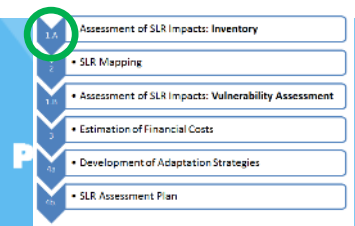
- Maritime
- Commercial Real Estate
- Airport

Inventory includes

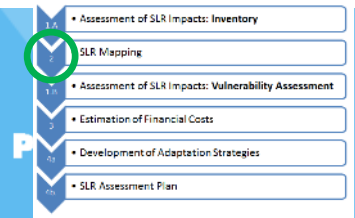
- Utilities
- Facilities
- Transportation
- Natural Habitats
- Community Assets

Inventory based on

- PortView
- Port staff input

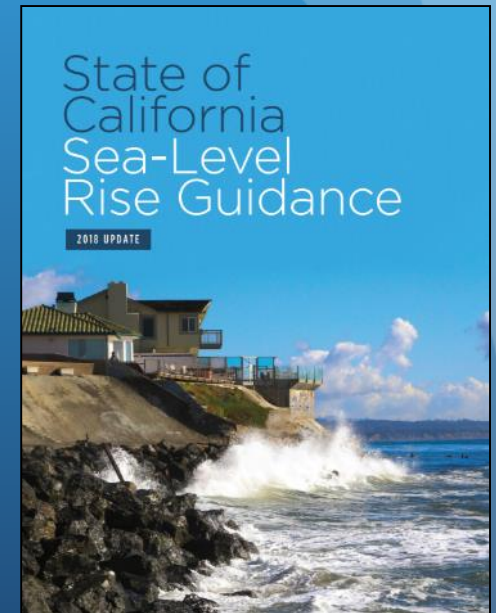


SLR Mapping



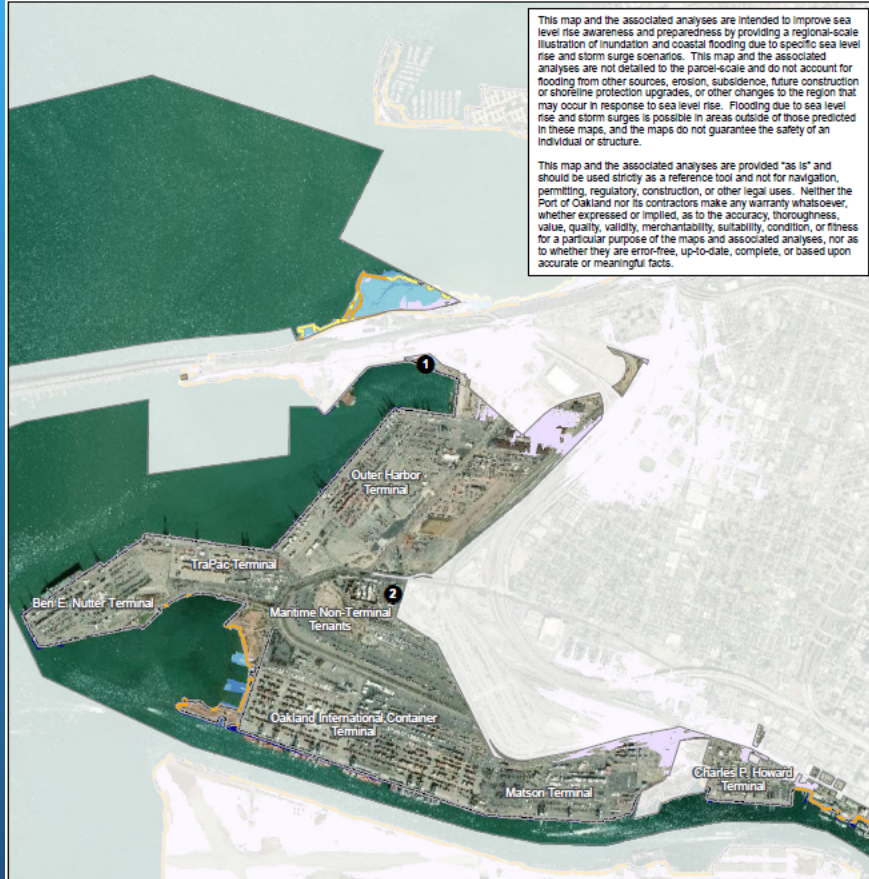
SLR Scenarios

Year	Inundation Maps (MHHW)	
2030	1 ft. SLR	1 ft. SLR + 100-yr Storm Tide (ST)
2050	2 ft. SLR	2 ft. SLR + 100-yr ST
2100	3 ft. SLR 5.5 ft. SLR	3 ft. SLR + 100-yr ST 5.5 ft. SLR + 100-yr ST



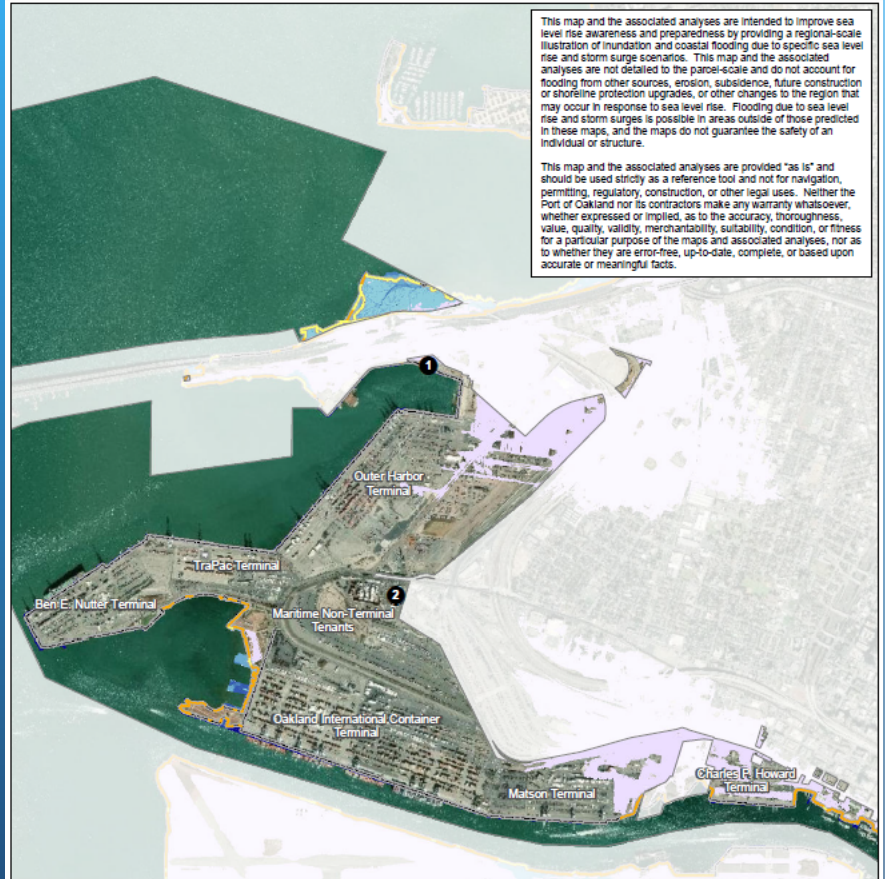
SLR Mapping - Year 2030 / 2050

- 1 Assessment of SLR Impacts: Inventory
- 2 SLR Mapping
- 3 Assessment of SLR Impacts: Vulnerability Assessment
- 4 Estimation of Financial Costs
- 5 Development of Adaptation Strategies
- 6 SLR Assessment Plan



This map and the associated analyses are intended to improve sea level rise awareness and preparedness by providing a regional-scale illustration of inundation and coastal flooding due to specific sea level rise and storm surge scenarios. This map and the associated analyses are not detailed to the parcel-scale and do not account for flooding from other sources, erosion, subsidence, future construction or shoreline protection upgrades, or other changes to the region that may occur in response to sea level rise. Flooding due to sea level rise and storm surges is possible in areas outside of those predicted in these maps, and the maps do not guarantee the safety of an individual or structure.

This map and the associated analyses are provided "as is" and should be used strictly as a reference tool and not for navigation, permitting, regulatory, construction, or other legal uses. Neither the Port of Oakland nor its contractors make any warranty whatsoever, whether expressed or implied, as to the accuracy, thoroughness, value, quality, validity, merchantability, suitability, condition, or fitness for a particular purpose of the maps and associated analyses, nor as to whether they are error-free, up-to-date, complete, or based upon accurate or meaningful facts.



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YEAR 2030 SCENARIO: 1 FOOT SEA LEVEL RISE + 100-YEAR STORM TIDE EVENT

Sea Level Rise Inundation & Storm Tide

0 - 2	Depth in Feet
2 - 4	
4 - 6	
6 - 8	
8 - 10	
10+	

100-Year Storm Tide Event

Shoreline Overtopping

- No Overtopping
- Sea Level Rise Overtopping
- Storm Tide Overtopping

Port of Oakland Assets

- 1 AMNAV Maritime Tug Service
- 2 Port Harbor Facilities

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Panel 1 of 3

YEAR 2050 SCENARIO: 2 FEET SEA LEVEL RISE + 100-YEAR STORM TIDE EVENT

Sea Level Rise Inundation & Storm Tide

0 - 2	Depth in Feet
2 - 4	
4 - 6	
6 - 8	
8 - 10	
10+	

100-Year Storm Tide Event

Shoreline Overtopping

- No Overtopping
- Sea Level Rise Overtopping
- Storm Tide Overtopping

Port of Oakland Assets

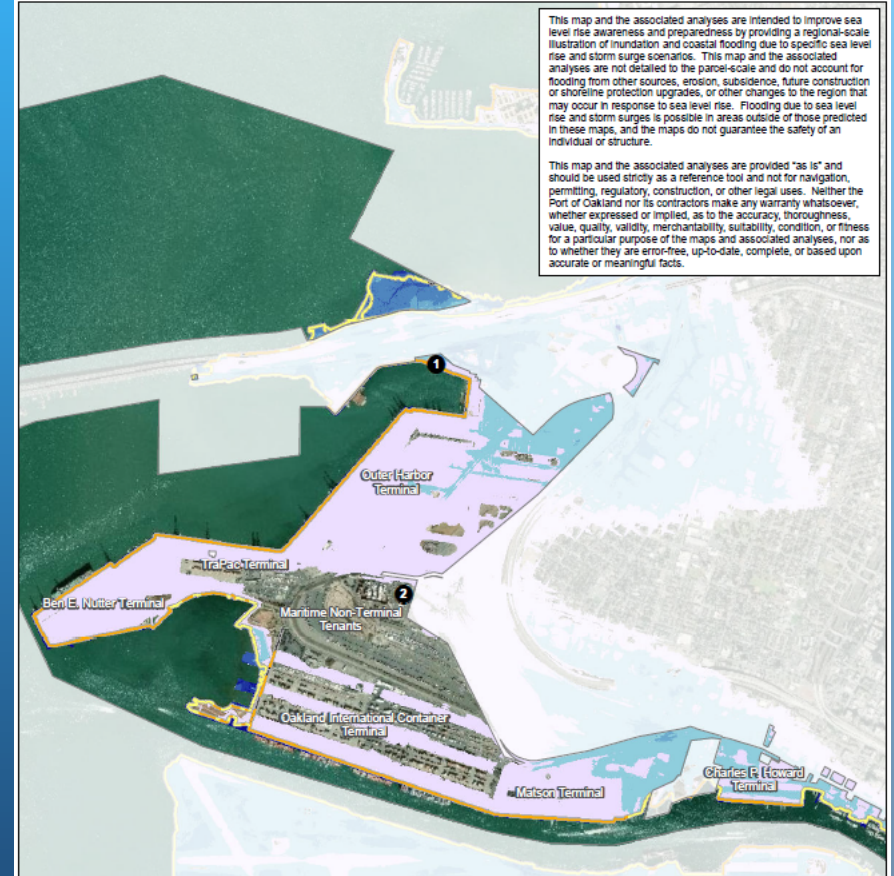
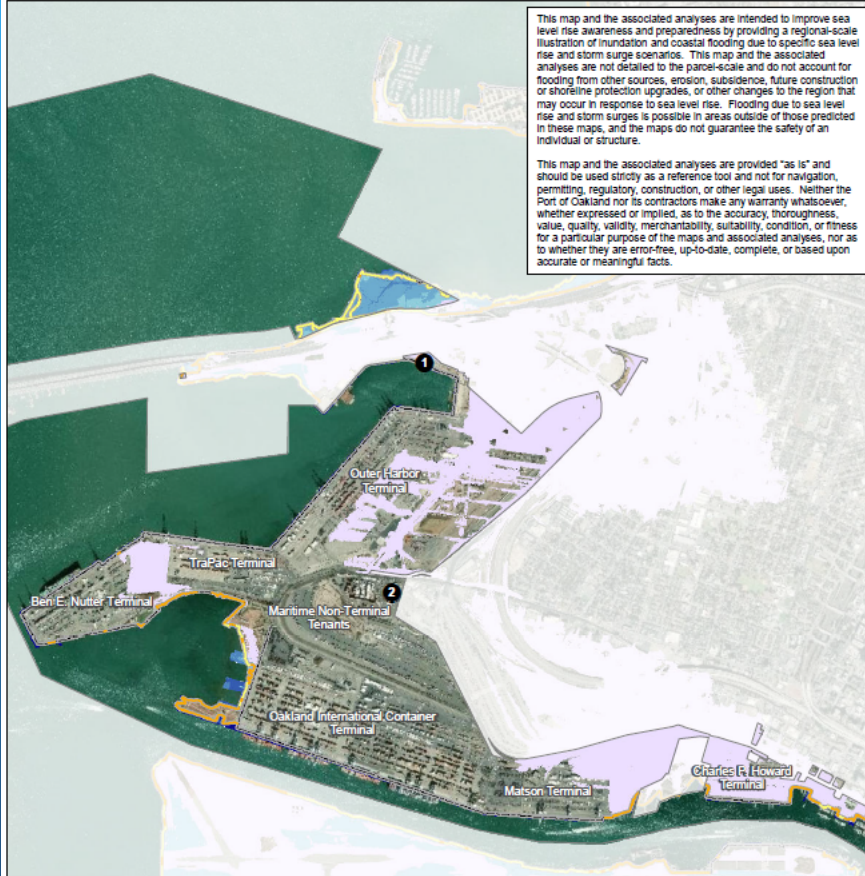
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Panel 1 of 3

SLR Mapping - Year 2100 L / H

- Assessment of SLR Impacts: Inventory
- SLR Mapping
- Assessment of SLR Impacts: Vulnerability Assessment
- Estimation of Financial Costs
- Development of Adaptation Strategies
- SLR Assessment Plan



YEAR 2100 LOW SCENARIO: 3 FEET SEA LEVEL RISE + 100-YEAR STORM TIDE EVENT

Sea Level Rise Inundation & Storm Tide

0 - 2
2 - 4
4 - 6
6 - 8
8 - 10
10+

Depth in Feet

100-Year Storm Tide Event

Shoreline Overtopping

- No Overtopping
- Sea Level Rise Overtopping
- Storm Tide Overtopping

Port of Oakland Assets

- 1 AMNAV Maritime Tug Service
- 2 Port Harbor Facilities

Panel 1 of 3

0 0.2 0.4 0.6 Miles

YEAR 2100 HIGH SCENARIO: 5.5 FEET SEA LEVEL RISE + 100-YEAR STORM TIDE EVENT

Sea Level Rise Inundation & Storm Tide

0 - 2
2 - 4
4 - 6
6 - 8
8 - 10
10+

Depth in Feet

100-Year Storm Tide Event

Shoreline Overtopping

- No Overtopping
- Sea Level Rise Overtopping
- Storm Tide Overtopping

Port of Oakland Assets

- 1 AMNAV Maritime Tug Service
- 2 Port Harbor Facilities

Panel 1 of 3

0 0.2 0.4 0.6 Miles

2. Vulnerability Assessment



By year 2030 (1 foot SLR)

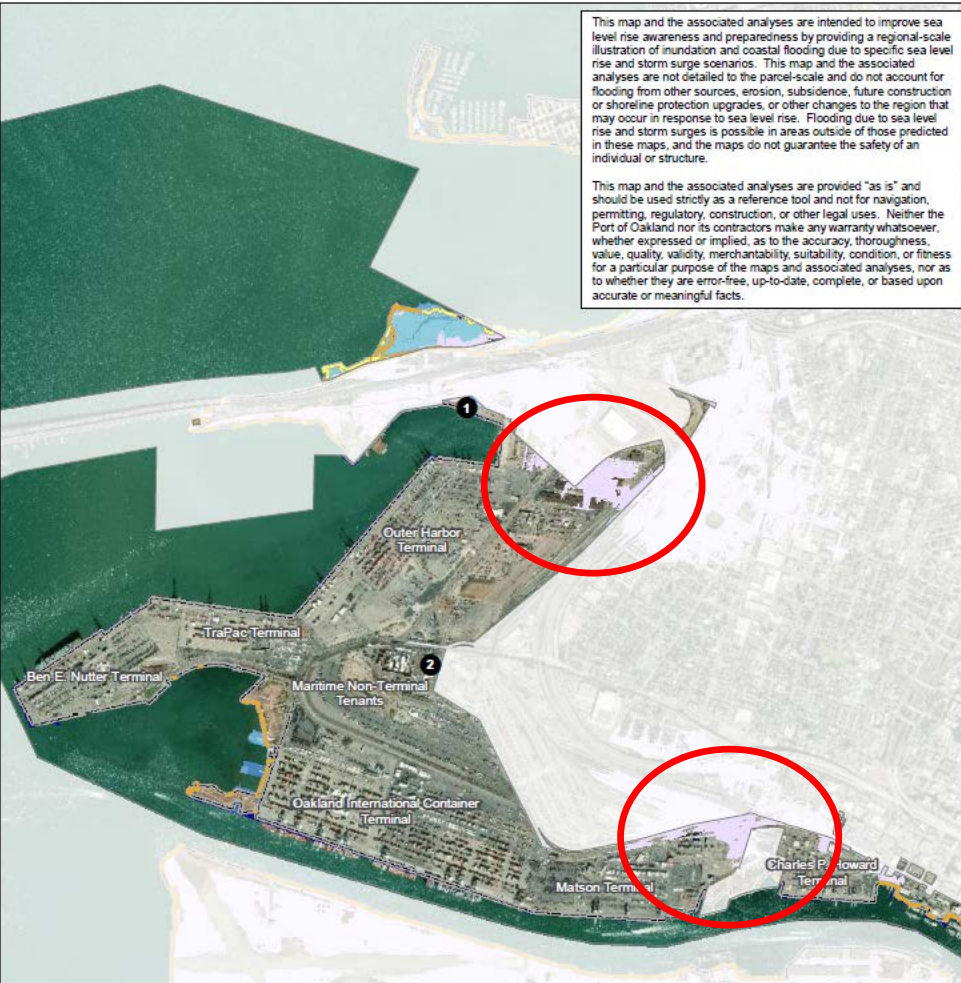
- Flooding at NE and SE corners of property

Temporary Flooding (100-year ST)

- Portions of rail
- Maritime Non-Terminal Tenant Area
- Substation

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Adaptation Strategies

1.A	• Assessment of SLR Impacts: Inventory
2	• SLR Mapping
3.A	• Assessment of SLR Impacts: Vulnerability Assessment
4	• Estimation of Financial Costs
5	• Development of Adaptation Strategies
6	• SLR Assessment Plan

Infrastructure adaptation strategies

Asset-specific
(focused on singular critical asset)

Area
(multiple assets and/or stakeholders)



Adaptation Strategies: M.1

Middle Harbor Shoreline Park

- 1.A • Assessment of SLR Impacts: Inventory
- 1.B • SLR Mapping
- 1.C • Assessment of SLR Impacts: Vulnerability Assessment
- 1.D • Estimation of Financial Costs
- 1.E • Development of Adaptation Strategies
- 1.F • SLR Assessment Plan



Sea Level Rise Inundation & Storm Tide

0 - 2	Light Blue	Depth in Feet
2 - 4	Medium Blue	
4 - 6	Dark Blue	
6 - 8	Purple	
8 - 10	Dark Purple	
10+	Black	
100-Year Storm Tide Event		

Shoreline Overtopping

- No Overtopping
- Sea Level Rise Overtopping
- Storm Tide Overtopping

Adaptation Strategies: **New** Terminal Shorelines

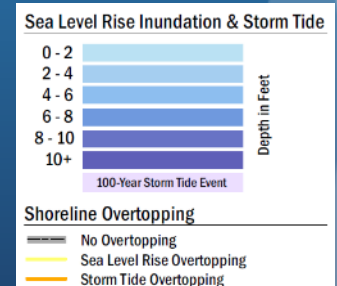
- 1.A. • Assessment of SLR Impacts: Inventory
- 1.B. • SLR Mapping
- 1.C. • Assessment of SLR Impacts: Vulnerability Assessment
- 1.D. • Estimation of Financial Costs
- 2. • **Development of Adaptation Strategies**
- 3. • SLR Assessment Plan



Length : ~1700 feet



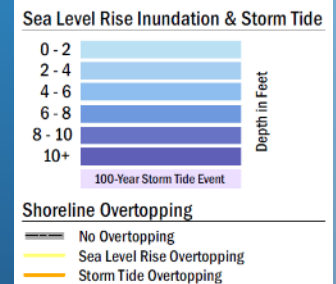
Length : ~1200 feet



Adaptation Strategies: M.3

All Maritime Terminals

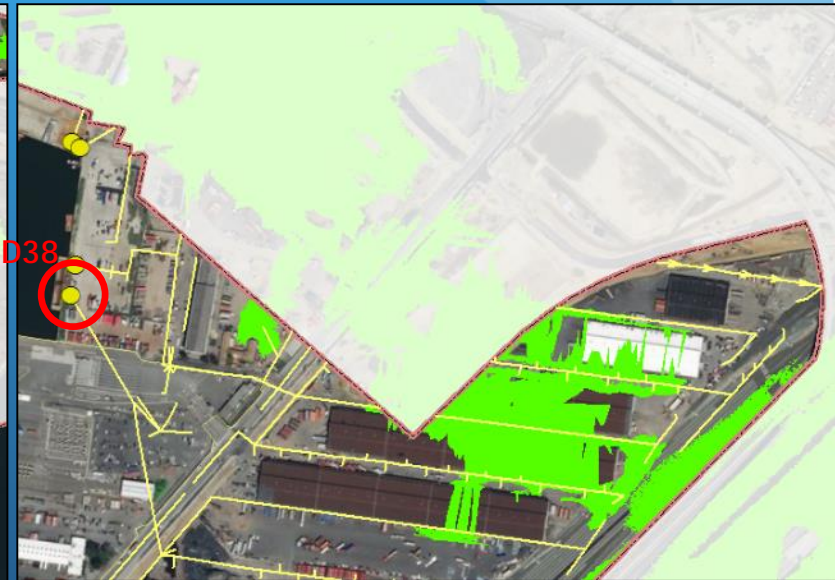
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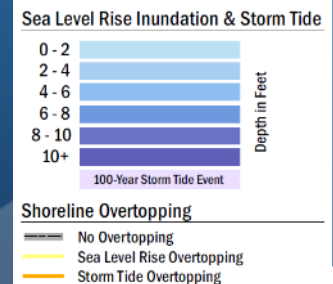
Adaptation Strategies: M.4

Matson Terminal and Northern Maritime Non-Terminal Tenant Area

- 1.A. Assessment of SLR Impacts: Inventory
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- Between 3 and 5.5 feet Mapped SLR Scenarios (4 feet SLR)
- Existing backflow prevention (in progress)



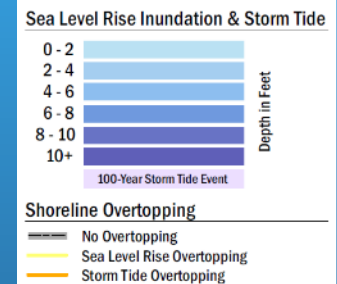
Adaptation Strategies: M.5

South Side of Bay Bridge Touchdown

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Length : ~3550 feet



Length : ~7300 feet

- *Collaboration outside of Port property*
- *Gateway Park*

Other SLR Efforts

Oakland Airport Specific Efforts

- Oakland Airport Perimeter Dike Improvement, ongoing
- Airport Northfield Flood Protection Study, ongoing

Thank You

