San Francisco Bay Conservation and Development Commission (BCDC)

Subregional Plan Essentials: Understanding Element C: Vulnerability Assessment

03.25.2026

Webinar

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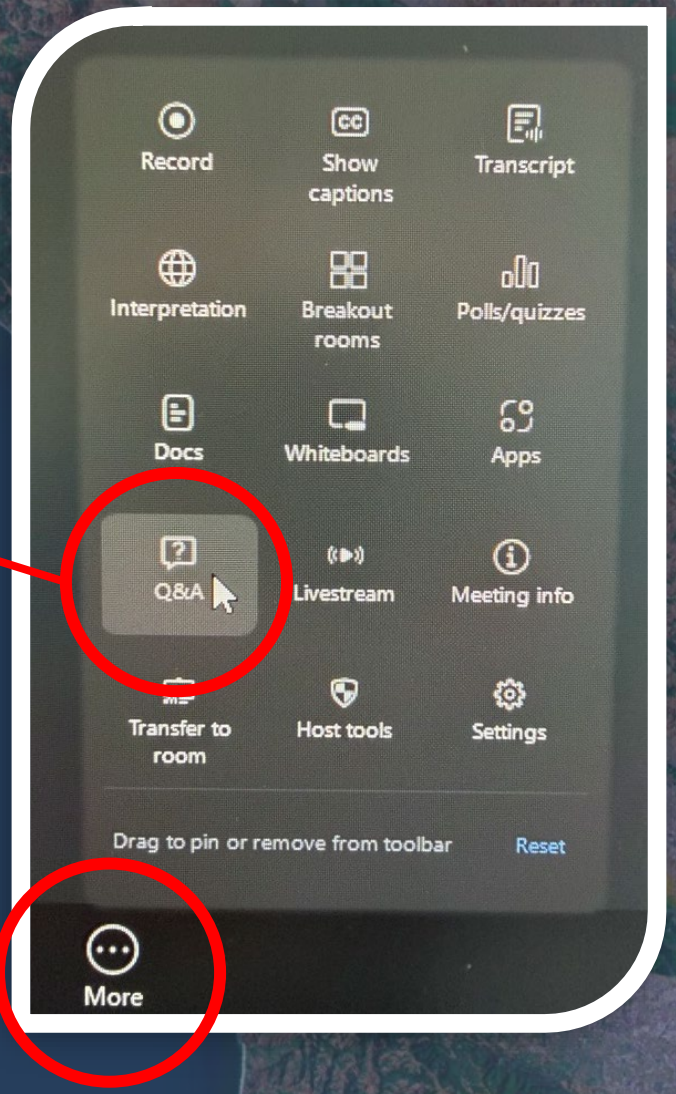
Step 1:
Select "More" at the bottom of your screen.



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San Francisco Bay Conservation and Development Commission (BCDC)

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Agenda

- **Introduction:** Goals and RSAP / Elements A & B refresh
- **Part 1:** Overview of Element C & C1 Exposure Analysis
- **Part 2:** C2-a Priority Areas & Demo Exercise
- **Part 3:** C2-b-d Assess & Summarize Vulnerability
- **Takeaways**
- **Questions and Answers**

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Webinar goals

1. Explain the purpose of Element C and why the vulnerability assessment matters.
2. Show how to map exposure and identify priority areas for detailed analysis.
3. Introduce vulnerability components: sensitivity, adaptive capacity, and consequence.
4. Highlight timing, phasing, and trigger points to guide adaptation under uncertainty.

The Regional Shoreline Adaptation Plan (RSAP) Guidelines

- Guides local planning and ensure compliance with Senate Bill 272.
- The Guidelines outline all required components for preparing a subregional plan.
- Consist of the **Plan Elements** and **Minimum Standards.**

Plan Elements

Element A: Planning Process

Document the planning process.

Element B:
Existing Conditions

Element C:
Vulnerability Assessment

Element D:
Adaptation Strategies and Pathways

Element E:
Land Use and Policy Plan

Element F:
Implementation Plan

Element G:
Project List

Understand the local context and conditions of vulnerability.

Select adaptation strategies and advance strategies.

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Minimum Standards

Coastal Flood Hazards & Sea Level Rise Scenarios

Minimum hazards and scenarios that must be included.

- **Coastal flood hazards**:
  - Storm surge (100-year)
  - Shallow and emergent groundwater
  - Tidal inundation (MHHW)
- **Sea level rise scenarios:**
  - 0.8 ft (2050)
  - 3.1 ft (2100 Intermediate)
  - 4.9 ft (2100 Intermediate-High)
  - 6.6 ft (2100 High)

Minimum Categories & Assets

Aspects of physical, environmental, social, and economic issues that must be considered in adaptation planning.

Equity Assessment

Equity considerations to address throughout the planning process.

Adaptation Strategy

Outcomes to be considered in strategy selection.

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Check out our February 11th webinar!

We covered:

Element A: Planning Process

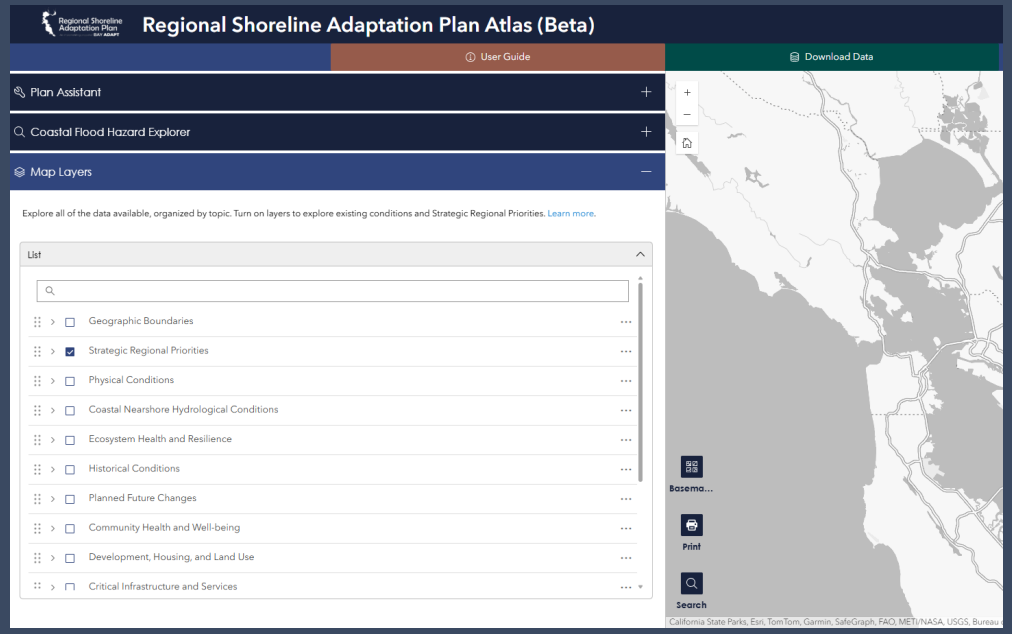
- Design, implementation, execution, and documentation of your planning process

Element B: Existing Conditions

- Identifying baseline local conditions that shape vulnerability and adaptation decisions

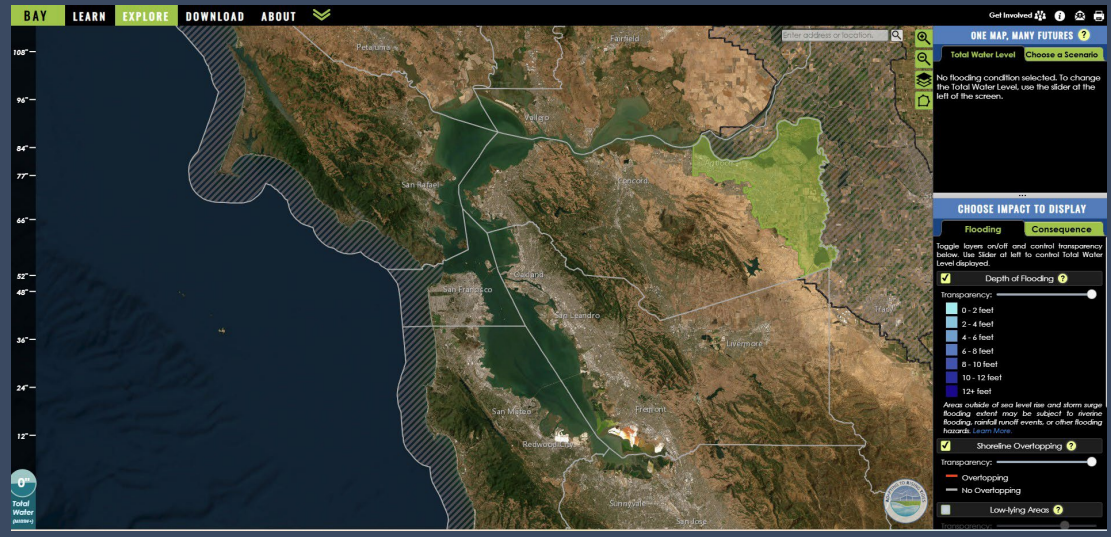
Watch the webinar here!

Resources



RSAP Atlas

A regional mapping tool that includes 65% of the data required in a subregional plan.



Bay Shoreline Flood Explorer

Maps showing potential future flooding and sea level rise, highlighting shoreline segments most at risk.

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Part 1
Overview of Element C
&
C1 Exposure Analysis

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Intended outcome:

A targeted summary of shoreline exposure and vulnerability that identifies high priority areas.

Photo courtesy California King Tides Project.

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Photo courtesy CA King Tides Project

Why this matters

- Creates a bridge between **Element B**: Existing Conditions and **Element D**: Adaptation Strategies.
- Grounds adaptation decisions by:
  - Identifying what assets and communities need protection.
  - Prioritizing where action is urgent.

See Chp. 3 of the Adaptation Roadmap for guidance on creating a locally grounded vulnerability assessment.

Element Sections

Element C: Vulnerability Assessment

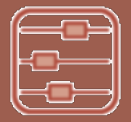
C1. Exposure Assessment

Identifies where flooding may occur from coastal hazards and sea level rise and what could be affected in the required coastal flood hazard and sea level rise scenarios.

C2. Vulnerability Assessment for priority areas

Summarizes vulnerability of priority areas to current and future hazards focusing on sensitivity, adaptive capacity, and consequences.

Required for exposure analysis and vulnerability assessment in priority areas.



All categories and assets must undergo an exposure analysis for all Coastal Flood Hazards and Sea Level Rise Scenarios Standard.

Must complete equity assessment.

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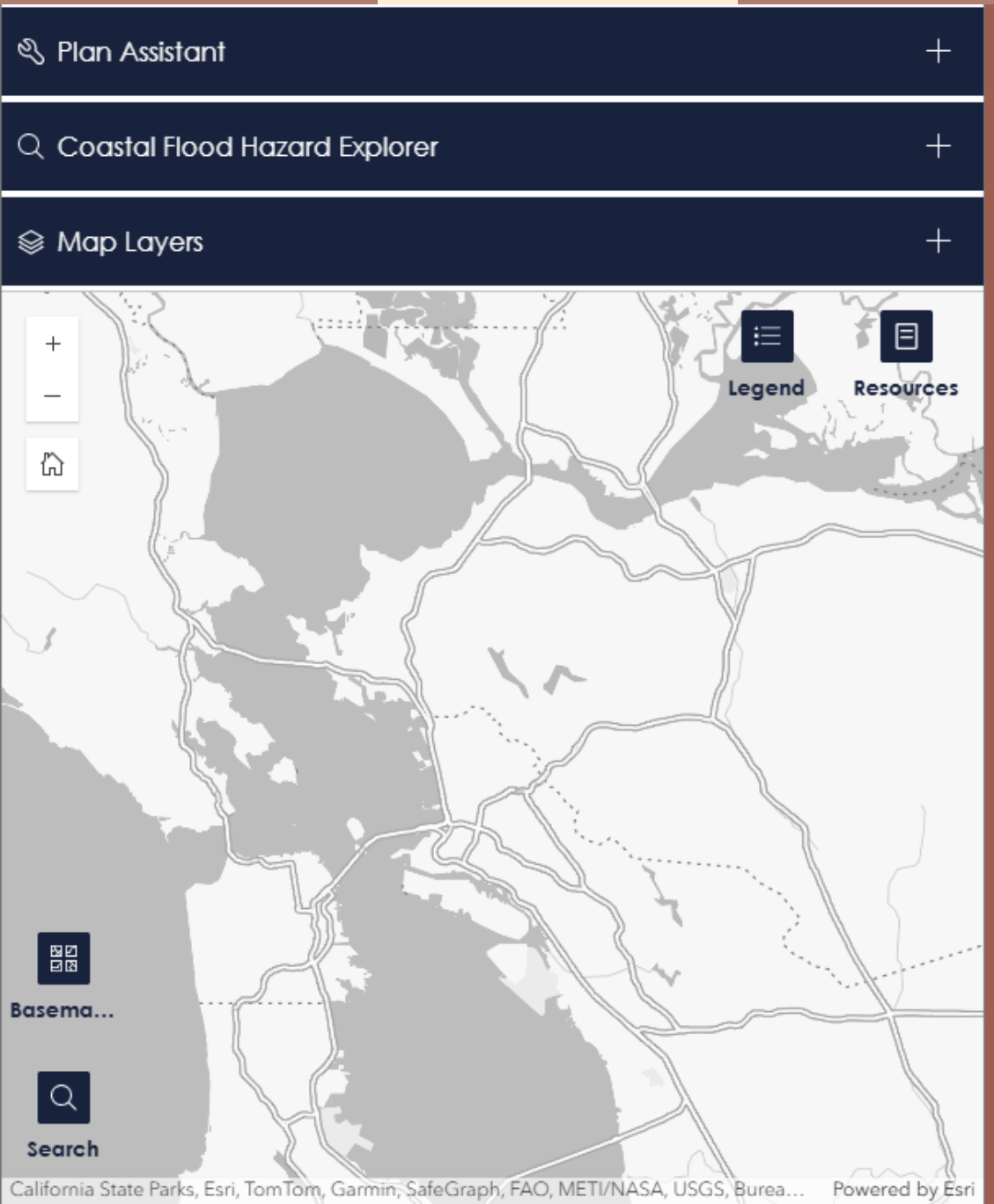
What this means in practice

Exposure across the entire planning area

To identifying priority areas for more detailed vulnerability assessments

To assessing sensitivity, adaptive capacity, and consequence

To summarizing exposure, vulnerability, and timing across scenarios



The RSAP Atlas & Element C

- The RSAP Atlas supports **INITIAL** requirements of Element C:
  - Generating maps and summaries of Exposure (C1-a) using the Plan Assistant
  - Mapping Strategic Regional Priorities
  - Mapping Baylands Habitats
  - Mapping Vulnerable Communities

C1. Exposure assessment

Map and describe the exposure of people, assets, ecosystems, and services to coastal flood hazards across minimum sea level rise scenarios.

Photo courtesy California King Tides Project.

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C1-a. Exposure to coastal flood hazards


Photo courtesy California King Tides Project.

What to include:

- Map and summarize the exposure of all Minimum Categories and Assets to the Coastal Flood Hazards and Sea Level Rise Scenarios Standard:

- ✓ storm surge (100-year)
- ✓ shallow groundwater
- ✓ emergent groundwater
- ✓ tidal inundation (MHHW)

- ✓ 0.8 ft (2050)
- ✓ 3.1 ft (2100 Intermediate),
- ✓ 4.9 ft (2100 Intermediate-High)
- ✓ 6.6ft (2100 High)

- Include community-identified assets from Element B3.
- Describe how vulnerable community assets were incorporated.

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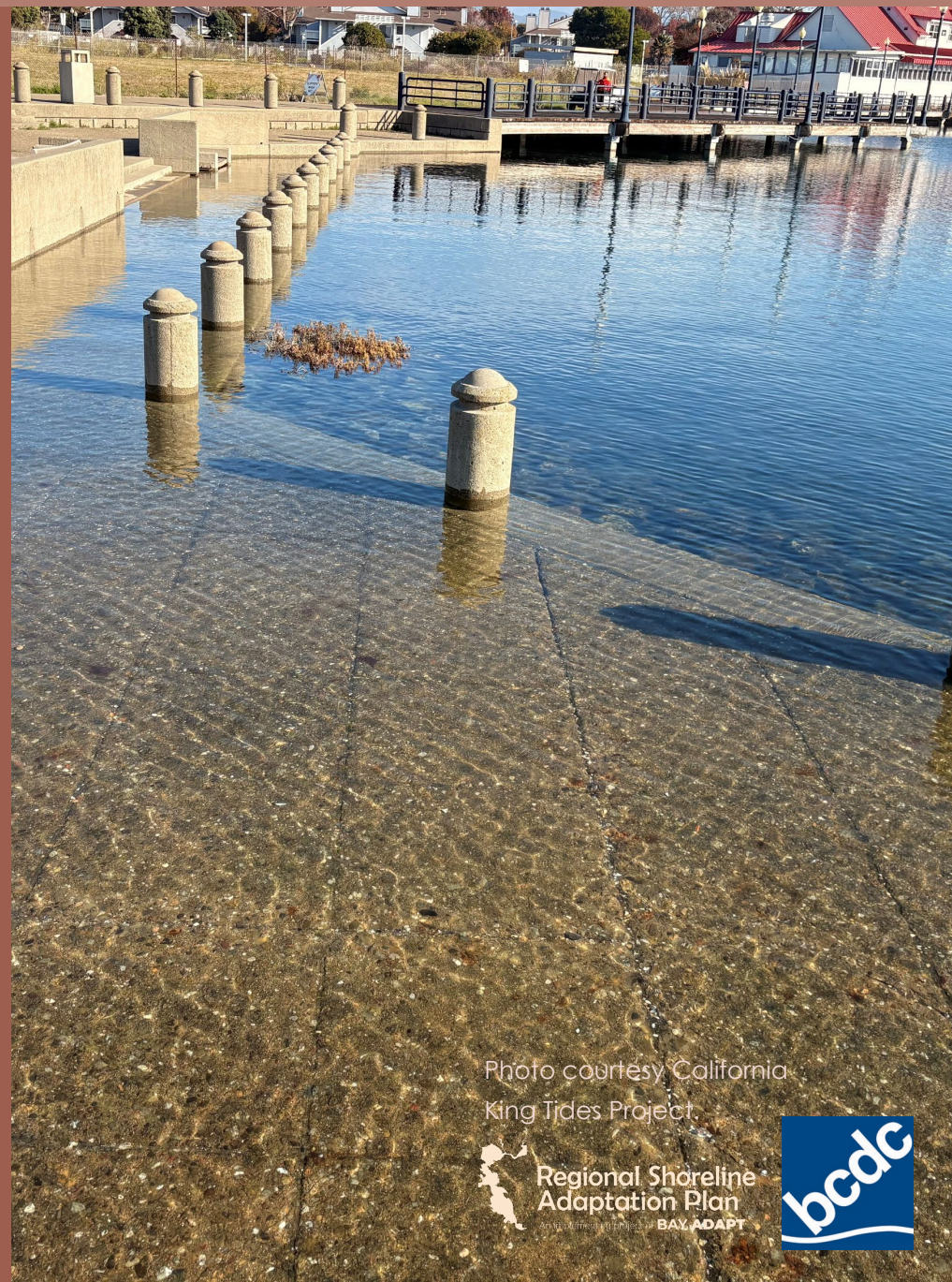
C1-a. Exposure to coastal flood hazards

How to approach it:

- Use existing exposure analyses to avoid duplication of work.
  - ➢ BCDC will accept predefined deviations and may consider others case by case.
- Use the **RSAP Atlas** to map and summarize exposure.
- Summarize exposure by asset category or geography, not asset-by-asset.
- Follow the **BCDC approval process for alternative or supplemental data**.



C1-b. Shoreline flood risk conditions


Photo courtesy CA King Tides Project

What to include:

- Assess and describe the planning area's shoreline conditions and characteristics to identify factors that influence flood risk.
- This may include but is not limited to:

Characteristics like:
- Areas of overtopping
- Flood pathways
- Thresholds
- Tipping points
- Ad hoc flood management
- Hydraulically connected areas

Conditions including:
- Low elevations
- Disconnected low-lying areas
- Subsidence
- Erosion
- Deterioration
- Lack of maintenance

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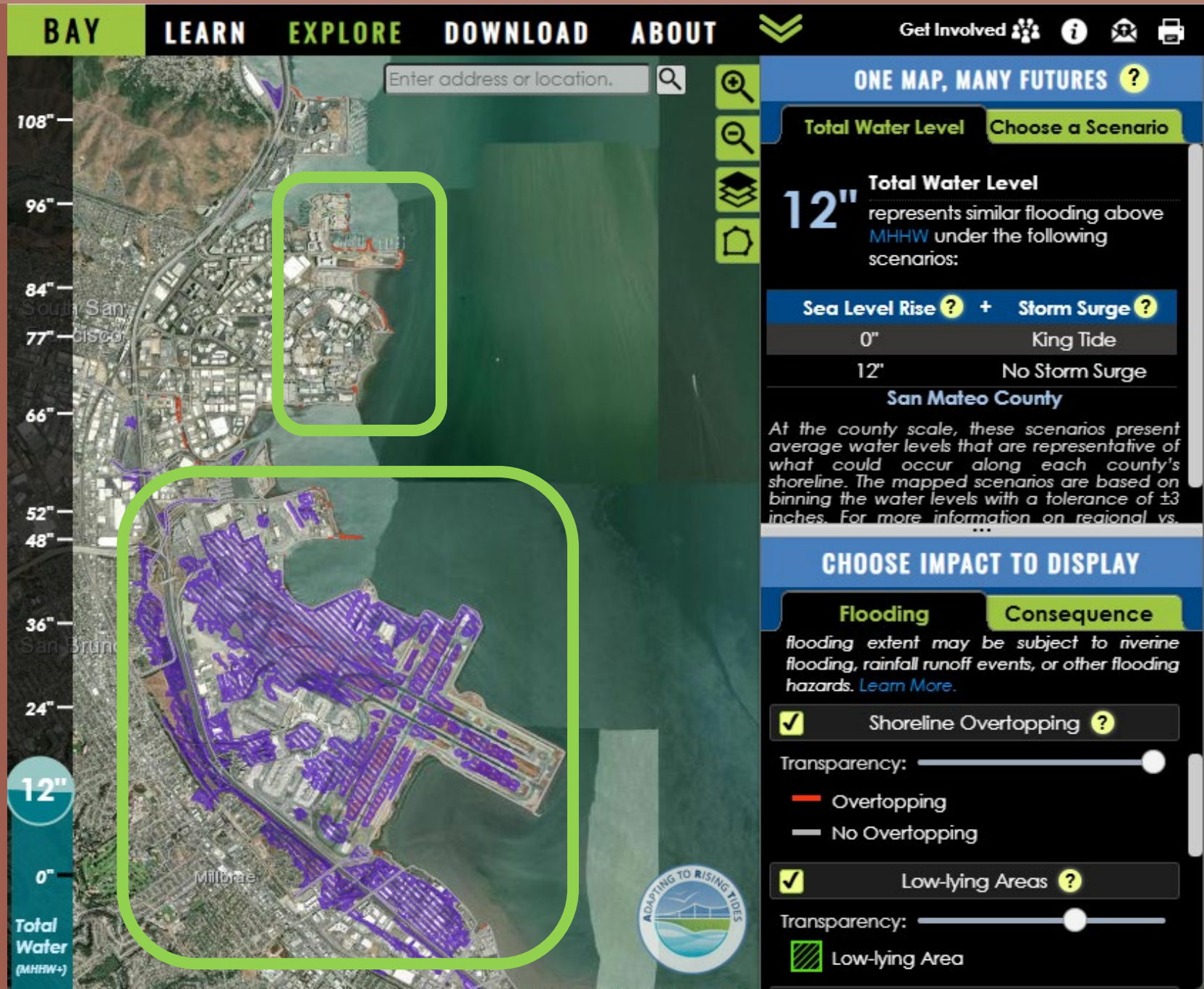
C1-b. Shoreline flood risk conditions

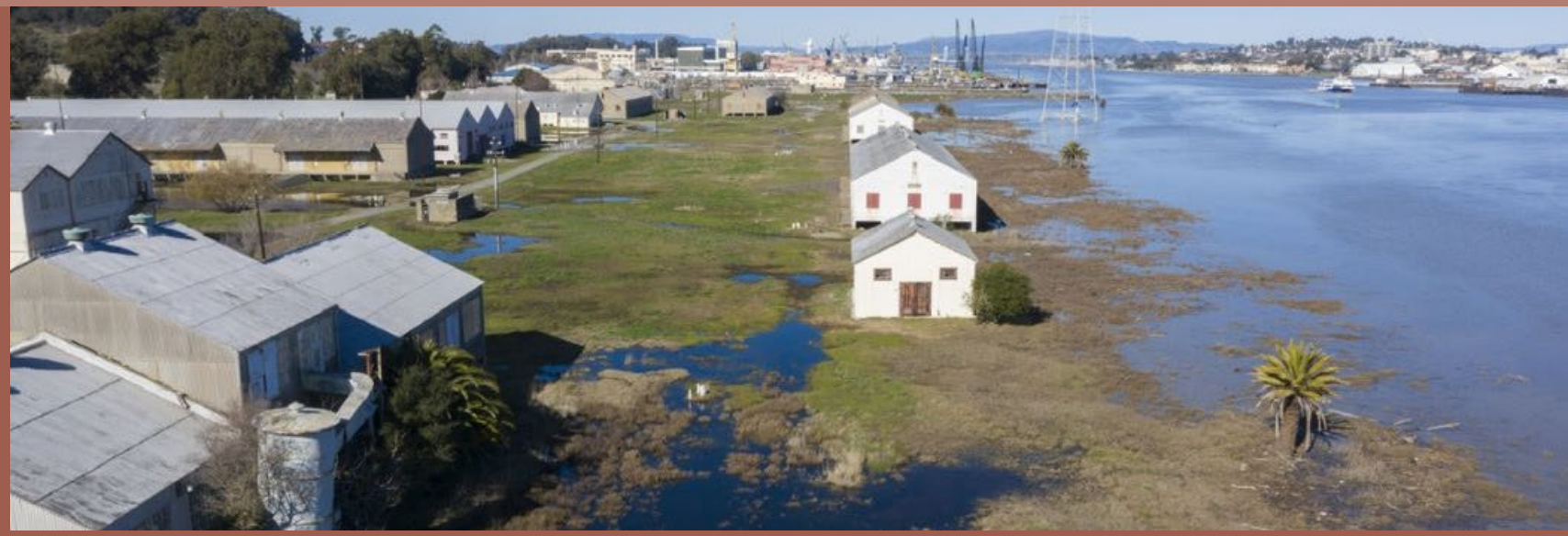
How to approach it:

- View **The Adapting to Rising Tides Flood Explorer** to explore shoreline overtopping, low-lying areas, and potential flood pathways.

https://explorer.adaptingtorisingtides.org/



C1-c. Potential cost and damages of inaction



SB 272 requires that plans include an economic analysis of, at a minimum, costs to critical public infrastructure and implementation strategies and projects.

What to include:

- Description of potential costs of damages, disruption, and losses to the economy, ecology, and community that would occur in the absence of adaptation actions.

You will be asked to determine the potential high-level costs of selected adaptation strategies in priority areas in Element F section F2.a.

C1-c.
Potential cost of damages from inaction

How to approach it:

- Consider starting with the Minimum Categories and Assets exposed in your 2100 High (6.6 ft) scenario.
  - What valuations you can associate with exposure?
- This description can be a high-level, order-of-magnitude estimate and can include quantitative, qualitative and non-financial metrics.
- Note any caveats or assumptions with your estimates.
- This value can provide a "baseline" when comparing the costs of different adaptation strategies to the cost of inaction.

Element C submittals

- Use the checklist to confirm all vulnerability assessment requirements are addressed.
- Submittals do not need to follow the order in the Guidelines if all information is included.
- Maps can be combined or submitted separately.
- The Equity Assessment can be embedded or submitted as a separate document.
- Alternative approaches must be approved by BCDC before submission.

Part 2
C2-a Priority Areas
&
RSAP Atlas Exercise

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Why identify priority areas?

- Narrow a wide range of assets and areas into key priorities.
- Focus detailed analysis on high-need areas.
- Identify areas for more detailed adaptation strategies.

C2-a.
Priority areas


Photo courtesy California King Tides Project.

What to include:

- Map and describe priority areas within the planning area. Identify areas based on:
  - Exposure to the 0.8 ft (2050) sea level rise scenario (C1-a)
  - Applicable Strategic Regional Priorities
  - Vulnerable communities (A4)
  - Baylands habitats (B2-c)
  - Locally identified significant high priority populations, assets, and services

Describe how communities provided input to shape the identification of priority areas.

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C2-a. Priority areas

How to approach it:

- Don't start from scratch.
  - Use existing plans and information collected in:
    - A4 (vulnerable communities)
    - B2-c (Bayland habitat)
    - C1-a (hazard exposure)
- Utilize the RSAP Atlas.
- Use community input and local expertise to refine priorities.
- Document why areas were selected as priorities.

Photo courtesy California King Tides Project.

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Exercise goals and limitations

This exercise is intended to:

- Walk you through how to analyze exposure to Coastal Flood Hazards and Sea Level Rise Scenarios for your jurisdiction.
- Simulate the steps you might take to evaluate a subset of the information needed for identifying priority areas.

This exercise does not:

- Evaluate all data layers required by the priority area identification criteria.
- Demonstrate the additional step of assessing vulnerability of the priority areas.

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Regional Shoreline Adaptation Plan

Regional Shoreline Adaptation Plan Atlas (Beta)

Local Sea Level Rise Plans

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Regional Shoreline Adaptation Plan Atlas (Beta)

The Regional Shoreline Adaptation Plan (RSAP) is a regional plan to address rising sea levels in San Francisco Bay. Local governments in the Bay Area are required to develop Subregional Shoreline Adaptation Plans (Plans), per SB 272. The RSAP Atlas is a tool to help create Plans that comply with these requirements. It includes region wide data on coastal flood hazards, community vulnerability, existing conditions, Strategic Regional Priorities, and nature-based adaptation suitability.

The RSAP Atlas allows you to:

1. Map how sea level rise might affect your community
2. Generate Plan submittals
3. Download GIS data

This is the Beta Version of the RSAP Atlas. How is it working? **We want to hear from you!** Reach out to GIS@bcdc.ca.gov with your questions or feedback.

Map layers may be slow to load. Viewing on a screen with a minimum resolution of 1000x800 is recommended.

User Guide | Explore Map | Download Data

Search

California State Parks, Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Lan…

Powered by Esri

Exercise Instructions

Scenario

- As a planner for your jurisdiction, you are using the RSAP Atlas to help you comply with RSAP Element C: Vulnerability Assessment.
- You will be generating summaries of exposure for the Critical Infrastructure and Services Topic Area with the Plan Assistant tool.
- Then you will review mapped Strategic Regional Priorities to identify potential priority areas using the Map Layers tool.
- Exercise worksheet is linked in chat.

Estimated completion time: ~ 15 minutes

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Exercise Learning Outcomes

- Generated exposure analysis to the Coastal Flood Hazards and Sea Level Rise Scenarios for your Plan Area using the RSAP Atlas Plan Assistant tool.
- Evaluated additional map criteria to inform a preliminary identification of priority areas, including mapped Strategic Regional Priorities, using the Map Layers tool.

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Part 3
C2-b to C2-d
Assess & Summarize Vulnerability

Photo courtesy California King Tides Project.

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C2-b. Assess vulnerability

What to include:

For each priority area, describe the vulnerability of the assets, populations, and services including:

- **Sensitivity** – How much an asset, population, or system is affected if exposed.
- **Adaptive capacity** – How well an asset can adjust, respond, cope, or recover.
- **Consequence** – Potential harm or disruption that may result from exposure to the asset.

C2-b. Assess vulnerability

How to approach it:

- If appropriate, summarize vulnerability at the asset category level.
- Jurisdictions can utilize their own methodologies to evaluate sensitivity, adaptive capacity and consequence, if desired.
- Consider linking vulnerability to the cost of inaction.
- Tap your planning team and local agencies for expertise on asset classes and their vulnerability.
- Breaking your area into smaller units
- There is not a single "right" way to conduct a vulnerability assessment.

For more guidance view the CA State Adaptation Planning Guidance 2.0 and BCDC's ART Planning Approach.

Breaking your area into smaller units

Shoreline "Reaches"

- Break the shoreline into manageable segments with similar conditions.
- Use natural features, land uses, hydraulics, or priority assets to guide the segmentation.

Neighborhoods / Communities

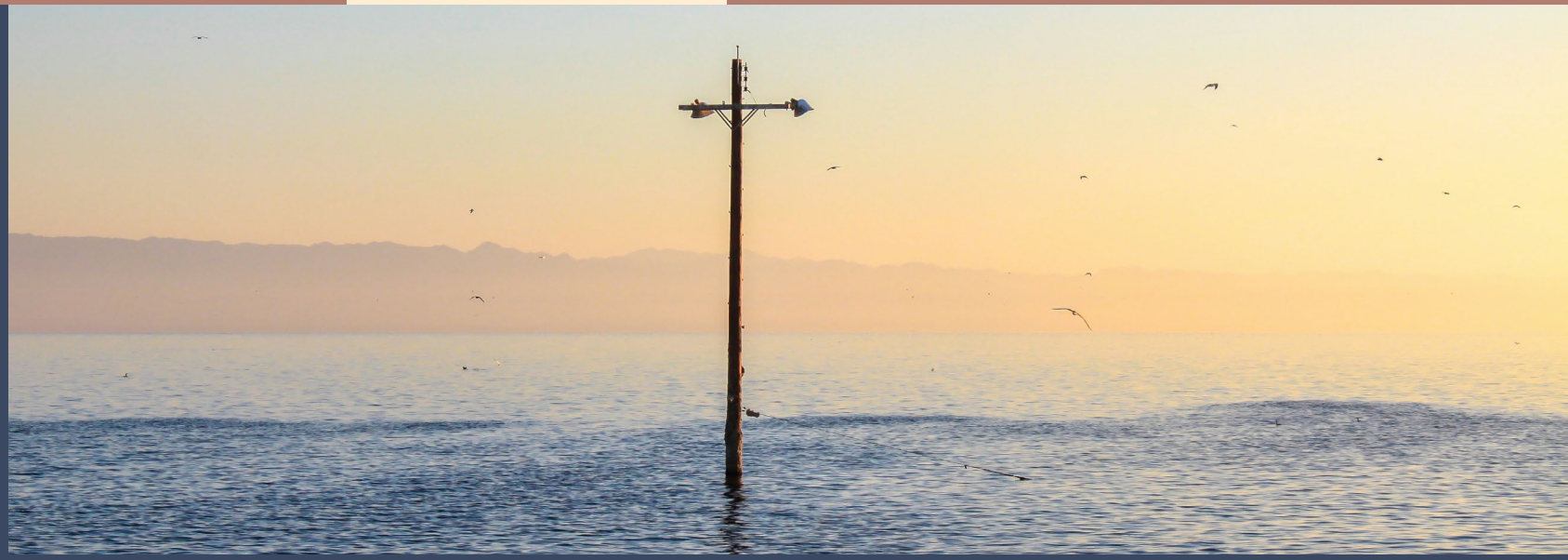
- Group analyses by neighborhood or community.
- Can help with messaging, engagement, and communicating local impacts.

Why this helps

- Organizes exposure and vulnerability summaries.
- Makes adaptation strategies more manageable.

These are optional planning tools!

C2-c. Summarize vulnerability



What to include:

- At a minimum, include a summary of exposure and vulnerability at each of the following required Coastal Flood Hazards and Sea Level Rise Scenarios Standards:
  - 0.8 ft (2050)
  - 3.1 ft (2100 Intermediate)
  - 4.9 ft (2100 Intermediate-High)
  - 6.6 ft (2100 High)

- This summary must include exposure and vulnerability of priority areas (C2-a), relevant shoreline flood risk conditions (C1-b), and clearly identify applicable Strategic Regional Priorities.

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C2-c. Summarize vulnerability

How to approach it:

- Include assets exposed (C1-a), even if they did not undergo a detailed vulnerability assessment.
- Consider summarizing vulnerabilities using general classifications or ratings like a matrix to organize and communicate results clearly.

Vulnerability matrix courtesy of City and County of San Francisco.

		SENSITIVITY				
		Low	Mod/Low	Moderate	Mod/High	High
ADAPTIVE CAPACITY	Low	L	M	H	H	H
	Moderate/Low	L	M/L	M/H	H	H
	Moderate	L	L	M	M	H
	Moderate/High	L	L	L	M/L	M
	High	L	L	L	L	M/L

Photo courtesy California King Tides Project.

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C2-d. Timing and phasing

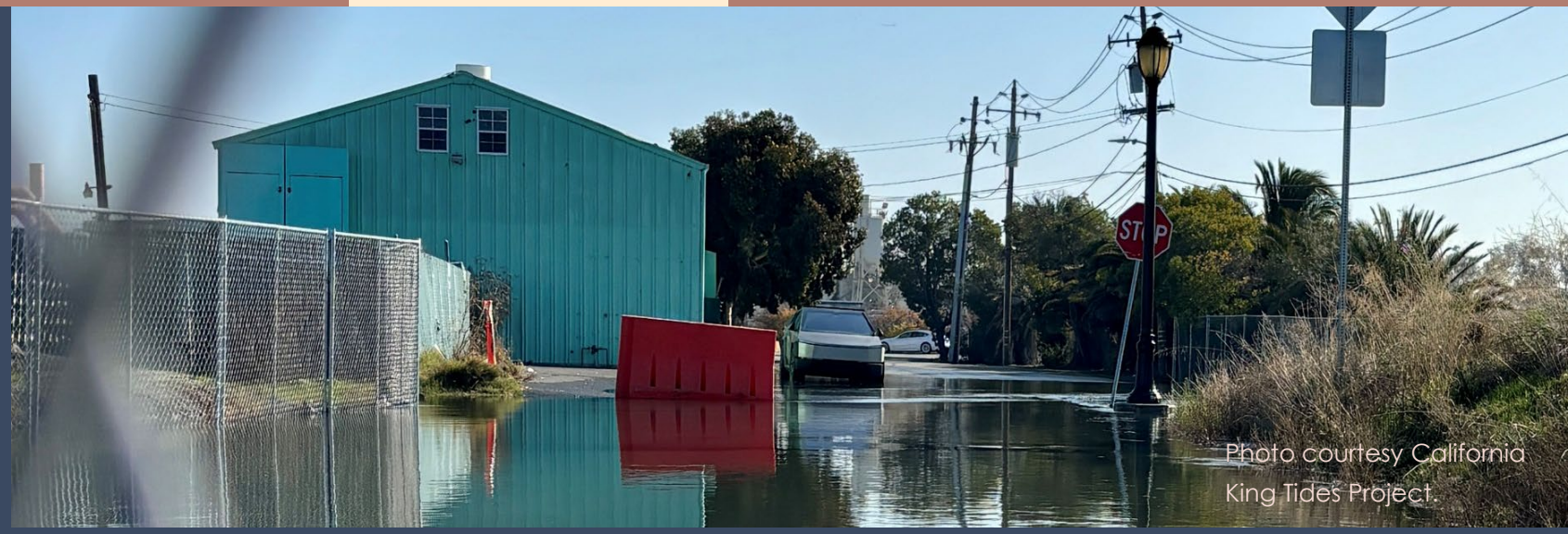

Photo courtesy California King Tides Project.

What to include:

- For each priority area, summarize the anticipated timing of exposure of assets.
  - At a minimum, timing must be based upon the Coastal Flood Hazards and Sea Level Rise Scenarios Standard:
    - 0.8 ft (2050)
    - 3.1 ft (2100 Intermediate)
    - 4.9 ft (2100 Intermediate-High)
    - 6.6 ft (2100 High) sea level
- Based on this timing, identify appropriate triggers or decision points based on local conditions and risks that can help identify when changes in conditions prompt changes in vulnerability.

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Trigger or decision points

- Sea level rise impacts are uncertain and depend on future decisions.
- Triggers or decision points are indicators or moments where a choice must be made.
  - Supports short-term actions while keeping long-term options open.
  - Encourages flexible, phased, and collaborative planning.

See Sections 3.4 and 5.3 of the Adaptation Roadmap to learn more about phasing and sequencing strategies.

Photo courtesy California King Tides Project.

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Photo courtesy California King Tides Project.

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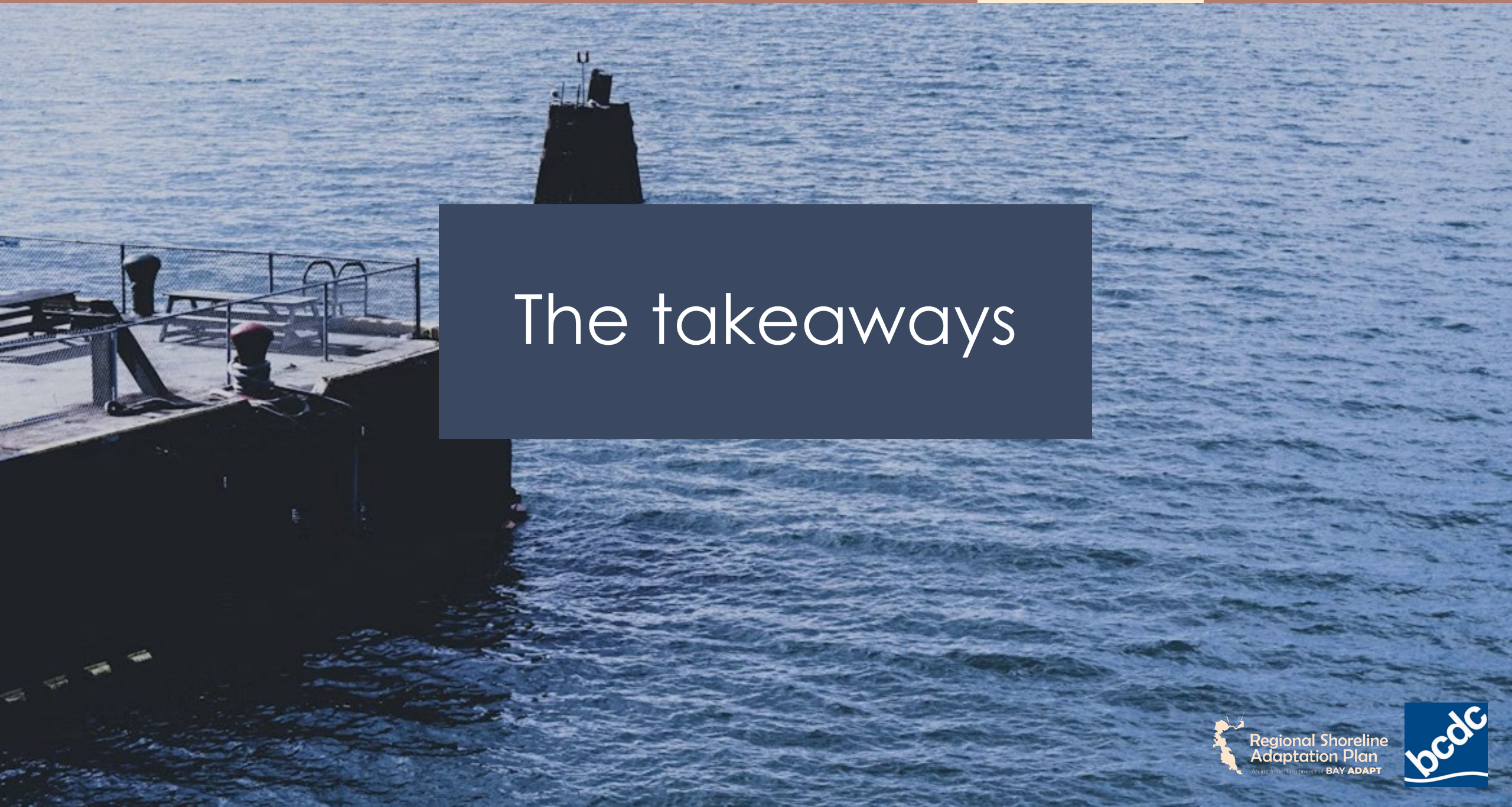
C2-d. Timing and phasing

How to approach it:

- How you define timing and phasing should be based on your local conditions, impacts, and opportunities.
- Consider including a range of timing, acknowledging that timing may change as science evolves.
  - A short-term planning horizon (~0-30 yrs) may be when flooding impacts critical infrastructure
- Consider the lifespans of infrastructure, development or certain land uses.
  - A medium-term planning horizon may be the end of an existing flood levees lifespan.



The takeaways

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The takeaways

1. Understanding exposure and vulnerability is the foundation for effective shoreline adaptation planning.

2. Priority areas help focus detailed assessments where risks and consequences are highest.

3. Tools like the RSAP Atlas can help map, summarize, and communicate your findings.

4. Assessments should be equitable and community-informed.

BCDC's resources

BCDC website

RSAP Atlas

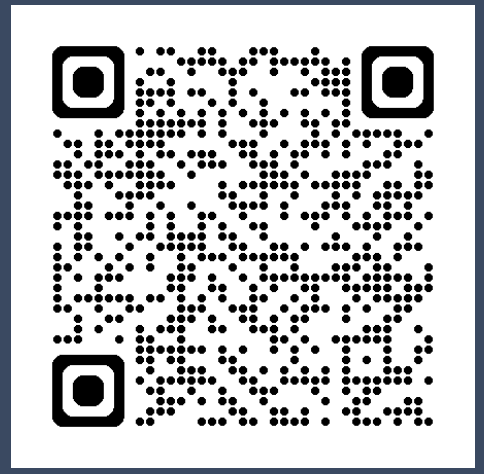
Plan resources

Subregional liaisons

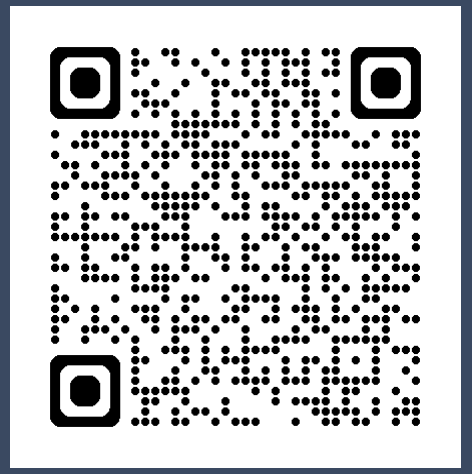
Tracking Plan Progress

Next Steps

Take our survey!



Register for future webinars.



Sign-up for our newsletter.

View a past webinar.

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Thank you! Questions?

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