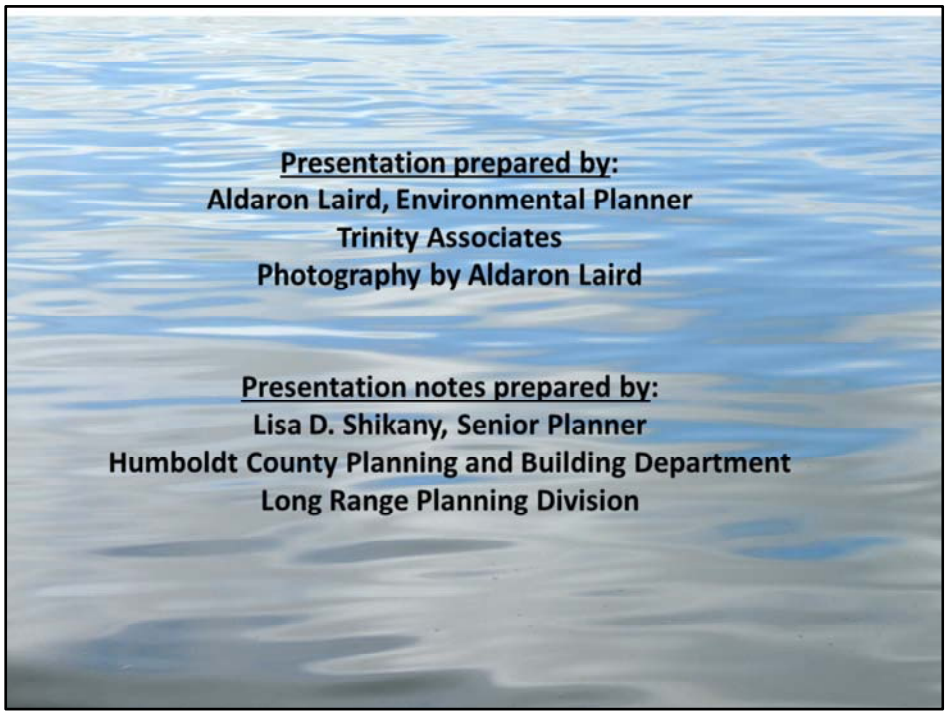
The audience for sea level rise issues includes property owners, residents, business owners, the general public, utility providers, and transportation agencies. Maximizing public participation in the sea level rise adaptation planning process is critical to ultimately adopting a suite of sea level rise policies that will hopefully be successful.

This presentation is available at Humboldt County's Local Coastal Plan Update webpage at the following link: https://humboldtgov.org/1678/Local-Coastal-Plan-Update

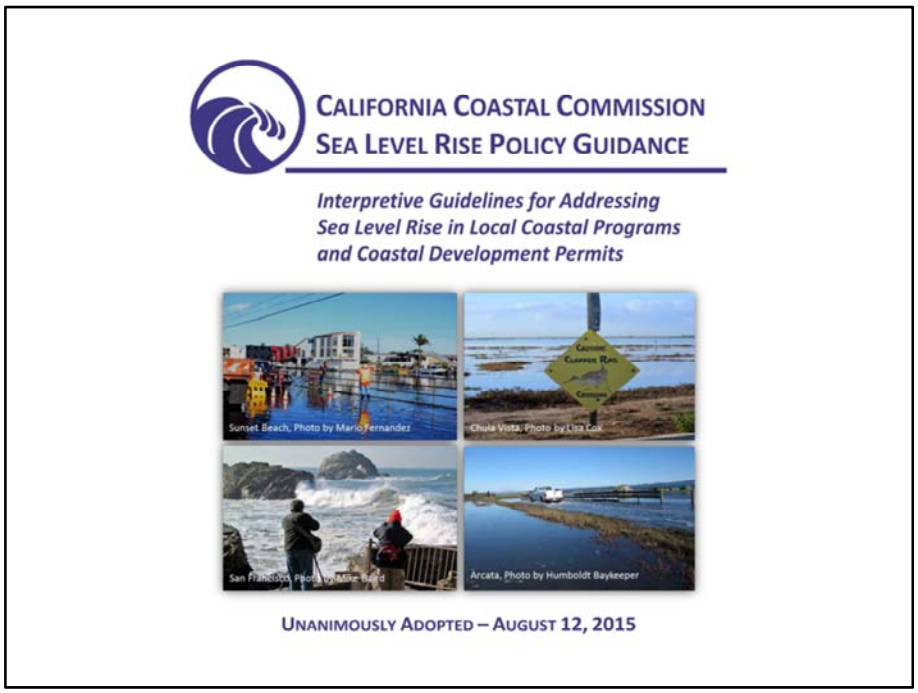


This PowerPoint presentation was prepared by Aldaron Laird, and was presented at the workshop by Mr. Laird, Humboldt County and the California Coastal Commission.

The County, with the assistance of Mr. Laird, prepared the explanatory notes provided in this document for each of the slides.

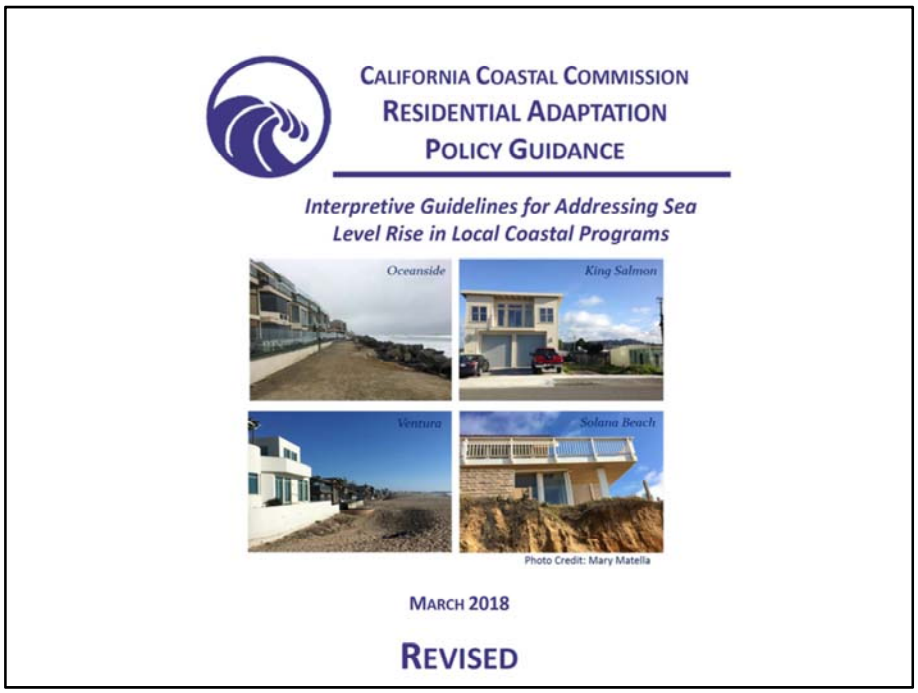
This slide provides the agenda for the workshop.

We will discuss why we should plan for sea level rise, when sea level rise will impact us, how sea level rise will impact us, where sea level rise will impact us, what can be done about these sea level rise impacts, and who will address these sea level rise impacts.



The Coastal Commission adopted a sea level rise policy guidance document in August of 2015. This guidance document is advisory, and is not a regulatory document or legal standard of review for the actions that the Commission or local governments may take under the Coastal Act.

As stated in the Introduction of the document, this Guidance provides a framework for addressing sea level rise in Local Coastal Programs (LCPs) and for coastal development permits (CDPs). The intended audience for this guidance document includes the Coastal Commission and Commission staff, local governments, other public agencies, permit applicants, members of the public, and others who are interested in how to implement and comply with the California Coastal Act while taking steps to address sea level rise. The California Coastal Commission Sea Level Rise Policy Guidance can be found at the following link: https://www.coastal.ca.gov/climate/slrguidance.html



The California Coastal Commission Residential Adaptation Policy Guidance is a next step following the Commission's 2015 Sea Level Rise Policy Guidance, which sets forth broad principles related to planning for sea level rise. This Residential Adaptation Policy Guidance provides a more in-depth discussion of sea level rise adaptation policies specifically related to residential development, and provides sample policies that cities and counties could modify for use in different community and geologic contexts.

Like the 2015 policy guidance document, this Residential Adaptation Policy Guidance is advisory and not a regulatory document or legal standard of review for the actions that the Commission or local governments may take under the Coastal Act. This document has not yet been adopted by the Coastal Commission. The latest drafts as well as previous drafts are available at the following link: https://www.coastal.ca.gov/climate/slr/vulnerability-adaptation/residential/

The County's Local Coastal Program (LCP) provides the planning mechanism for implementing sea level rise adaptation strategies. The Humboldt Bay Area Plan (HBAP) is one of six coastal plans that comprise the County's LCP. The County is in the process of updating the HBAP, including adding policies to address sea level rise.

As part of the initial sea level rise planning effort, the County contracted with Aldaron Laird, Trinity Associates, to prepare the Humboldt Bay Area Plan Sea Level Rise Vulnerability Assessment, which identifies what assets in the Humboldt Bay area are vulnerable to, or at risk from, sea level rise. The broad asset categories examined include the existing shoreline, land uses, transportation, utilities, and coastal resources. The report describes the location and characteristics of these assets, the extent and timeframe of exposure of these assets to various sea level rise elevations, and the susceptibility of these assets to tidal inundation (salt water intrusion and flooding). This document can be found at the following link on the County's Local Coastal Plan Update website:
https://humboldtgov.org/DocumentCenter/View/62872/Humboldt-Bay-Area-Plan-Sea-Level-Rise-Vulnerability-Assessment-Report-PDF?bidId=

Information we obtain from this workshop, a previous workshop to address sea level rise in King Salmon and Fields Landing, and any other public input we receive will contribute to a final sea level rise policy draft. The final draft will be completed and ready for Planning Commission hearings by the end of this year, a requirement of the Coastal Commission grant funding we received for this work.

The Planning Commission will hold a series of public hearings anticipated to occur over several months, presenting a great opportunity for public participation. The Planning Commission will make policy recommendations to the Board of Supervisors, who will hold another series of public hearings, providing another opportunity for public involvement. After approval by the Board, the Coastal Commission will hold one or more public hearings, an opportunity once again for public involvement.

Once the policies receive final approval from the Coastal Commission, we will see how they work. Addressing sea level rise will be an iterative approach, where we learn what works, what doesn't, and make adjustments and improvements as needed.

Fairhaven Bay Shoreline

There is no waterfront development in Fairhaven, and there are no shoreline structures. The shoreline is approximately 9 to 10 feet in elevation and composed of erodible sand formations.

Fairhaven Undeveloped Waterfront

This is the Fairhaven Fire Station, located approximately 500 feet from the bay on the corner of Gass and Bendixen Streets in Fairhaven. The shoreline is approximately 9 to 10 feet in elevation in this location. The developed residential/commercial areas of Fairhaven range in elevation from 9 to 12 feet, and there are some inland low-lying areas that range in elevation from 6 to 9 feet. The navigation channel that provides access to the various docks on the Samoa Peninsula fronts Fairhaven as well as Finn Town.

Finn Town, where this maritime use is located, has a developed waterfront and a shoreline elevation of approximately 9 to 10 feet. It would be very difficult to construct a shoreline barrier in this location to prevent tidal inundation of the boat yard and inland areas, while still maintaining access to the bay for the boat yard. The boat yard may have to be isolated from the rest of the waterfront if a tidal barrier is considered.

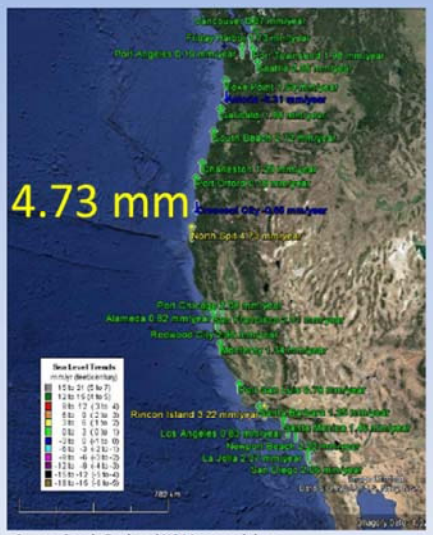
Finn Town Residential Waterfront

Finn Town's developed waterfront also includes residential development where the shoreline elevation is approximately 9 to 10 feet. The more inland developed residential/commercial areas range in elevation from 9 to 12 feet.

Governor Brown's Executive Order B-30-15 establishes a California greenhouse gas reduction target of 40 percent below 1990 levels by 2030. The Executive Order requires state agencies to take climate change into account in their planning decisions.

It is important to plan for sea level rise now and into the future, particularly since Humboldt Bay has the highest relative rate of sea level rise on the west coast due to rising ocean levels in combination with ground subsidence caused by tectonic activity. The current sea level rise planning process will help to identify assets that are vulnerable to sea level rise, with the goal of protecting critical assets to the extent feasible, and ensuring adequate time for the community to otherwise adapt to rising seas. A robust planning process, beginning with updating the County's local coastal program, which functions as the planning framework for development within the coastal zone, will provide a venue for educating local agencies and the community.

Relative Sea-Level Rise



Source: Google Earth and NOAA coops-slt.kmz

Relative or Local Mean Sea-Level Rise (RSLR):

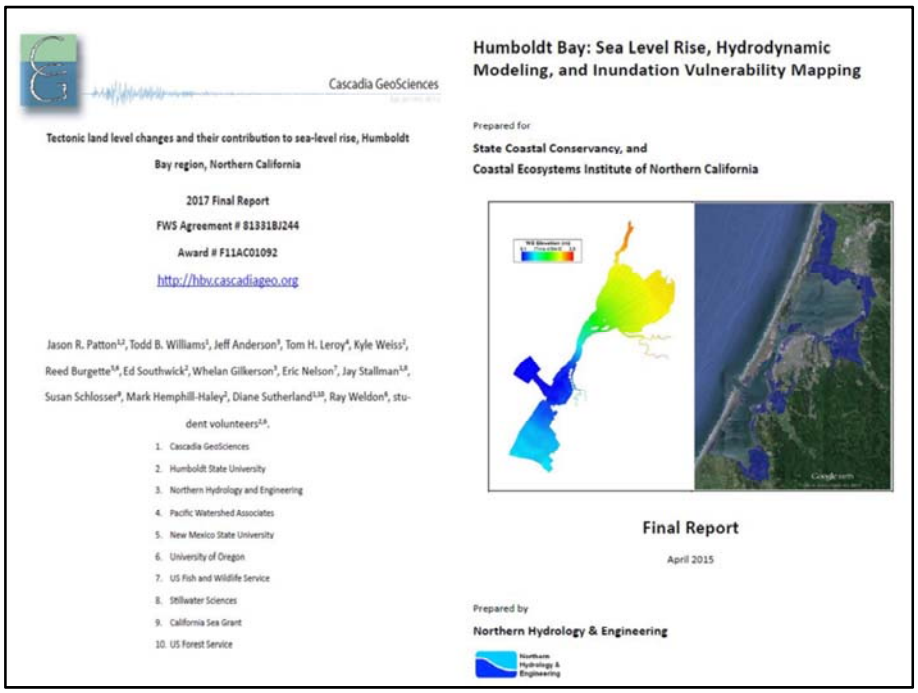
- Average sea-level rise measured at a tide gauge relative to a specific point on land (e.g. North Spit Tide Gauge)
- RSLR can be different than GSLR or ReSLR due to local factors such as
  - Local climate and ocean patterns (e.g. ENSO and PDO)
  - Vertical land motion
  - Tide gauge record length

RSLR rates:

- RSLR has been increasing over most of US West Coast consistent with GSLR and ReSLR trends, but at different rates
- Green values range from 0 to 3 mm/yr (all show increasing rates of SLR, constent with ReSLR)
- Yellow values range from 3 to 6 mm/yr (higher than ReSLR)
- Blue values indicate negative RSLR (lower than ReSLR)
- North Spit and Crescent City RSLR appear to be the two extremes

NHE 2013

The north spit tide gage shows the highest rate of relative sea level rise on the West Coast, 18.6 inches per century or 0.186 inches (4.73 millimeters) per year.



Cascadia GeoSciences

Tectonic land level changes and their contribution to sea-level rise, Humboldt Bay region, Northern California

2017 Final Report

FWS Agreement # 81331BJ244

Award # F11AC01092

http://hbv.cascadiageo.org

Jason R. Patton[1,2], Todd B. Williams[1], Jeff Anderson[3], Tom H. Leroy[4], Kyle Weiss[2], Reed Burgette[5,6], Ed Southwick[2], Whelan Gilkerson[3], Eric Nelson[7], Jay Stallman[1,8], Susan Schlosser[9], Mark Hemphill-Haley[2], Diane Sutherland[1,10], Ray Weldon[6], student volunteers[1,6].

1. Cascadia GeoSciences
2. Humboldt State University
3. Northern Hydrology and Engineering
4. Pacific Watershed Associates
5. New Mexico State University
6. University of Oregon
7. US Fish and Wildlife Service
8. Stillwater Sciences
9. California Sea Grant
10. US Forest Service

Humboldt Bay: Sea Level Rise, Hydrodynamic Modeling, and Inundation Vulnerability Mapping

Prepared for

State Coastal Conservancy, and

Coastal Ecosystems Institute of Northern California

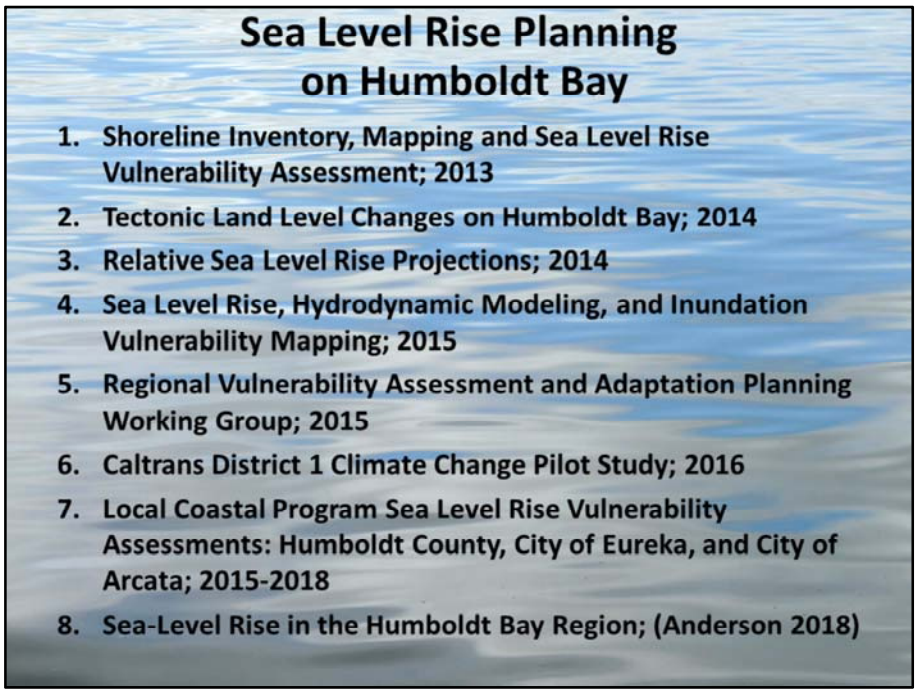
Final Report

April 2015

Prepared by

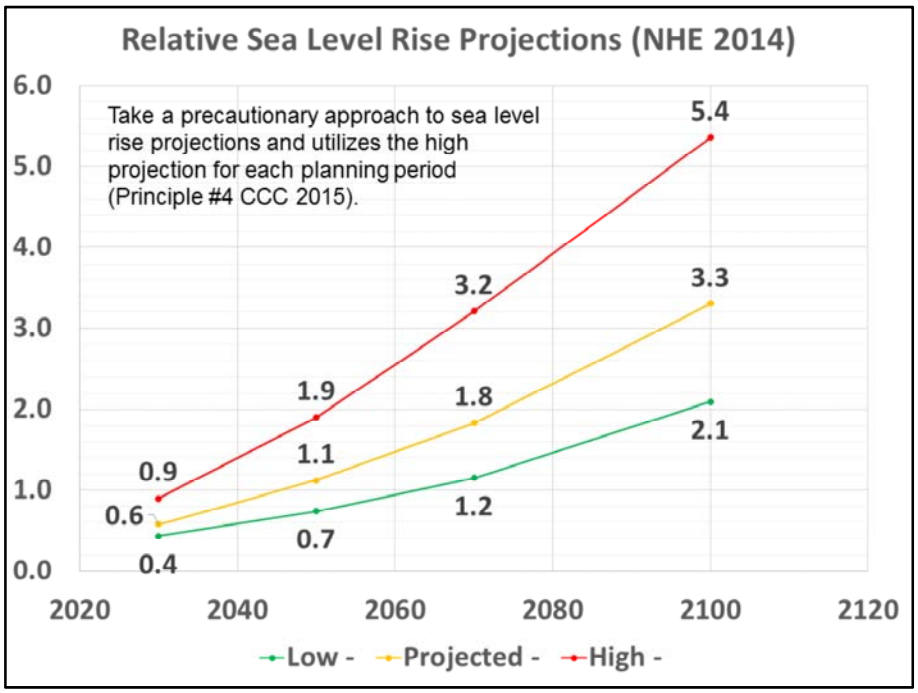
Northern Hydrology & Engineering

Cascadia Geosciences' tectonic trends research and the Northern Hydrology & Engineering Relative Sea Level Rise Modeling and Mapping work on Humboldt Bay form the basis or foundation for focused sea level rise vulnerability assessments and adaptation planning.



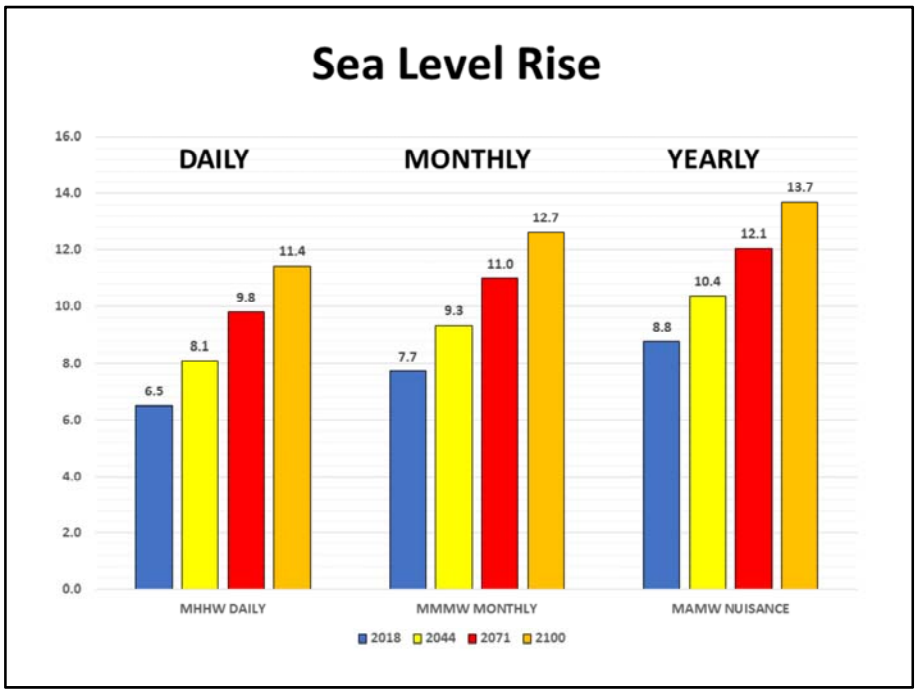
This is a list of some of the documents that have been prepared to address sea level rise on Humboldt Bay. These documents are available through the County's local coastal program update webpage at: https://humboldtgov.org/1678/Local-Coastal-Plan-Update or through the Humboldt Bay Harbor, Recreation and Conservation District's webpage: http://humboldtbay.org/humboldt-bay-sea-level-rise-adaptation-planning-project.

When will sea level rise impact us?



This slide shows the low, projected, and high sea level rise projections around Humboldt Bay: High for 2030 = 0.9 feet, 2050 = 1.9 feet, 2070 = 3.2 feet, and for 2100 = 5.4 feet. The high range is precautionary (would provide greater notice of pending hazard) while low range is conservative (would encumber less area in a hazard zone).

High projections beyond 2050 are constantly being revised upwards, and are now projected to be approximately 6.6 feet or more by 2100 (Griggs 2017). But on Humboldt Bay, the greatest impact in terms of area impacted will occur with the first 3 feet of sea level rise, after which inundation and floodwaters will generally deepen without a substantial increase in the area they cover.



This graph illustrates the impact of sea level rise on three different tidal frequencies during the next 80 years:

- Daily high tide (Mean Higher High Water, MHHW) – occurs 182+ times per year, considered perennial flooding
- Monthly high tide (Mean Monthly Maximum Water, MMMW) – occurs 8+ times per year, considered chronic flooding
- Yearly high tide or king tide (Mean Annual Maximum Water, MAMW) – occurs 4+ times per year, considered nuisance flooding

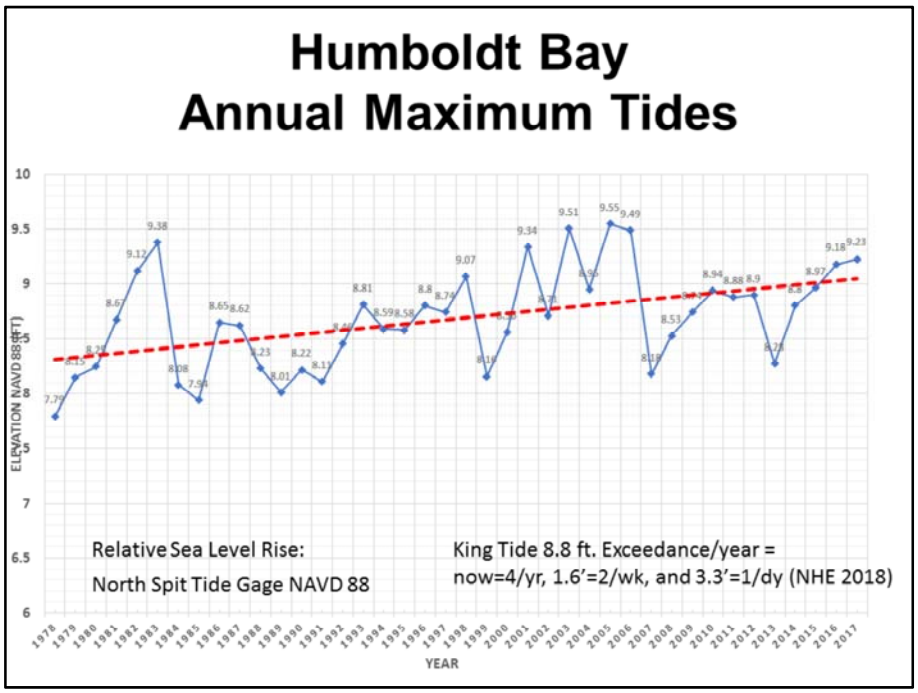
To put the impacts of these tides into perspective, the surface elevation of the waterfront in Fairhaven and Finn Town is approximately 9 to 10 feet. More inland residential and commercial areas are approximately 9 to 12 feet in elevation, and some low-lying areas have an elevation of 6 to 9 feet. With 1.6 feet of sea level rise (0.5 meters) that could occur in approximately 2040, the current MAMW elevation of 8.8 feet would be reached 125 times per year, and would be exceeded 355 times per year with 3.3 feet (1 meter) of sea level rise expected by approximately 2070. (NHE 2018)

When will sea level rise start to affect critical assets in the Humboldt Bay area, and when will the inundation from sea level rise become more than nuisance flooding? This slide shows what future high water elevations could be if we do nothing to protect our communities from sea level rise. For example, the shoreline/waterfront in Fairhaven and Finn Town will be impacted by king tides (10.4 feet, which occur 4 times per year) by approximately 2044, and will also experience tidal inundation greater in elevation than today's king tides on a monthly basis (Mean Monthly Maximum Water or MMMW elevation of 9.3 feet with 1.6 feet of sea level rise) by approximately 2044, which would be considered chronic flooding. By approximately 2070, the Fairhaven and Finn Town shoreline/waterfront will experience tidal inundation greater in elevation than today's king tides on a daily basis (Mean Higher High Water or MHHW elevation of 9.8 with 3.3 feet of sea level rise), a frequency considered to be perennial flooding.

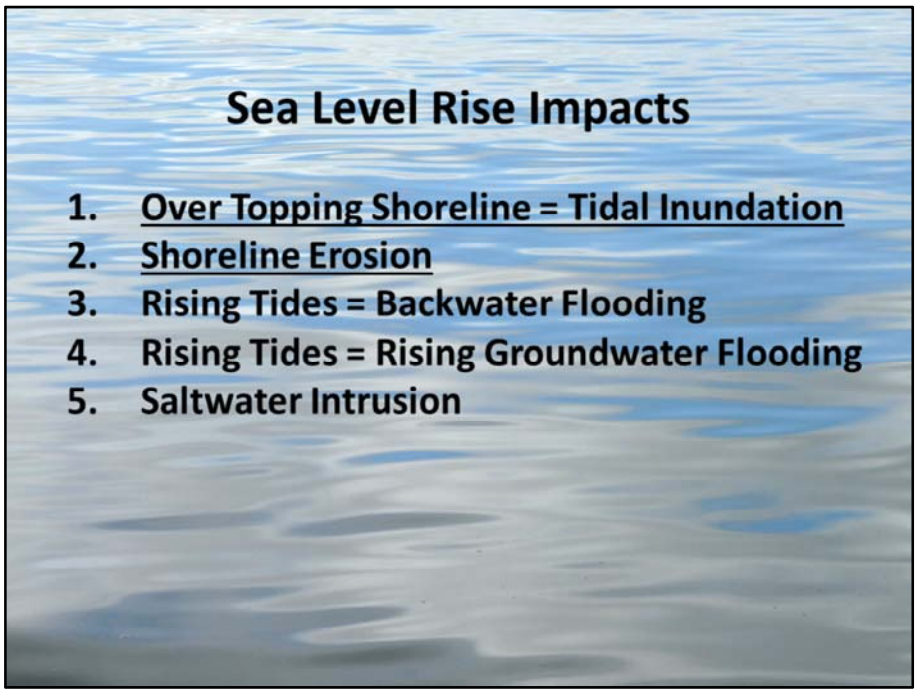
How will sea level rise impact us?

Assets in Fairhaven that could be impacted by sea level rise include residential development, and coastal resources such as beach and wetland.

Finn Town assets that could be impacted include commercial and residential development, and coastal-dependent uses such as the Zerlang & Zerlang Marine Services boat yard, and aquaculture facilities.



There is a clear sea level rise trend on Humboldt Bay; sea levels have increased 0.8 feet in the past 40 years, which equates to 2.0 feet in 100 years. Mean annual maximum tides (MAMW or king tides) have varied over the past 40 years by 1.8 feet, from 7.75 feet to 9.55 feet. The annual range of water elevation from mean high water (MHW, represented by the wetted shoreline) to MAMW is 3.0 feet. MAMW of 8.8 feet occurs approximately 4 times a year; with 1.6 feet (0.5 meters) of SLR, that elevation would be reached 125 times per year, and with 3.3 feet (1.0 meter) of SLR it would be exceeded 355 times per year. (NHE 2018)



Fairhaven was built on former coastal dunes, and is located between the base of a tall dune terrace and the bay shoreline. A gradient from 9 to 12+ feet and the low-lying wetlands (6 to 9 feet in elevation) east of Lindstrom Street and to the south provide a pathway for inundation.

Fairhaven has approximately 0.8 feet of shoreline, and Finn Town approximately 0.3 feet of shoreline, rated highly vulnerable (shown in red). The shoreline shown in yellow is rated moderate, and could be overtopped with 3 feet of sea level rise. The shoreline shown in green has a low vulnerability rating.

Where will sea level rise impact us?

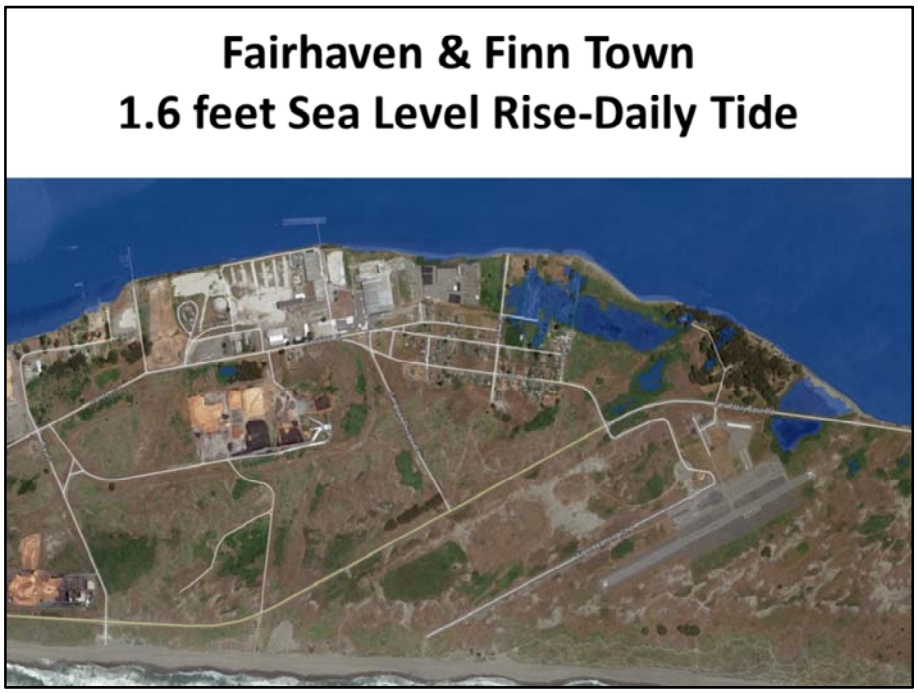
These next few slides will illustrate the potential footprint of various sea level rise elevations in Fairhaven and Finn Town if nothing is done to alter current shoreline conditions.

The daily high tide (Mean Higher High Water, MHHW) is 6.5 feet (NAVD 88). This slide shows inundation under today's MHHW, which occurs approximately 182+ times per year. The areas shown as inundated are low-lying areas behind the shoreline.

The shoreline in Fairhaven and Finn Town is 9 to 10 feet in elevation, the developed residential/commercial areas range in elevation from 9 to 12 feet, and there are low-lying areas with an elevation of 6 to 9 feet.

The king tide (Mean Annual Maximum Water, MAMW) is 8.8 feet (NAVD 88). This slide shows inundation under today's MAMW which could occur 4 times per year, and assuming nothing is done to change the current shoreline conditions.

The shoreline in Fairhaven and Finn Town is 9 to 10 feet in elevation, the developed residential/commercial areas range in elevation from 9 to 12 feet, and there are low-lying areas with an elevation of 6 to 9 feet.



The daily high tide (Mean High Higher Water, MHHW) elevation with 1.6 feet (0.5 meters) of sea level rise would be 8.1 feet in approximately 25 years based on high projections, and could occur 182+ times per year. This slide shows what this inundation footprint would be, assuming nothing is done to change the shoreline conditions.

The shoreline in Fairhaven and Finn Town is 9 to 10 feet in elevation, the developed residential/commercial areas range in elevation from 9 to 12 feet, and there are low-lying areas with an elevation of 6 to 9 feet.

The monthly high tide (Mean Monthly Maximum Water, MMMW) elevation with 1.6 feet (0.5) meters of sea level rise would be 9.3 feet in approximately 25 years based on high projections, and could occur 8 times per year or combined with king tides, would be reached or exceeded 12 times a year. This slide shows what this inundation footprint would be, assuming nothing is done to change the shoreline conditions.

The shoreline in Fairhaven and Finn Town is 9 to 10 feet in elevation, the developed residential/commercial areas range in elevation from 9 to 12 feet, and there are low-lying areas with an elevation of 6 to 9 feet.

The king tide (Mean Annual Maximum Water, MMMW) elevation with 1.6 feet (0.5 meters) of sea level rise would be 10.4 feet in approximately 25 years based on high projections, and could occur 4 times per year. This slide shows what this inundation footprint would be, assuming nothing is done to change the shoreline conditions.

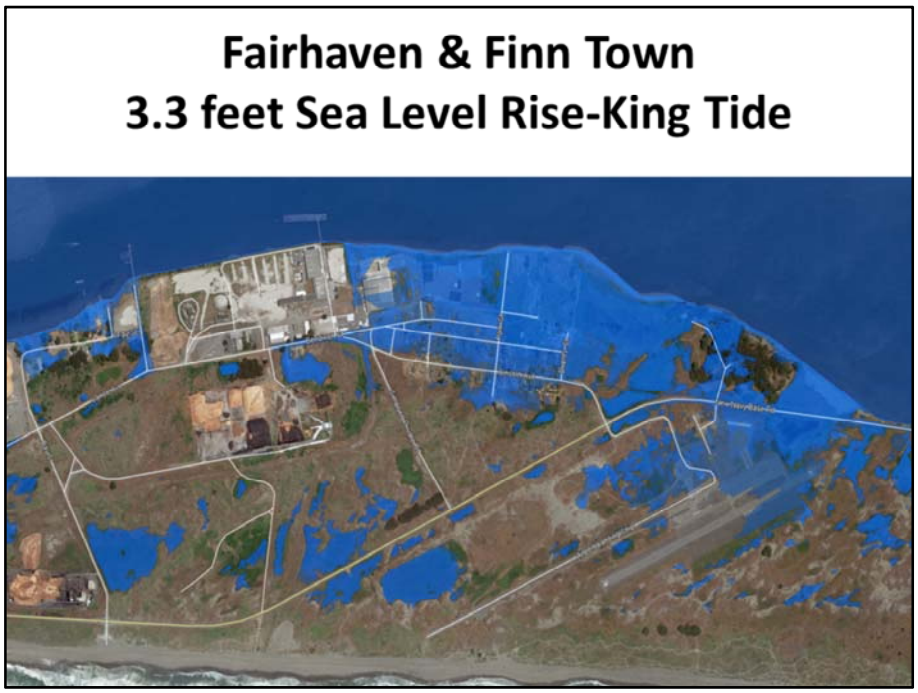
The shoreline in Fairhaven and Finn Town is 9 to 10 feet in elevation, the developed residential/commercial areas range in elevation from 9 to 12 feet, and there are low-lying areas with an elevation of 6 to 9 feet.

The daily high tide (Mean High Higher Water, MHHW) elevation with 3.3 feet (1 meter) of sea level rise would be 9.8 feet in approximately 50 years based on high projections, and could occur 182+ times per year. This slide shows what this inundation footprint would be, assuming nothing is done to change the shoreline conditions.

The shoreline in Fairhaven and Finn Town is 9 to 10 feet in elevation, the developed residential/commercial areas range in elevation from 9 to 12 feet, and there are low-lying areas with an elevation of 6 to 9 feet.

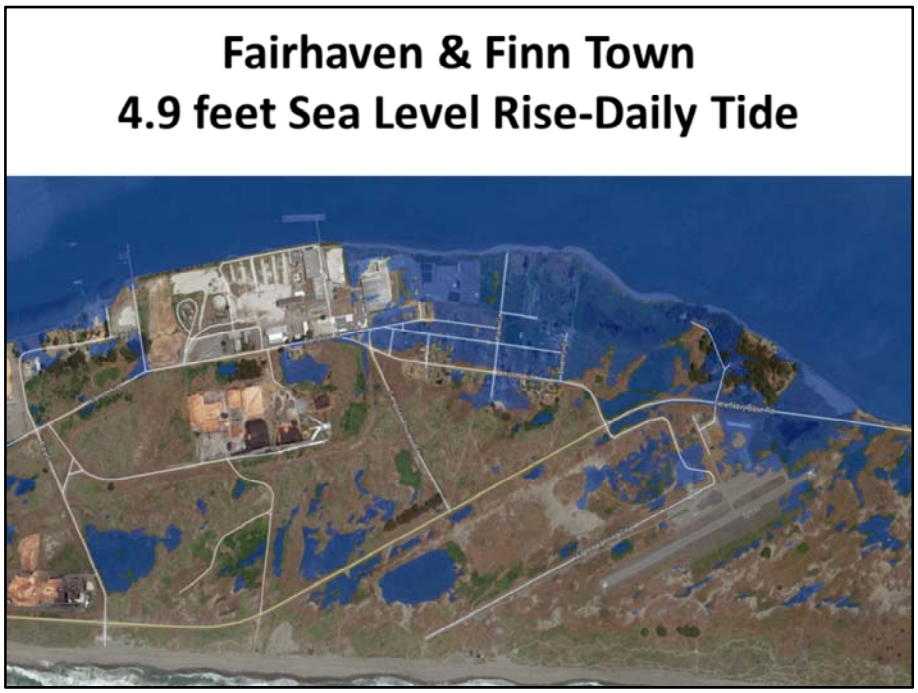
The monthly high tide (Mean Monthly Maximum Water, MMMW) elevation with 3.3 feet (1 meter) of sea level rise would be 11.0 feet in approximately 50 years based on high projections, and could occur approximately 8 times per year or combined with king tides, would be reached or exceeded 12 times a year. This slide shows what this inundation footprint would be, assuming nothing is done to change the shoreline conditions.

The shoreline in Fairhaven and Finn Town is 9 to 10 feet in elevation, the developed residential/commercial areas range in elevation from 9 to 12 feet, and there are low-lying areas with an elevation of 6 to 9 feet.



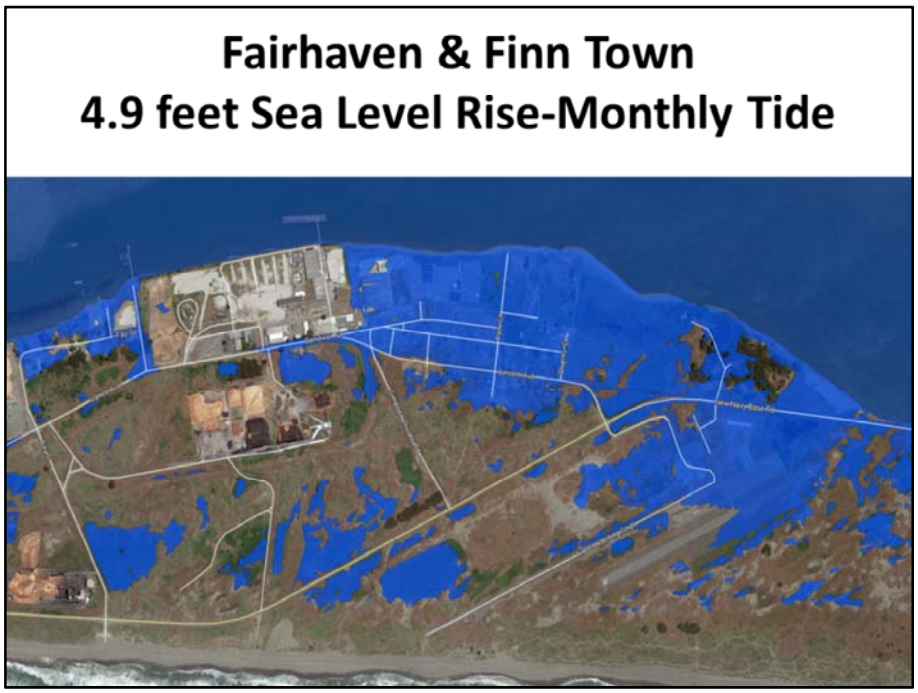
The king tide (Mean Annual Maximum Water, MAMW) elevation with 3.3 feet (1 meter) of sea level rise would be 12.1 feet in approximately 50 years based on high projections, and could occur approximately 4 times per year. This slide shows what this inundation footprint would be, assuming nothing is done to change the shoreline conditions.

The shoreline in Fairhaven and Finn Town is 9 to 10 feet in elevation, the developed residential/commercial areas range in elevation from 9 to 12 feet, and there are low-lying areas with an elevation of 6 to 9 feet.



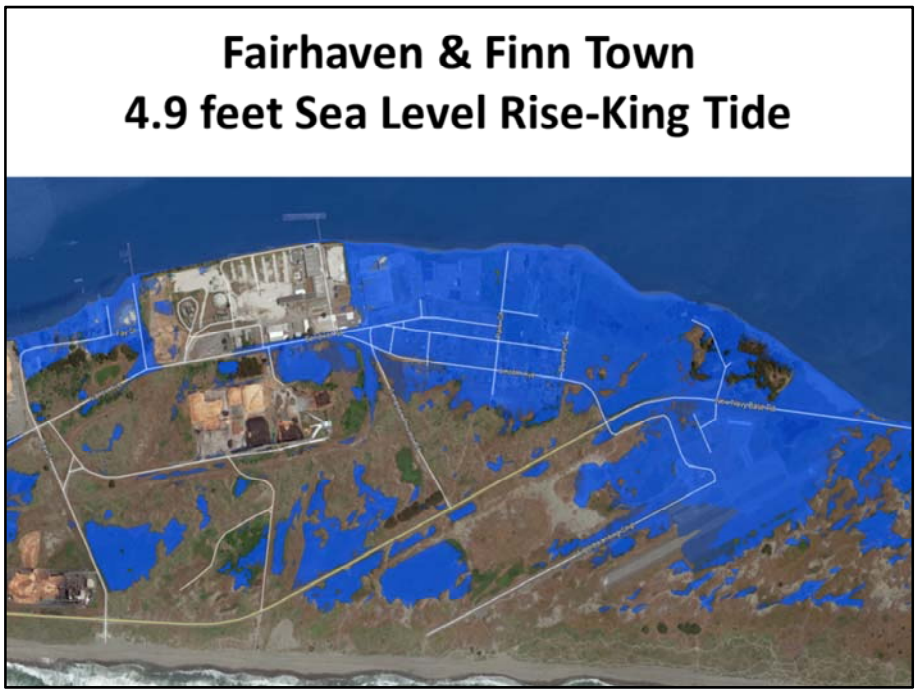
The daily high tide (Mean High Higher Water, MHHW) elevation with 4.9 feet (1.5 meters) of sea level rise would be 11.4 feet in approximately 80 years based on high projections, and could occur 182+ times per year. This slide shows what this inundation footprint would be, assuming nothing is done to change the shoreline conditions.

The shoreline in Fairhaven and Finn Town is 9 to 10 feet in elevation, the developed residential/commercial areas range in elevation from 9 to 12 feet, and there are low-lying areas with an elevation of 6 to 9 feet.



The monthly high tide (Mean Monthly Maximum Water, MMMW) elevation with 4.9 feet (1.5 meters) of sea level rise would be 12.7 feet in approximately 80 years based on high projections, and could occur approximately 8 times per year or combined with king tides, would be reached or exceeded 12 times a year. This slide shows what this inundation footprint would be, assuming nothing is done to change the shoreline conditions.

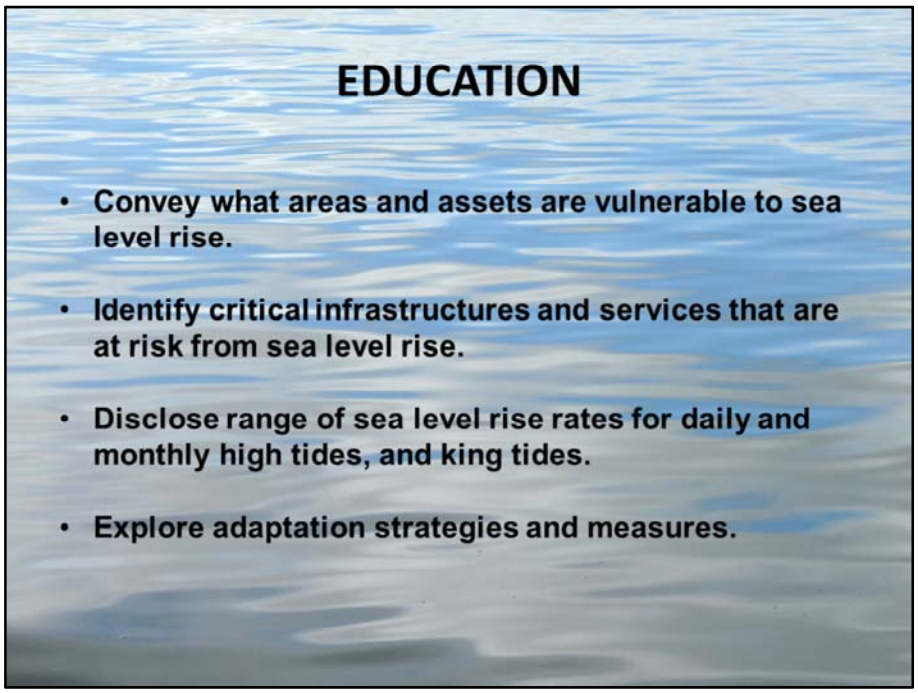
The shoreline in Fairhaven and Finn Town is 9 to 10 feet in elevation, the developed residential/commercial areas range in elevation from 9 to 12 feet, and there are low-lying areas with an elevation of 6 to 9 feet.



The king tide (Mean Annual Maximum Water, MAMW) elevation with 4.9 feet (1.5 meters) of sea level rise would be 13.7 feet in approximately 80 years based on high projections, and could occur approximately 4 times per year. This slide shows what this inundation footprint would be, assuming nothing is done to change the shoreline conditions.

The shoreline in Fairhaven and Finn Town is 9-10 feet in elevation, and there are low-lying areas with an elevation of 6-9 feet.

What can be done about these sea level rise impacts?

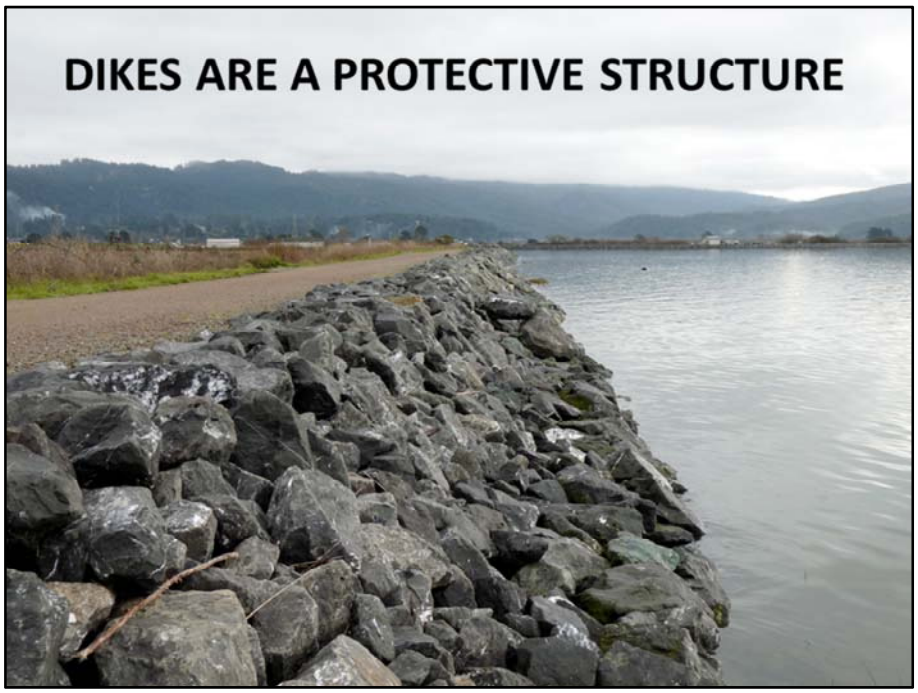


The County is working to educate the community regarding sea level rise and these listed areas of concern. This workshop is one component of community outreach and education. The County's webpage on sea level rise has numerous documents that provide important information on sea level rise: https://humboldtgov.org/1678/Local-Coastal-Plan-Update. Future Planning Commission, Board of Supervisors, and Coastal Commission public hearings to consider adoption of sea level rise policies for the Humboldt Bay Area Plan will also provide opportunities to obtain information and provide public input.

This slide provides a list of some of the potential goals for addressing sea level rise impacts to the various types of assets at risk.

Existing and future development each require different sea level rise adaptation strategies. Existing development can be defended or protected through "hard" shoreline protection, such as dikes, sheet piling, sea walls, and other types of bulwarks. It can also be protected by moving the sea level rise hazard further away from existing development through the use of "soft" shoreline protection such as beach nourishment and living shorelines, to buffer wave action. Sea level rise impacts to existing development can also be addressed by managed retreat, including the removal and possibly relocation of existing development.

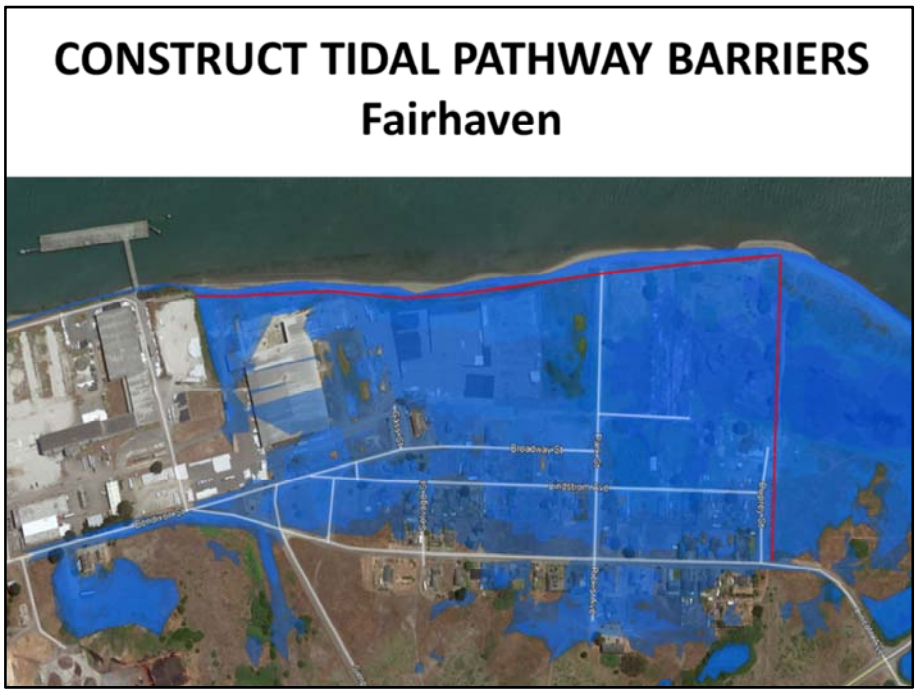
The Coastal Commission preferred adaptation strategy for future development is to avoid siting development in an area that could be impacted by sea level rise. If this is not possible, development can be designed is such a way as to accommodate sea level rise, such as constructing a residence with the habitable portion on the second floor, with the bottom floor designed to withstand flooding.



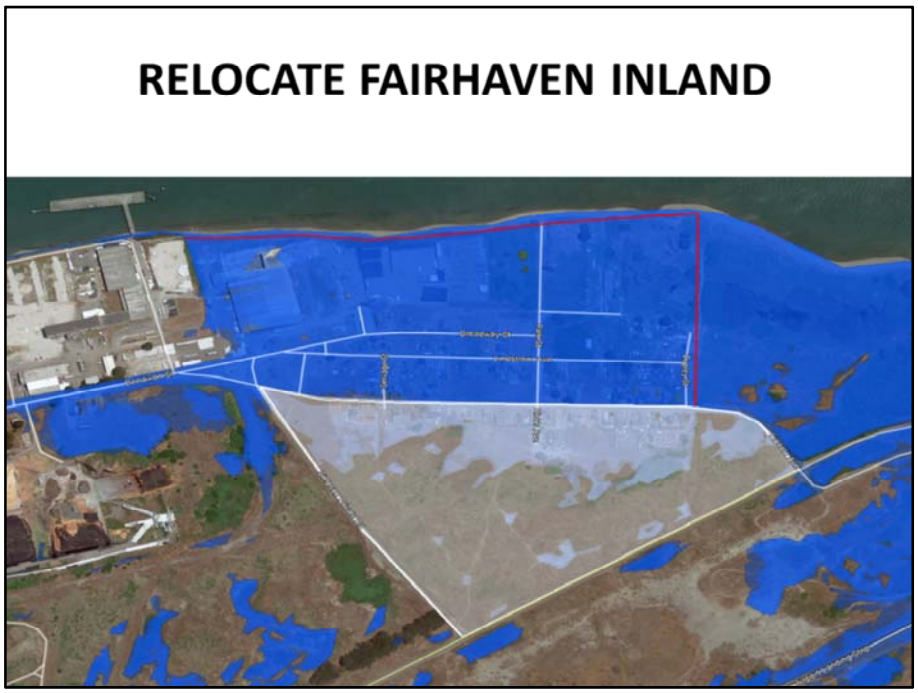
Dikes are one type of protective “hard” shoreline structure. They require a relatively large footprint that will generally expand as a dike gets taller. A dike can cost in the neighborhood of $2.7 million to construct, with a number of factors determining the actual cost.

Steel sheet piling is another type of “hard” protective shoreline structure. It will generally have a smaller footprint than a dike. There may be height limitations for this type of structure. Steel sheet piling could potentially be used in combination with a dike.

Composite sheet pile is another “hard” form of shoreline fortification. Like steel sheet piling, it will generally have a smaller footprint than a dike, and there may be height limitations. It may be possible to use composite sheet piling in combination with a dike.



One possible option to address sea level rise in Fairhaven would be to construct a dike that would block tidal pathways in the location shown above with a red line. The dike would be up to 14 feet tall and approximately 0.7 miles long.

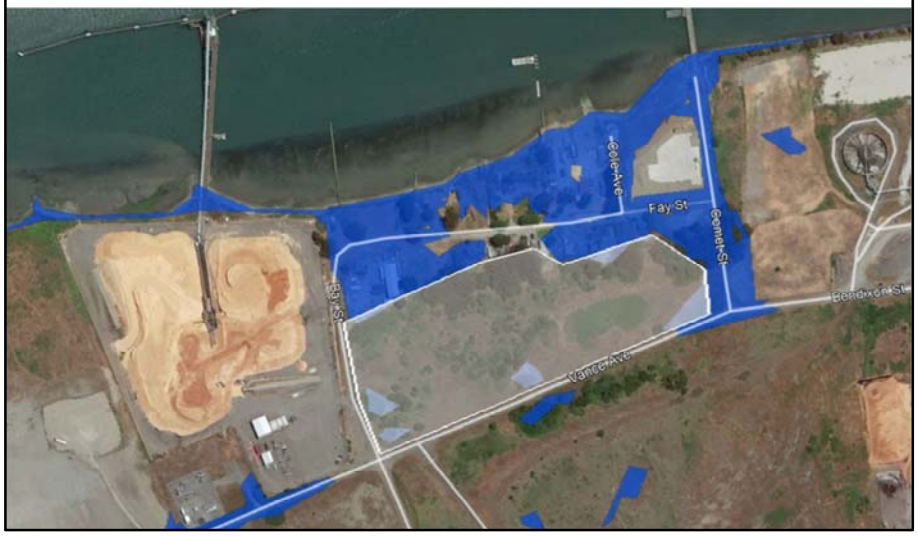


Besides protection, another option for addressing sea level rise is relocation. This slide shows an area approximately 51 acres in size where Fairhaven could conceivably relocate mostly outside the area that would be inundated during a monthly high tide (Mean Monthly Maximum Water, MMMW) with 4.9 feet (1.5 meters) of sea level rise. This area consists of a mix of publicly and privately held property. Relocation of an entire community would be a complex and long-term undertaking.

CONSTRUCT TIDAL PATHWAY BARRIERS
Finn Town

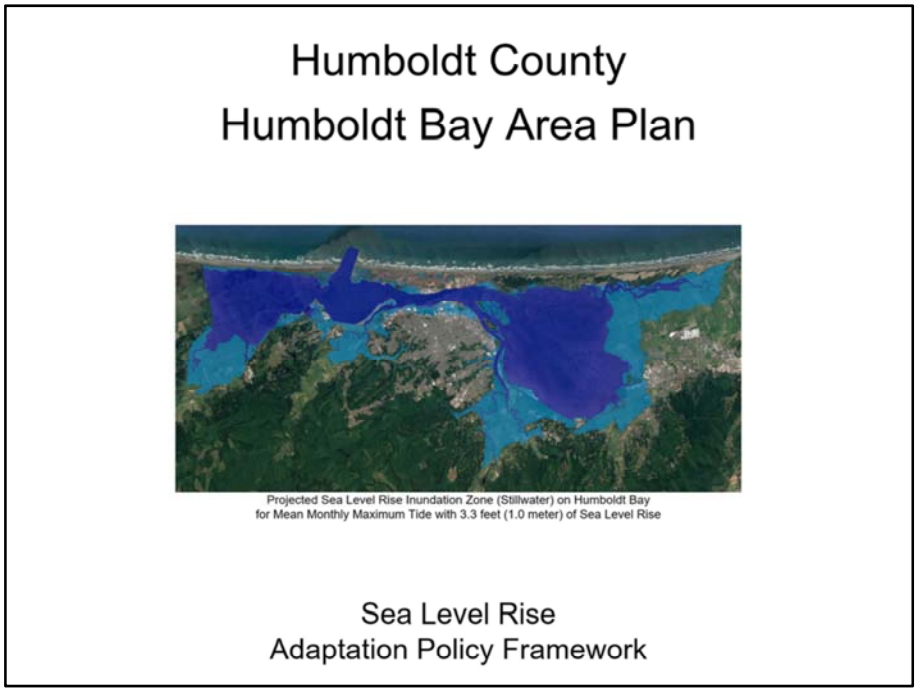
One possible option to address sea level rise in Finn Town would be to construct dikes that would block tidal pathways in the location shown above with a red line. This option would require approximately 0.2 miles of shoreline dike and two approximately 0.1-mile sections of east/west dikes, for a total of 0.4 miles of dike. Another option is a shoreline dike only, shown along the shoreline with a red line and a yellow line, which would be approximately 0.3 miles long. This option of diking the entire shoreline would, however, conflict with an existing maritime use, Zerlang & Zerlang Marine Services, which requires access to the bay for the boat yard.

RELOCATE FINN TOWN INLAND



Another option for addressing sea level rise in Finn Town is relocation. This slide shows an area of approximately 13 acres where Finn Town could conceivably relocate outside the area that would be inundated during a monthly high tide (Mean Monthly Maximum Water, MMMW) with 4.9 feet (1.5 meters) of sea level rise. This area consists of privately held property. Relocation of an entire community would be a complex and long-term undertaking.

Who will address these sea level rise impacts?



Humboldt County's Local Coastal Program (LCP), and specifically the Humboldt Bay Area Plan (HBAP, one of six coastal plans that comprise the County's LCP), provides the planning framework for development within the coastal zone that insures development is consistent with the California Coastal Act. The County's LCP is currently silent on sea level rise.

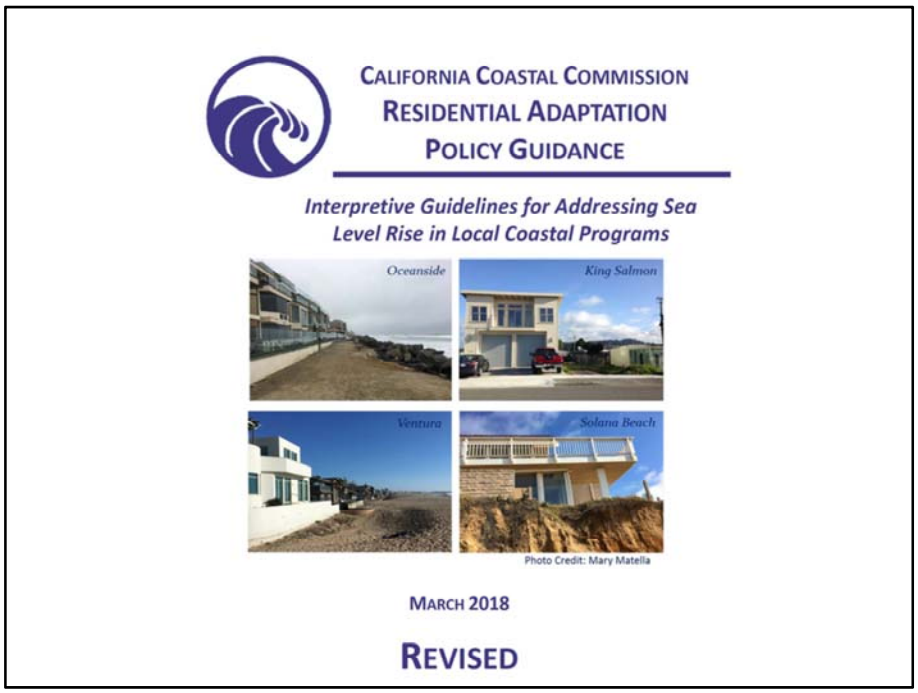
The County is in the process of updating the HBAP to provide sea level rise (SLR) adaptation goals, policies, and implementation measures for the Humboldt Bay area. There has been a significant amount of work completed on SLR on Humboldt Bay, and the County has made good progress toward planning for SLR. A draft SLR policy options document (HBAP Sea Level Rise Adaptation Policy Background Study August 2018) was recently released and is available, along with other SLR documents, at the County's LCP update webpage at the following link: https://humboldtgov.org/1678/Local-Coastal-Plan-Update. This workshop is part of the public outreach to provide input into these policies, which are a work in progress.

Implementing a consistent SLR approach is complicated by the fact that there are three local jurisdictions with LCPs that cover various portions of the Humboldt Bay area (Arcata, Eureka and Humboldt County). In addition, the Coastal Commission retains coastal development permit (CDP, required for all development in the coastal zone) jurisdiction over tidelands, public trust lands and submerged lands which comprise almost the entire shoreline of Humboldt Bay, in all three local jurisdictions; the local jurisdictions have permit jurisdiction in the remaining portion of the coastal zone. The Coastal Commission uses LCPs as guidance only when considering CDPs, meaning they are not required to comply with a local jurisdiction's LCP policies. Instead, the Commission relies on Chapter 3 of the Coastal Act as the basis for issuing CDPs. Thus, regardless of the Coastal Commission's certification of the County's LCP, including sea level rise policies in the HBAP, the Commission is not required to follow the policies they certify as being in compliance with the Coastal Act. The majority of the area where future sea level rise shoreline protection policies could potentially be implemented are located in Coastal Commission jurisdiction. With the Coastal Commission not being required to implement County LCP policies, implementation of HBAP sea level rise policies within Coastal Commission's jurisdiction is uncertain. The County's hope is that the Coastal Commission will rely fully on the HBAP SLR policies when considering approval of a CDP, and that local jurisdictions will coordinate their sea level rise policies, thereby providing a consistent SLR planning effort.

Another complicating factor in addressing sea level rise is that some of the adaptation measures require not only CDPs, but also permits from a number of state and federal agencies.

There will be many agencies to partner with, now and into the future, in our sea level rise adaptation planning efforts. This slide provides a list of some of those partners, some of which can provide funding to support sea level rise planning and adaptation implementation.

The LCP sea level rise policies are intended to increase the County's adaptive capacity to address sea level rise impacts. This slide lists some key points that need to be considered as sea level rise strategies are developed. A fundamental consideration is the fact that the County lacks the capacity to implement sea level rise strategies for assets that are privately owned or that are the responsibility of another agency.

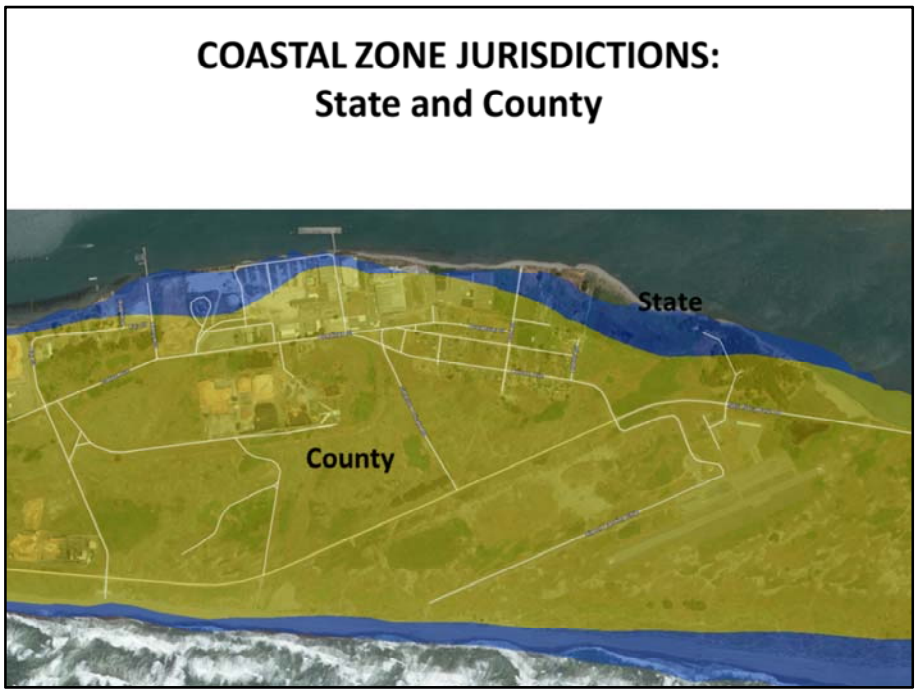


Melissa Kraemer, Supervising Analyst, California Coastal Commission North Coast District Office, Melissa.Kraemer@coastal.ca.gov, (707) 826-8950, presented the Coastal Commission's perspective on sea level rise. The information in the following slides is a combination of what Ms. Kraemer presented at this workshop, what Bob Merrill, District Manager, Coastal Commission North Coast District Office, presented at the King Salmon/Fields Landing workshop, and information provided by the County.

The Commission has both a regulatory aspect (issuing coastal development permits), and also works with coastal cities and counties to create a local coastal program that carries out the policies of the Coastal Act. The Commission's mission is to protect coastal resources, not just dunes, sensitive habitats or scenic coastal views, but also coastal-dependent lands and land uses that must be near the ocean to function. The Coastal Commission has a role in sea level rise planning under the state Coastal Act, and is working with 76 coastal cities and counties across the state that are also thinking about sea level rise and coastal development.

Sea level rise is a worldwide problem and we can either do nothing, or take steps now while there is still time, to address its impacts. The Coastal Commission and the Ocean Protection Council have given the County grant funding to help the County address the issue of sea level rise.

The Coastal Commission has produced some sea level rise guidance documents. The SLR Residential Adaptation Policy Guidance, designed to help cities and counties to develop policies to grapple with these issues, is currently under review and will probably be adopted by the end of the year. There is an earlier document called the Sea Level Rise Guidance Document that looks at sea level rise issues more generally. Both documents are available on Coastal Commission's website: https://www.coastal.ca.gov/climate/slr/



This slide shows the approximate areas of Coastal Commission (State, shown in blue) and County (shown in yellow) coastal development permit (CDP) jurisdiction in Fairhaven and Finn Town. Although the County's local coastal program (LCP), specifically the Humboldt Bay Area Plan (HBAP), includes both Coastal Commission and County CDP jurisdiction, the County does not have CDP jurisdiction in the blue area, which is the area of state retained jurisdiction. The shoreline in Fairhaven and Finn Town, where tidal barriers would likely be built, is in the Coastal Commission's jurisdiction, while the more inland areas are in the County's jurisdiction.

The Coastal Act provides for split permit jurisdiction, where there are parts of the Coastal Zone where the Commission issues CDPs and parts where the County is responsible for CDPs (see slide #48 for further discussion on coastal zone jurisdictions). In general, tidelands, public trust lands and submerged lands are Coastal Commission jurisdiction. When the County issues a CDP, it relies on its LCP. The Coastal Commission uses the County's LCP as guidance only, and relies on Chapter 3 of the Coastal Act as the basis for issuing CDPs. County-issued permits can be appealed to the Commission.

There is always a lot of discussion about the Commission and the local government having an adversarial relationship. When the legislature established the Coastal Act, they tried to create a partnership where local government would be responsible for preparing the local coastal programs and the Commission would review them to make sure they incorporate the appropriate policies to protect the coast.

As listed in the Coastal Commission's Draft Residential Adaptation Policy Guidance, proactive adaptation strategies generally fall into the categories listed on this slide, though some strategies combine elements of more than one of these five strategies.

When new development is considered, the Commission looks at ways to design development to be resilient to flood hazards, with the most obvious being to avoid placing development in areas where there are flood hazards. Thus, the Coastal Commission considers #1 on the list, avoidance, to be the ideal adaptation strategy. The Coastal Act requires that risks to life and property be minimized, hazards related to flood and other hazards be avoided, and promotes development that does not require shoreline protection. It is important to consider how long a development will exist. If the life of a development will be over 100 years, the Commission expects 5.5 feet of sea level rise at that time, which must be considered when designing a new structure for a flood hazard area.

Where there is existing development, accommodation, #2 on the list, is more feasible than #1, at least in the short term. It is also time to start looking at managed retreat, strategy #3, since despite the use of other strategies, rising groundwater will still cause flooding. There are potential programs to assist with managed retreat, such as buyout programs and transfers of development rights (TDRs) to help relocate existing development and direct new development away from areas impacted by sea level rise.

Beach nourishment, living shorelines, and other strategies can be used to move hazards away from development, strategy #4. Regarding strategy #5, the Coastal Commission does not consider hard barriers as the most preferred strategy. This is because they prevent the escape of stormwater runoff and groundwater, can impact coastal access, do not address utilities or groundwater, and pose potential conflicts with the Coastal Act which allows shoreline protection, but generally only for development that existed when the Act was adopted in 1977. The Coastal Commission has been recognizing that it may be appropriate to allow "hard" barriers where there is a checkerboard of old and new development, contingent on providing mitigation for resource impacts, but generally this is not a long term solution.

The Coastal Commission is not interested in taking private property without compensation. Although not developing in areas impacted by sea level rise is the safest choice, it is not always the only choice. There are structures along the coast that have been designed with habitable space elevated above sea level rise projections, a sea level rise accommodation strategy. This slide shows a home in King Salmon that provides an example of this type of construction. The habitable portion of the home is on the second floor. The first floor walls are reinforced concrete walls and breakaway walls. When inundated, the entire structure will not be destroyed. Utilities, storage cabinets, etc. are elevated to minimize potential damage. A lot of development will need to accommodate sea level rise in the short term, with the more difficult issue being what to do in the long term.

It is important to keep in mind that this kind of accommodation does not address sea level rise impacts to roadways that provide access to a residence, nor does it address impacts to the various utilities that support a residence. While the residence itself may be able to accommodate sea level rise, access to the residence and lack of utilities may become the factor that makes a residence impacted by sea level rise uninhabitable.

Addressing sea level rise will require a collaborative effort involving a host of agencies. The Coastal Commission wants to work together with the County to address short term and long term impacts of sea level rise. We do have some time, a few decades to work through solutions.