



Climate Change Adaptation and Coastal Resiliency Plan (CRP)



Port of
LONG BEACH
The Green Port

Justin Luedy
Environmental Specialist

Importance of Resiliency

- Climate impacts already being seen
- Sea level rise/greater frequency & magnitude of storms
- Decision making for port and port tenants
- Hurricane Marie—August 2014
 - Damage at Navy Mole and Pier F shorelines & rock dikes
 - Significant damage to breakwater—3 large holes and many other breeches
 - Access restricted to rail operations, critical facilities, fueling stations, etc.

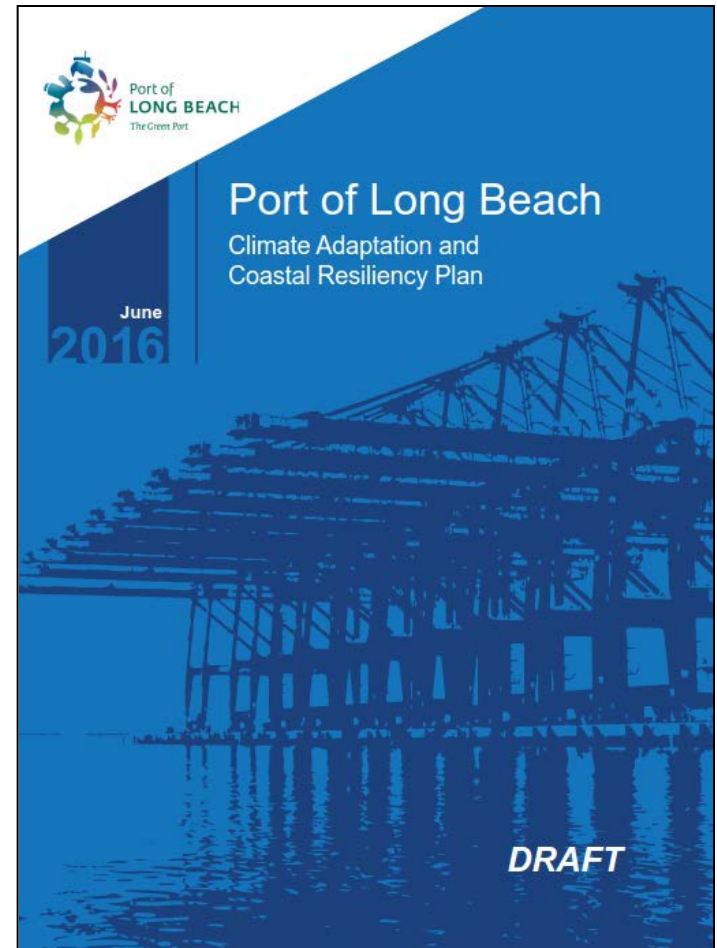


August 2014 - Hurricane Marie

CRP – Introduction

Project Goals

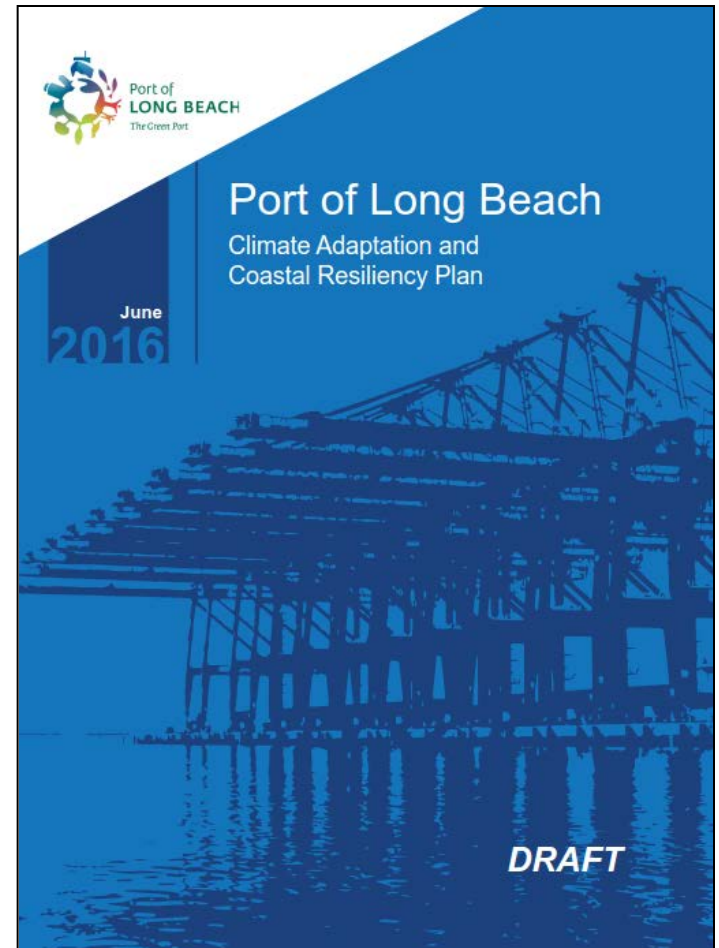
- Ensure resilience and business continuity in the Port
- Assess/manage risks associated with climate change
- Identify most vulnerable Port assets
- Identify adaptation strategies to protect the Port



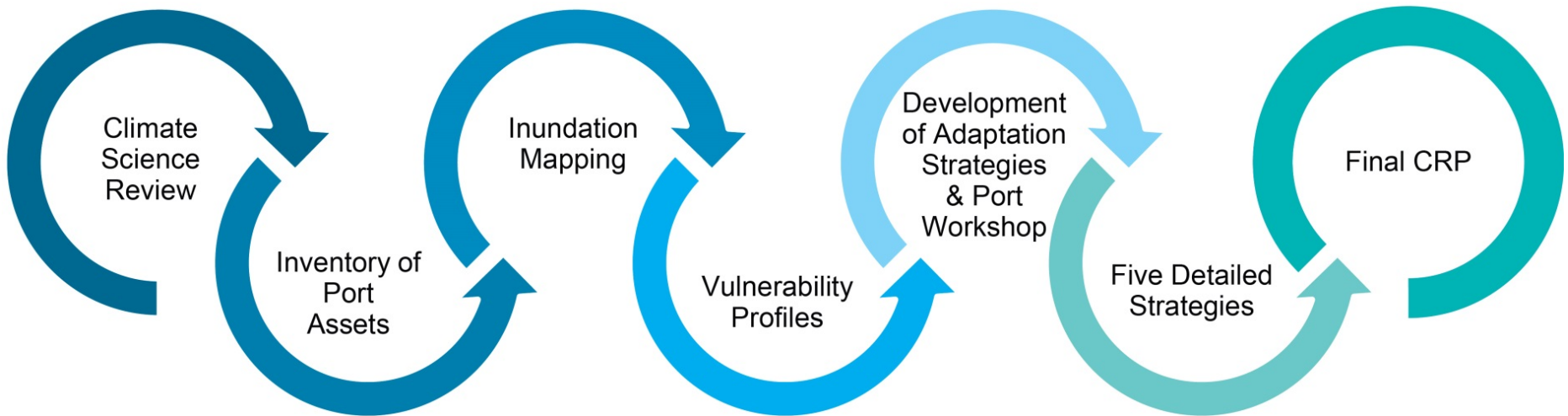
CRP – Introduction

Project Benefits

- A more resilient Port able to continue operations under changed conditions
- A Port prepared and ready to adapt
- More future-looking risk assessment process
- Long-term sustainable development
- Green Port Policy initiative



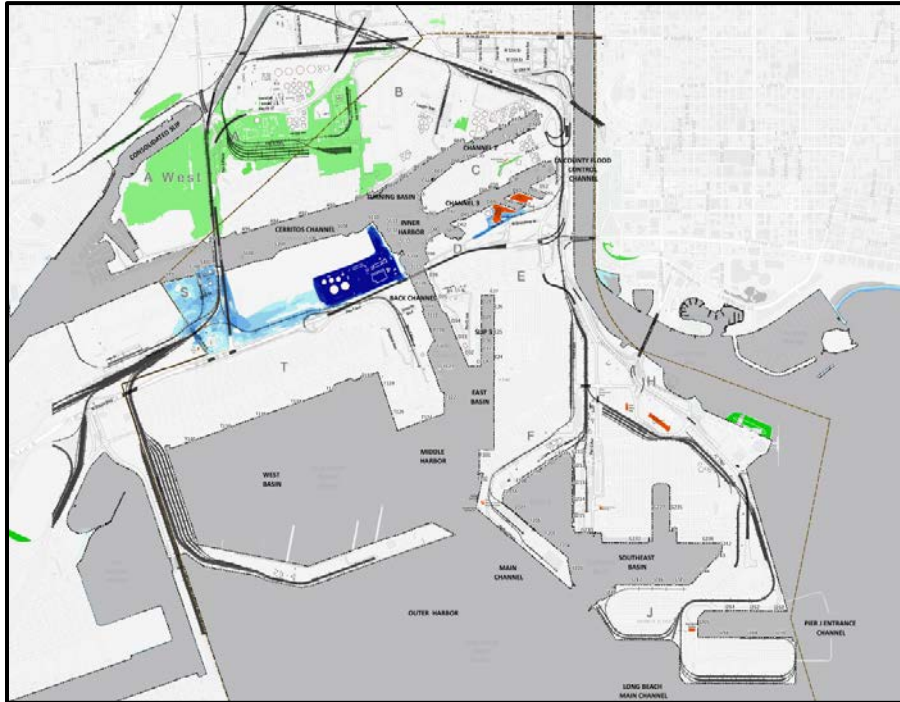
CRP – Project Approach



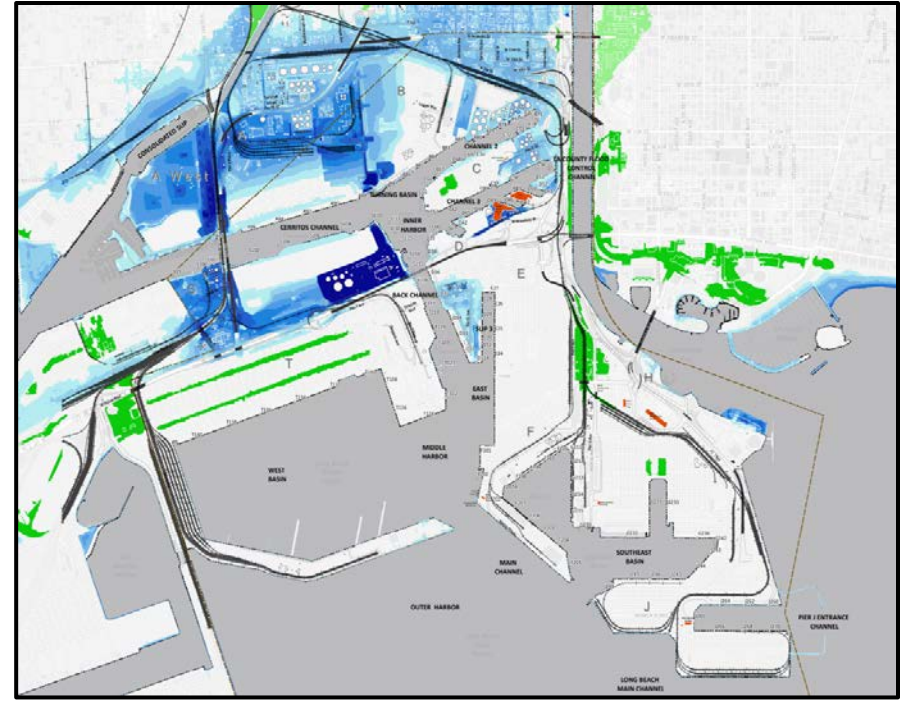
Phase 1: Data Gathering

Phase 2: Adaptation Strategies

CRP – Inundation Mapping

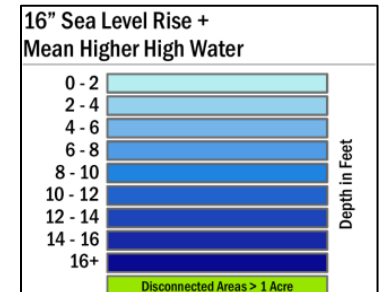


Least Extreme (16" SLR)



Most Extreme (55" SLR + 100yr Storm Surge)

SLR + SS Scenarios	
16"	16" + 100yr SWEL
36"	36" + 100yr SWEL
55"	55" + 100yr SWEL



Adaptation Strategies – Selection Process

- 
- Develop long list of 50+ strategies

- Port workshop – Prioritize & discuss strategies

- Further develop 5 strategies & concept designs

Adaptation Strategies – Selection Process

Types of Strategies

Governance

- Overarching port policies, integration into plan documents, manuals, guidelines, etc.
- Design Criteria

Initiative

- Informational gaps
- Support Port's current efforts
- Stakeholder engagement

Physical Infrastructure

- Modification & enhancement of existing structures
- Asset/location specific

CRP – Adaptation Priority Strategies

Five Prioritized Strategies

Governance

1. Addressing climate change impacts through various Port policies, plans, and guidelines
2. Adding climate change analysis to the Harbor Development Permit process

Initiative

3. Piers A & B Study – combined impacts of riverine and coastal flooding around Dominguez Channel

Physical Infrastructure

4. Terminal Island shoreline protection
5. Terminal Island SCE electrical substation protection – evaluation of multiple strategies

*Additional future strategies to consider were also analyzed, but to a lesser degree.

Strategy: Adding climate change analysis to Harbor Development Permit (HDP) process

HDP Application—required for construction, alterations, remodels, demolitions, etc.

Text insertion:

Sea Level Rise and Storm Surge Vulnerability Assessment

Note: Guidance for Incorporating Sea Level Rise and Storm Surge into Port of Long Beach Harbor Development Permit (HDP) Applications is available upon request.

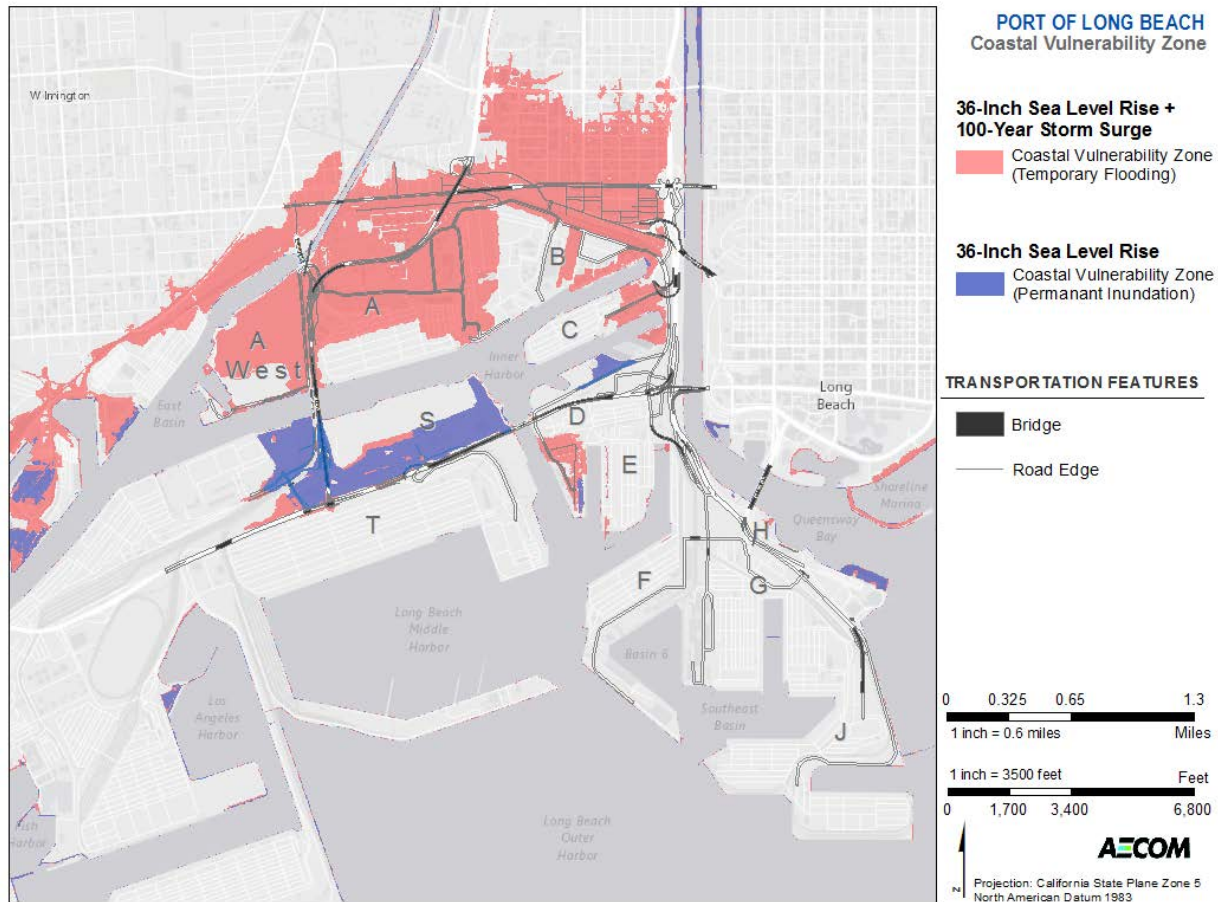
1. Using the Port Coastal Vulnerability Zone Map (found at the end of this application form), is the proposed project subject to temporary flooding and/or permanent inundation? Yes___ No___

If the answer to question 1 is YES, please answer the next three questions. If the answer to question 1 is NO, please skip the remainder of this checklist.

2. What is the potential maximum lifespan (functional working life) of the equipment and/or development (i.e., is the life of the asset or project over 15 years)? _____
3. Is there a risk that the asset could be damaged or its maintenance or operation disrupted if flooded? Yes___ No ___
4. If you have considered potential adaptation or mitigation measures, please describe them here:

Strategy: Adding climate change analysis to Harbor Development Permit (HDP) process

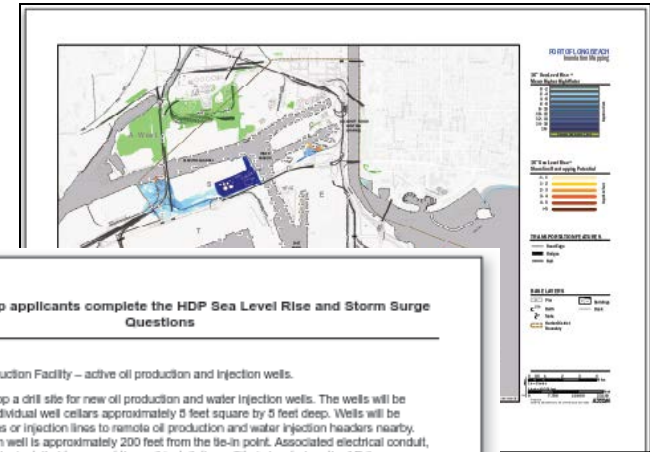
Coastal Vulnerability Zone Map—36” SLR and 36” SLR + 100 year storm



Strategy: Adding climate change analysis to Harbor Development Permit (HDP) process

Staff Guidance – Handout

- Introduction
- SLR/storm surge projections
- Definitions (vulnerability, risk, adaptation strategies)
- Forms, example project, and internal checklist for staff reviewing applicable projects



Guidance to help applicants complete the HDP Sea Level Rise and Storm Surge Questions

Project Example
Project Title: Oil Production Facility – active oil production and injection wells.
Project scope: Develop a drill site for new oil production and water injection wells. The wells will be installed in pre-cast individual well casings approximately 5 feet square by 5 feet deep. Wells will be connected via flow lines or injection lines to remote oil production and water injection headers nearby. The farthest production well is approximately 200 feet from the tie-in point. Associated electrical conduit, wiring, and panels will be installed to support the well installations. Site is located north of Edison power plant on Terminal Island. Area is 20,000 square feet (sq. ft.) and project cost is estimated to be \$415,000 for materials and \$900,000 for labor.

Sea level rise and storm surge section only:

Let applicant know that additional guidance is available, if they are interested.

Look at Coastal Vulnerability Zone Map at the end of the application and locate the site of the proposed development. Select YES if the project is in the red or blue zone.

If YES is selected, follow up with applicant to recommend to ensure understanding of the type of inundation (temporary or permanent) and the depth so that appropriate adaptation strategies can be considered.

Determine if the inundation, temporary or permanent, would cause damage or disruption. In this example, the electrical equipment is likely to fail if it gets wet.

The answer to this question will determine the level of relevant flooding and inundation scenarios.

This question is intended to ensure awareness of flood/inundation hazards and consideration of measures to increase resiliency of the asset. In this example, after looking at the detailed inundation map and knowing that the lifespan of the asset will be around 10 years, the design team incorporated adaptive strategies.

Sea level rise (SLR) and storm surge considerations:

Note: Guidance for Incorporating Sea Level Rise and Storm Surge into Port of Long Beach Harbor Development Permit (HDP) Applications is available upon request.

Vulnerability Assessment

1. Using the Port Coastal Vulnerability Zone Map (found on page x of this application form), is the proposed project subject to temporary flooding and/or permanent inundation? Yes No
2. What is the potential maximum lifespan (functional working life) of the equipment and/or development (i.e., is the life of the asset or project over 15 years)? 10
3. Is there a risk that the asset could be damaged or its maintenance or operation disrupted if flooded? Yes No
4. If you have considered potential adaptation or mitigation measures, please describe them here:
Supporting electrical equipment (wiring, panels, conduits) will be elevated to a height above the permanent inundation and temporary flooding water depths (8 feet above the present ground elevation). Additionally, because this site is projected to experience permanent inundation under the 36-inch SLR scenario, the well casings and well access encasings will need to be increased to an elevation above the permanent inundation depth (5 feet above the present ground elevation) and accessed by a platform. Acquisition and installation of emergency pumps will also be provided at the site to ensure that storms occurring under future water level scenarios do not flood the well access.

Lessons Learned

- Timing is important – don't wait for the best data
- Collaboration with local agencies, organizations, academia is/will be important
- Staff input/support is essential
- There may be multiple adaptation options which require careful assessment
- Extreme weather events help highlight the potential impacts
- Adaptation is crucial



August 2014 - Hurricane Marie