CHAPTER 4

About this Adaptation Plan

This Adaptation Plan draws on the City of Del Mar's Coastal Hazards, Vulnerability, and Risk Assessment (ESA2016, http://www.delmar.ca.us/DocumentCenter/View/2455) and guidance provided by the STAC. This Adaptation Plan was developed over a series of public STAC meetings in which the STAC and public provided input and feedback.

4.1 Adaptation Plan Overview and Process

The recommended approach for the City of Del Mar planning for sea level rise involves phasing in short and long term adaptation strategies. This phased approach provides a structure for sequencing adaptation measures using expected sea-level rise thresholds, and provides a way to manage uncertainty in timing and extent of sea level rise impact. Thresholds guide in the planning and implementation stages of adaptation strategies. For example, thresholds related to the extent of flooding or frequency of damages might be used to initiate new adaptation options. The process should involve the local community, and reflect the Del Mar community's risk tolerance, local conditions, and adaptation vision.

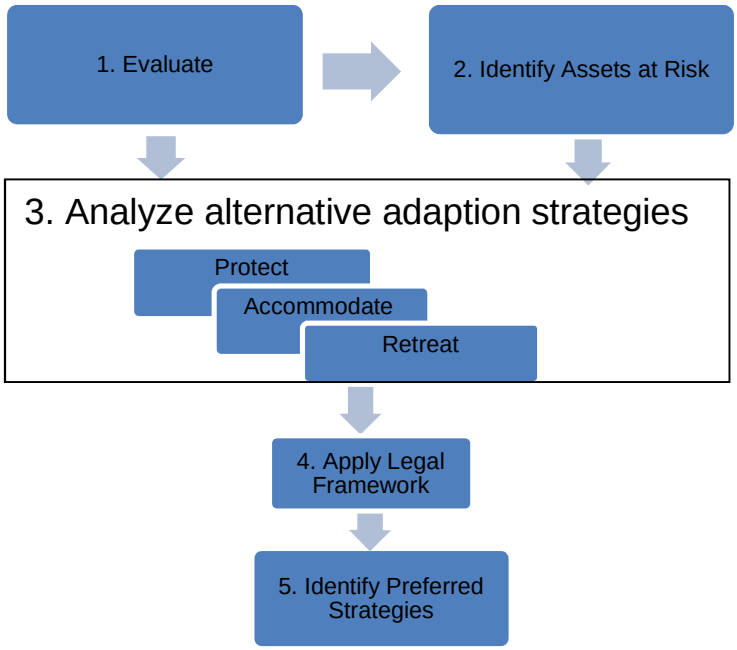
The Adaptation Plan provides a framework for the City to manage risks (Section 4.2), to monitor effects of sea-level rise (Section 4.3), and choose from a toolbox of adaptation options (Section 4.4). The Adaptation Plan provides flexibility for the City to choose from an array of adaptation measures over time as specified thresholds are met. The Adaptation Plan therefore provides potential adaptation options for managing risks, to be incorporated into specific plans of action when needed. The City will choose among adaptation options as the projected effects of sea-level rise are realized. Project-level planning and approvals will be required to further develop and implement the adaptation measures included in the Adaptation Plan (Section 4.5). The Adaptation Plan identifies the lead times for project-level planning of adaptation measures so that the City can begin planning the implementation of adaptation measures in advance of when implementation is needed.

The Adaptation Plan is based on the best science and adaptation practices available today; however, the Adaptation Plan acknowledges that sea-level rise science and practices are evolving and the intent of the Adaptation Plan is that the City will evaluate future decisions and take action based on the best-available science and technology at the time.

The Adaptation Plan includes a range of sea-level rise adaptation measures within the three general categories of adaptation defined as follows by the California Coastal Commission (2016).

After evaluating vulnerability and establishing policies to be used throughout hazardous areas, communities can begin the process of evaluating and choosing adaptation strategies for specific areas. In most cases, especially for LCP land use and implementation plans, multiple adaptation strategies will be needed and every community will need to assess their risks and their potential options. There are a number of options for how to address the risks and impacts associated with sea level rise. Choosing to “do nothing” or following a policy of “non-intervention” will likely lead to unacceptable exposure to hazards and impacts to coastal resources, so the strategies for addressing sea level rise hazards will require proactive planning to ensure protection of coastal resources and development. Figure 4.1 illustrates the process of selecting and implementing proactive adaptation strategies.

Figure 4.1
Process to Evaluate, Select and Plan Adaption Options



Consistent with the California Coastal Commission Sea-Level Rise Policy Guidance and current environmental practice, the Adaptation Plan includes hybrids between these approaches, nature based or green infrastructure solutions, and multi-objective measures that incorporate environmental considerations, rather than focusing on single-purpose solutions to protection such as traditional shoreline armoring.

4.2 Risk Management

The goal of the Adaptation Plan is to manage sea-level rise-related risks by keeping these risks within an acceptable limit. Table 2 summarizes risk for extreme (infrequent) and significant (more frequent) flooding from the Coastal Hazards, Vulnerability, and Risk Assessment (ESA 2016). “Low, moderate, and high” risks are defined for the purposes of the Risk Assessment and Adaptation Plan as follows:

- Low: 0% - 5% chance of occurrence in a given year
- Moderate: 5% - 30% chance
- High: 30% - 100% chance

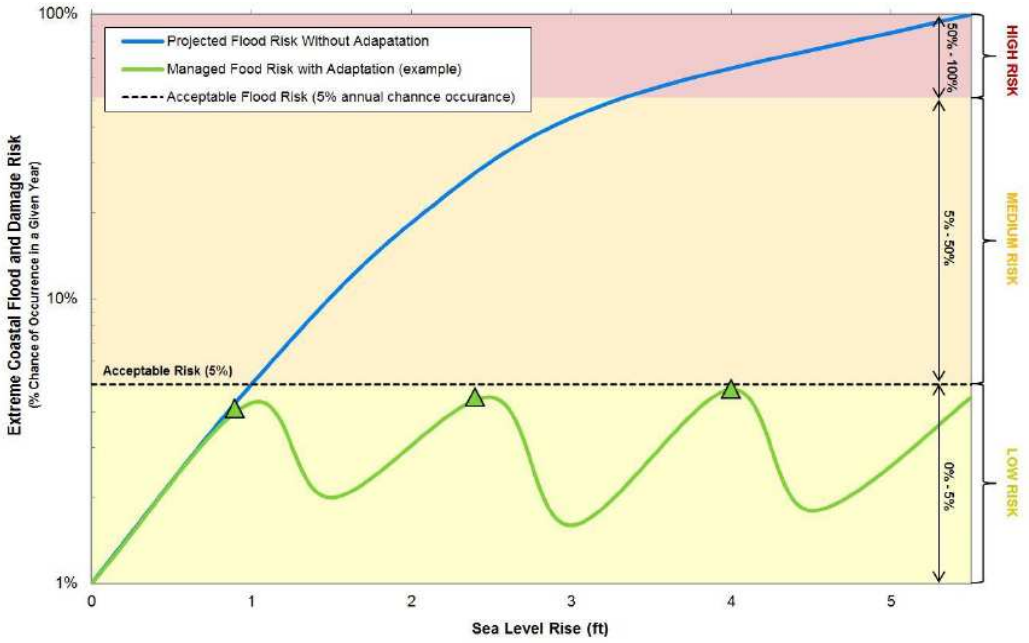
A guiding principle of the Adaptation Plan is to limit the risk of extreme flooding and damage to a low risk level (i.e., less than 5% chance of occurrence in a given year).

TABLE 4.1
Summary of North Beach Asset Vulnerability to Flooding and Damage

Type and degree of flooding and damage		Risk				
		Present (0 ft of sea-level rise)	1 ft of sea-level rise	2 ft of sea-level rise	3.2 ft of sea-level rise	5.5 ft of sea-level rise
Coastal	Significant (e.g., 2016 storms)	Moderate 10%	High 50%	High 100%		
	Extreme (e.g., 1983 storm)	Low 1%	Mod. 5%	Mod. 15%	High 50%	High 100%
River	Significant (e.g., 1980 flood)	Low 4%	Mod. 15%	Mod. 25%	High 50%	High 100%
	Extreme (e.g., FEMA 1% chance flood)	Low 1%	Mod. 5%	Mod. 6%	Mod. 6%	Mod. 20%

Risks to Del Mar's assets increase with sea-level rise. The goal of the Adaptation Plan is to plan a sequence of adaptation measures that can be taken to reduce the risk of extreme flooding, thereby maintaining the risk at a low or acceptable level (Figure 4.2)

Figure 4.2
Concept of Adaptation to Manage Del Mar's Risks with Increasing Sea Level Rise



The Adaptation Plan includes accommodating some increase in flood risks. For significant flooding (i.e., flooding that occurs more frequently than extreme flooding, but is still significant), the current low – moderate risk will increase to moderate – high levels with 1 ft of sea-level rise or more (Table 4.1). Thus, the Adaptation Plan focuses on limiting extreme flood risks to low levels, but an increase in significant flooding is expected with sea-level rise.

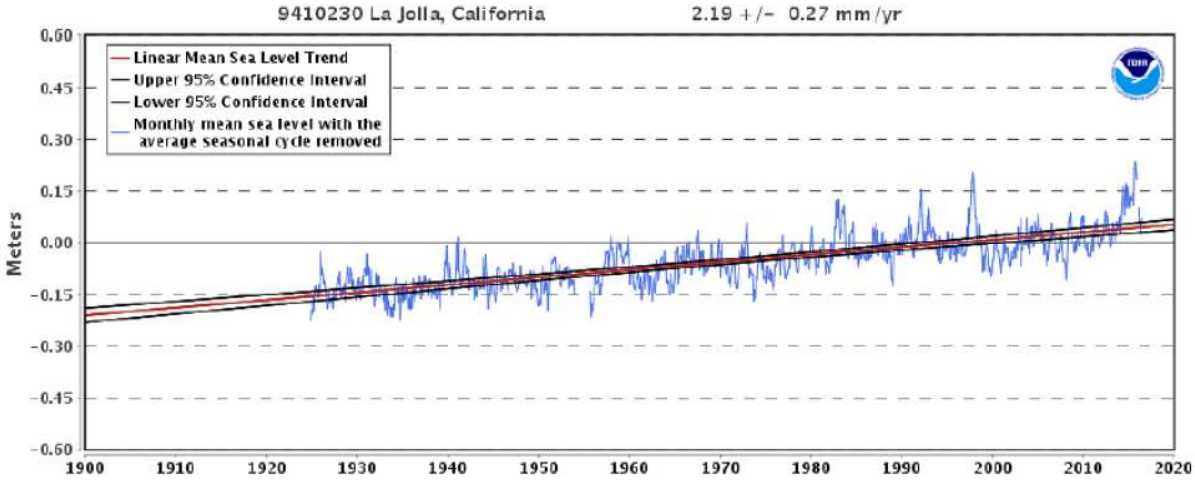
4.3 Monitoring Change

The Adaptation Plan includes measurable thresholds which, if and when they occur, call for the implementation of adaptation measures to limit risks. The Adaptation Plan sets conceptual planning-level adaptation thresholds such that adaptation measures can be implemented to reduce risks before the acceptable target level of risk is exceeded. The City will need to monitor and evaluate the trajectory towards these thresholds to track whether and when these thresholds are met. The Adaptation Plan thresholds and monitoring are summarized below. Section 5 includes additional discussion of thresholds for beach, bluff, river, and wetland adaptation plan components.

- **Amount of sea-level rise** (e.g., 1 ft, 2 ft, and 3 ft of sea-level rise). Certain adaptation measures will be to be taken when sea-level rise has risen by a certain amount. To monitor sea-level rise and progress towards the sea-level rise amount thresholds, the City will follow sea-level rise reports from the State and Scripps Institute of Oceanography (SIO) and sea level rise data from the nearby NOAA tide gage at Scripps Pier at La Jolla Shores, which is updated annually (Figure 4.3). Sea level is inherently variable in response to predictable astronomical tides and less-predictable atmospheric events such as El Nino and individual storms; however, given that extreme flooding occurs infrequently, sea-level rise may be realized before extreme flooding occurs.

Tracking sea-level rise may therefore allow the City to anticipate and act in advance of the projected effects of sea level rise.

Figure 4.3
Sea Level Rise Trend at La Jolla Tide Gage



SOURCE: NOAA

- **Flooding and storm damage frequency.** In addition to the amount of sea-level rise, the frequency or risk of flooding and storm damage is used as a threshold in the Adaptation Plan. To monitor the frequency of flooding and storm damage, the City will track and keep records of coastal and River flooding and storm damage events and information. This could be a collaborative effort between City staff and residents in which reports, pictures, and videos are collected. The date, type, location, and severity of flooding (e.g., depth, duration, wave height), and damages can be collated into a file. The intent will be to track the frequency, extent, and severity of flooding to assess if and how the frequency of flooding is increasing. If significant and/or extreme flood events occur, then storm data (e.g. water levels, wave conditions) can be collected and storm frequencies can be recalculated to quantify the increase in flood risk for comparison against risk-based thresholds.
- **Beach width**. Given that a guiding principle is to maintain a walkable beach, beach width is used as a threshold for considering when beach adaptation measures would be implemented. Specific beach width thresholds are discussed in Chapters 8 and 9 and will be further detailed as part of subsequent analyses including the preparation of a Sediment Management Plan. Southern California Edison and SANDAG currently perform beach profile surveys to monitor beach width. Southern California Edison is required to maintain a minimum beach width of 32.4 ft to 180.0 ft (depending on the location on the beach) through 2025, assuming no adverse impacts from the project are found, as part of the California Coastal Commission Coastal Development Permit for the San Dieguito Lagoon Restoration; however, this requirement and Southern California Edison's beach maintenance program do not account for future sea-level rise. SANDAG measures four profiles in Del Mar. Profiles are surveyed two times per year, from 1999 to present. The City will review the results of Southern California Edison's and

SANDAG's beach surveys and assess the results against beach width thresholds. Supplemental and long term beach monitoring programs, including all of Del Mar's beaches, is recommended for consideration as part of the implementation of the Adaptation Plan.

- **Bluff top offset.** The Adaptation Plan uses the offset or distance between the top of the bluffs and assets such as the LOSSAN railroad track, sewer line, and the edge of bluff top properties as a threshold for bluff adaptation measures. When the bluff top reaches the threshold set based on the distance at which the safety of the asset is at risk, the Adaptation Plan calls for implementation of bluff adaptation measures. The North Coast Transit District and SANDAG currently monitor the condition of the bluff relative to the safety of the railroad track. Dr. Adam Young of the Scripps Institute of Oceanography has also performed research on the erosion of Del Mar's bluff. The City will review and track bluff-top erosion monitoring and results from NCTD, SANDAG, and/or Dr. Young. If and when the railroad is relocated off the bluff, the City will consider supplemental and long term bluff top erosion monitoring programs to track erosion towards the sewer line and property along the bluff against the offset threshold.
- **San Dieguito River channel deposition.** Per the Coastal Hazards, Vulnerability, and Risks Report (ESA 2016), the potential for increased deposition of sand in the San Dieguito River channel with sea-level rise is a significant factor in increasing the City's risk of River flooding. The amount of channel deposition is therefore used as a threshold for River flooding adaptation measures in the Adaptation Plan. Southern California Edison currently surveys channel cross-sections and is required to maintain a certain tidal flow (tidal prism), but is not required to maintain a channel bed elevation for the purposes of reducing flood risk to Del Mar. The City will review and track Southern California Edison's channel surveys and assess if deposition thresholds are reached and will consider supplemental channel monitoring if and when necessary.
- **San Dieguito Lagoon wetland conversion.** The Adaptation Plan uses conversion of San Dieguito Lagoon wetland habitats with sea-level rise (e.g., conversion of vegetated wetland habitat to mudflat and open water habitat) as a threshold for wetland adaptation measures. As part of the San Dieguito Lagoon Restoration, wetland habitat acreages are monitored by UC Santa Barbara on behalf of the California Coastal Commission, and Southern California Edison is required to maintain certain wetland acreages; however, these requirements and maintenance do not account for future sea-level rise. The City will review and track the Restoration habitat monitoring and coordinate with the California Coastal Commission and Southern California Edison on evaluating thresholds and the process for implementing adaptation measures when thresholds are reached. The City will also consider monitoring of wetland areas outside of the Restoration and coordination with the City of San Diego on upstream wetland habitat monitoring and adaptation.

The City will consider preparation of a sea-level rise Adaptation Plan Monitoring and Thresholds Assessment Report on a regular cycle, recommended to be annual. The City will use the report to identify significant changes or progress towards thresholds. The City will evaluate if and when thresholds are reached and identify and plan next steps towards implementing adaptation

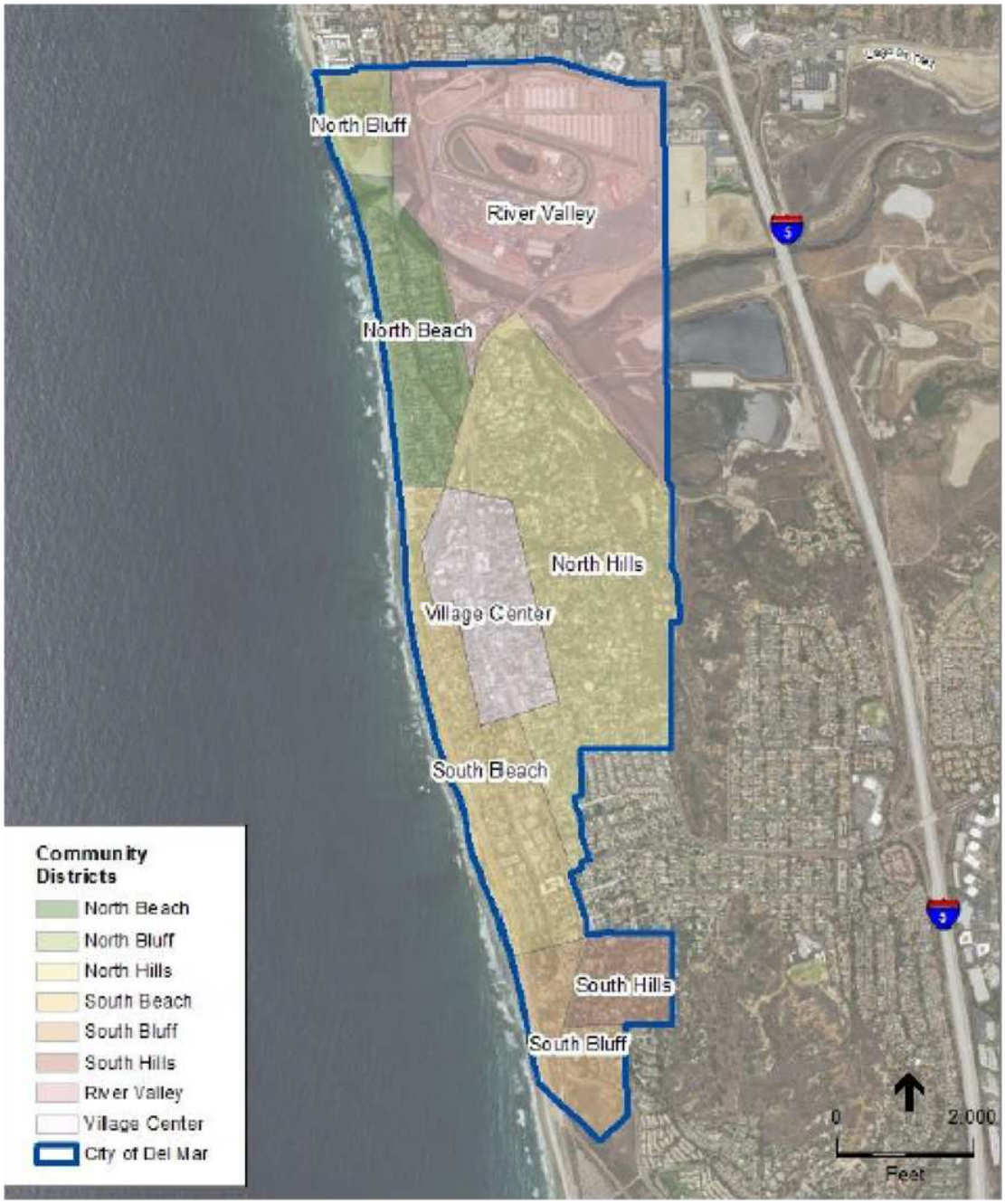
measures. The City may conduct this process in consultation with technical experts and will seek public input and review. The City will also consider participating in regional efforts, if initiated, to monitor and track sea-level rise and related effects.

4.4 Analysis of Adaptation Options

The adaptation plan identifies near-term measures for City assets and addresses specific vulnerabilities and risks for the City District areas illustrated in Figure 4.4. Each chapter presents a range of adaptation options with the benefits, constraints, limitations, and potential impacts for each. A figure for each of the four City areas (beach, bluff, river, and wetlands) illustrates available adaptation measures together with criteria to be monitored to assess rate and amount of change, lead times and anticipated time ranges when each measure would be effective. The plan has the following five parts:

- **Chapter 5 - High Priority Measures for Public Resources**: High priority measures to relocate and flood-proof public safety and public works facilities, and plan for beach sand retention and replenishment.
- **Chapter 6 - San Dieguito Lagoon wetland adaptation**: Relevant to the River Valley and San Dieguito lagoon.
- **Chapter 7 - San Dieguito River flooding adaptation:** Relevant to the River Valley, Del Mar Fairgrounds, and North Beach (north from 15th St to the San Dieguito river mouth).
- **Chapter 8 - Bluff/beach erosion adaptation:** Relevant to the South Bluffs, bluffs along South Beach, and the North Bluffs.
- **Chapter 9 - Beach erosion and flooding adaptation**: Relevant for North Beach (north from 15th street to the San Dieguito river mouth)

Figure 4.4
City Districts in Del Mar



Criteria for considering an adaption measure include degree of loss of beach, bluff, or wetland, frequency of damaging storms, and river channel deposits. As discussed in Section 4.3, “Monitoring Change”, as changes happen and progress, full evaluation of design, environmental impacts, and costs of any given adaptation measure will require additional studies. Adaptation strategies also need to be evaluated for conformance with the relevant City and state policy, plans and guidelines detailed in Chapter 2, which include the following:

- Del Mar Community (General) Plan
- Del Mar Local Coastal Program

- Del Mar Climate Action Plan
- California Coastal Commission Sea Level Rise Policy Guidance
- Safeguarding California Plan

Coastal Development Permit review and approval for adaptation measures will fall within the California Coastal Commission and/or the City's coastal permitting jurisdiction and, depending on the jurisdiction, may be processed through either the City of Del Mar's LCP and/or pursuant to the California Coastal Act. For the four City areas listed above (beach, bluff, river, and wetlands), four tables summarize the likely coastal permitting mechanisms for available adaptation measures. These tables provide information for the development of the LCP Amendment as a next step. Other approvals and permits beyond those listed in Chapters 5 - 9 may also be required and would need to be addressed separately.

4.5 Project-Level Planning and Lead Times

The Adaptation Plan identifies adaptation measures at a conceptual planning-level of detail and discusses potential benefits and effects of adaptation measures. Additional detailed project-level planning and design would be required to implement adaptation measures. For adaptation measures involving construction, the project-level planning and design may include:

- Feasibility study including additional technical analyses, development and assessment of project alternatives and details, conceptual and preliminary engineering design, and cost estimating
- CEQA and possibly NEPA environmental review and regulatory permitting
- Final engineering design.

Lead time is required to perform project-level planning, secure funding, and implement or construct an adaptation measure. The Adaptation Plan approximates lead times to allow for the City to begin advance planning in anticipation of when adaptation measures would be required to be in place to limit risk.

4.6 Re-Evaluation

The Adaptation Plan is intended to establish a process in which new data and information are assessed to inform adaptation decisions and actions. As such, it is anticipated that the Adaptation Plan may be re-evaluated and updated based on new science, technology, and practices. For example, the Adaptation Plan may be re-evaluated and updated every 10 to 15 years or when new major developments in the field of sea-level rise adaptation occur. Later sections of this document discusses the next steps in the Sea-Level Rise Adaptation Plan and LCP Amendment process, which include the development of LCP policies and regulations and additional studies that will provide further detail on adaptation measures and their implementation