

**COLLABORATION: SEA-LEVEL MARIN ADAPTATION RESPONSE TEAM  
(C-SMART)**

**Public Workshops #2 - Values & Risks**



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*Photo Credit: Dianne Arrigoni*

**October 28-30, 2014**

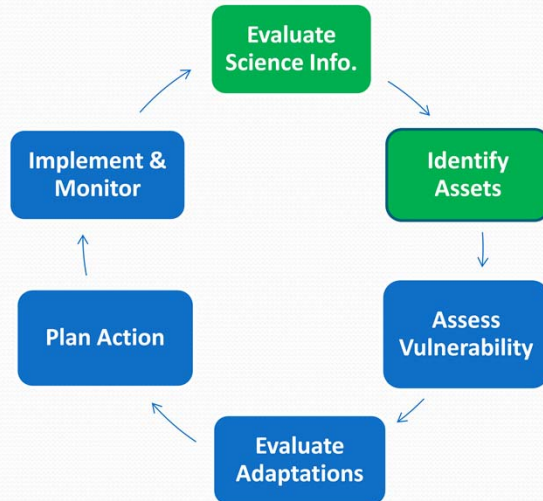


The Bad News is the SEA IS RISING. The good news is we still have time to plan, prepare and respond. One of our consultants has said that sea level rise is like being run over by a turtle. I hope the goal we all share is simply that of the boy scout motto: **be prepared.** Together, we can do that.

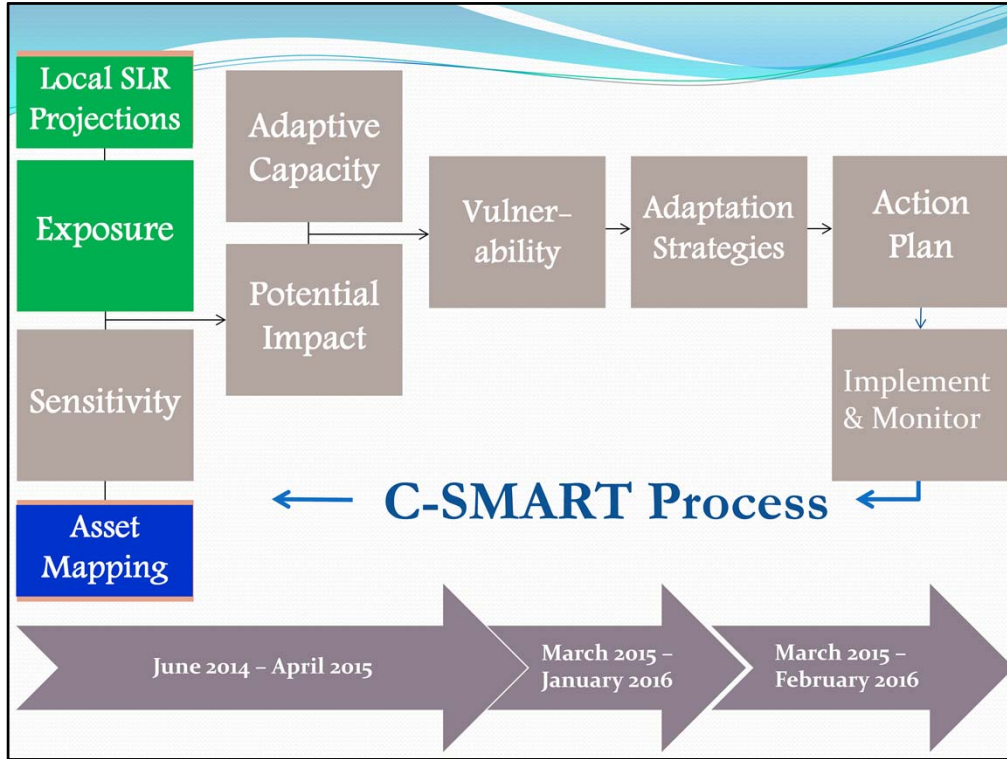


So **who is the “T”** in C-SMART’s Team? **The OPC and CCC** made this possible by providing funding for the project. There are also a number of partners responsible for producing different elements of the work. We also want to check in, touch base, gather ideas, get information, and listen to feedback from everyone who has a stake in and would be affected by SLR. **This includes numerous agencies and institutions, and it includes you** and the other people in your communities. This bottom array represents just a few of the several score of organizations we will be contacting.

# Sea Level Rise Adaptation Process



BIG PICTURE OF THE PROCESS. The green boxes represent what we have done or are currently working on and where we would like community input. We are currently at the “identify assets” phase.



A BIT **MORE DETAILED** WORK AND **TIMELINE**. We aim to accomplish this first cycle by FEB 2016. Grey boxes are yet to completed. After determining the assets we will then work with the committees and communities to determine the sensitivity for each asset identified, the potential impact of Sea Level Rise on that asset, the adaptive capacity to maintain the asset, and the steps to respond to Sea Level Rise. Finally, we will have to continually monitor Sea Level Rise and update evaluations and action plans.

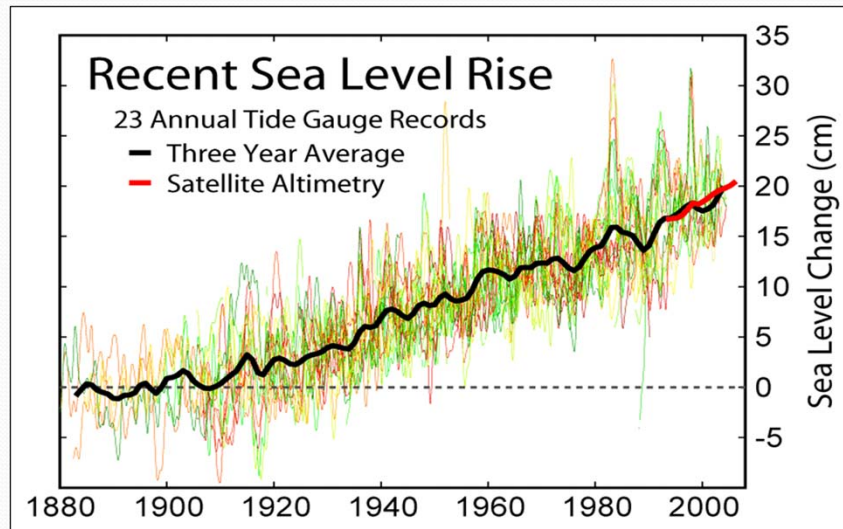
# Sea Level Rise 101

Cliff Notes Version

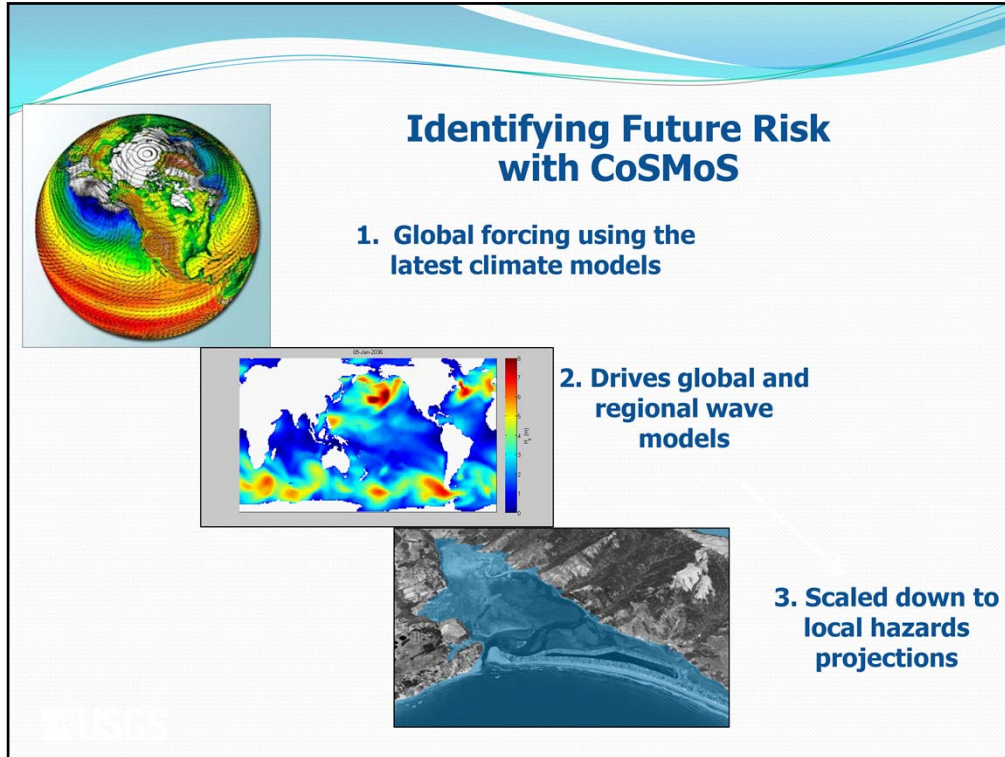


The following slides are a brief overview of the science behind Sea Level Rise. For more information visit [MARINSLR.ORG](http://MARINSLR.ORG).

## Observed Sea Level at Golden Gate: 8" per Century



There is an undeniable and inexorable trend sea level has risen 8 inches since measuring began. Note also the WIDE FLUCTUATIONS, this highlights that BOTH THE AVERAGE WATER LEVEL AND THE EXTREME LEVELS demand our attention. This has important implications for flooding of homes, businesses, schools and critical facilities, erosion of shorelines, maintenance of roads, drowning of wetlands and habitat areas among other concerns.



Our projections are based on the work of the United States Geological Survey. The approach: take output from relevant global climate models, use other models to simulate waves, scale down using another suite of models (adding tide, pressure, and wind fields along the way) until we can make relevant hazards projections at the parcel scale (flooding, wave impacts, coastal erosion, cliff failures).

Rather than using observations over the past 15 years or so (depending on the particular buoy), we opted to assess the future wave climate considering the latest projected wind conditions using global climate models. This allows to us to account for a 1) potentially non-stationary climate and non-linear trends of future wave conditions and 2) to assess the differences in response to different climate change scenarios.



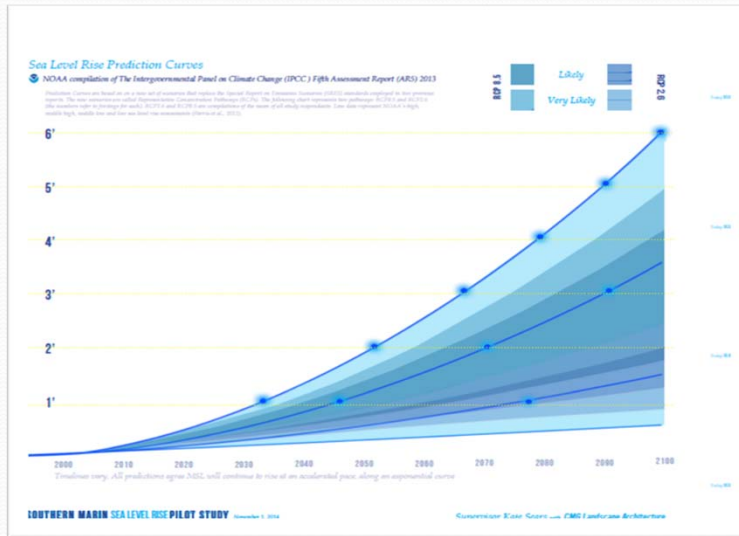
## State of California Official Guidance

Period	Projected Range of SLR
2030	<b>1.6 - 11.8 in.</b> (4 - 30 cm)
2050	<b>4.7 - 24 in.</b> (18 - 61 cm)
2100	<b>16.6 - 65.8 in.</b> (42 - 167 cm)

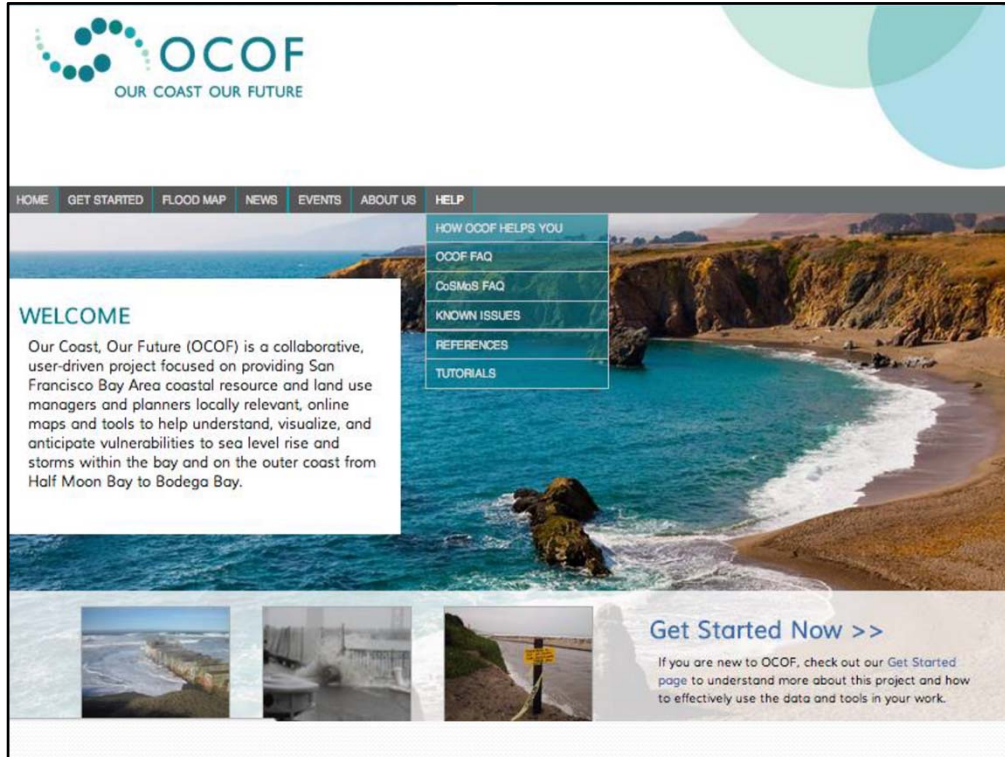
NRC Sea-Level Rise Projections for California (SF Region), *NAS-NRC 2012*

The models used the range of projected sea level rise developed by the national res council of National Academy of Science. Note the wide range in the projections. For any given year we don't a precise idea of how high water levels will be.

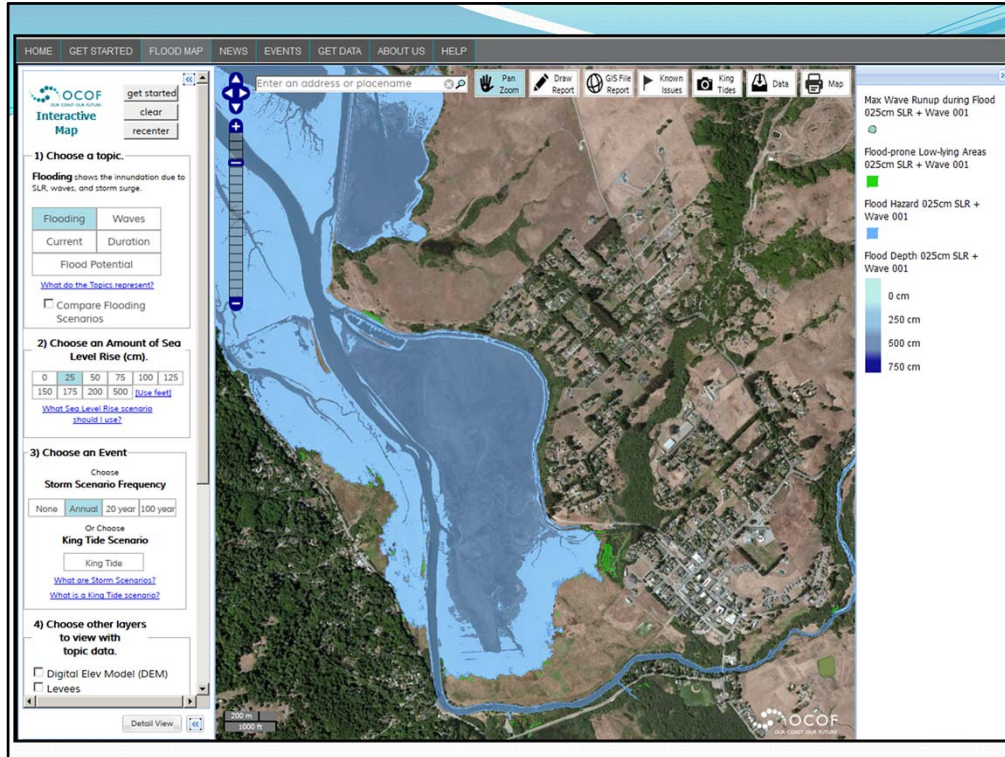
# Potential Future Sea Level Rise



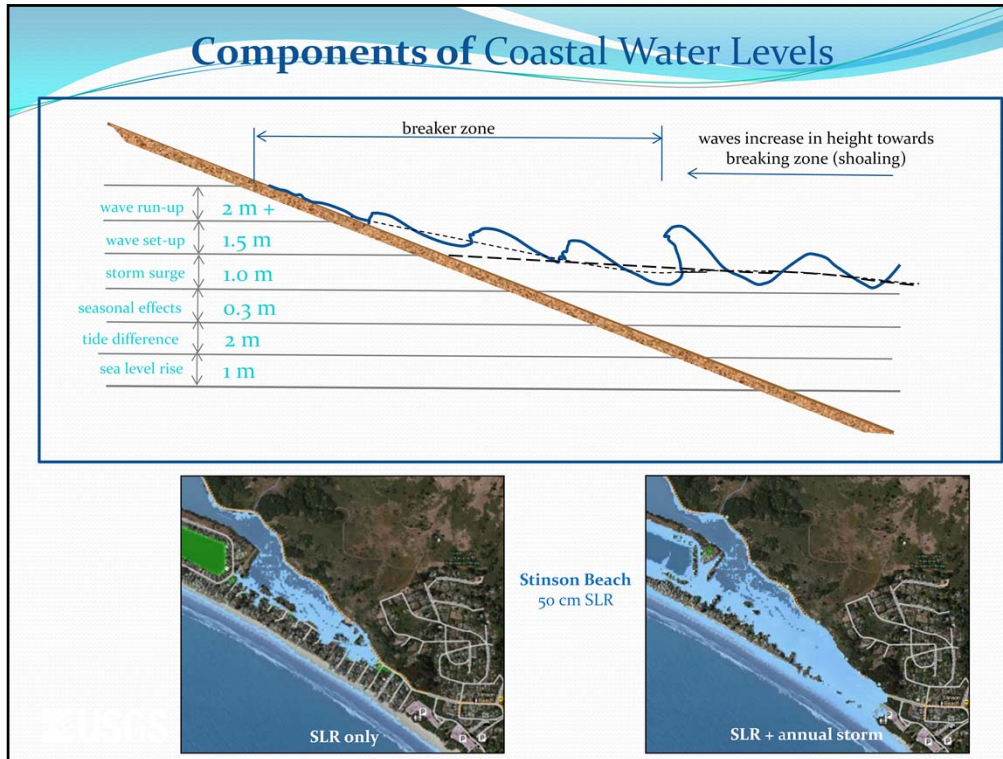
Here's another way of looking at that wide range for any given year. But what this does show us is that while the best science cannot yet tell us **exactly how much and when** sea level will rise – it does confirm that it will rise –and that's what we need to plan for.



Point blue has made this modeling data more accessible to all. Visit “Our Coast Our Future” to use the model on your own for the areas that interest you.



They have taken the model runs of various combinations of sea level rise, storms, currents, duration and an uncertainty factor so anyone can look at those – that’s 40 different Sea Level Rise scenarios.



Actual water Level is a result of these individual components. Wind, storm surge, and waves add to the water level. An important fact is storms will come first causing TEMPORARY FLOODING. Persistent Sea Level Rise will come later and result in PERMANENT INUNDATION. That's why our scenarios show different combinations- and that is something we will specifically address in the next steps.

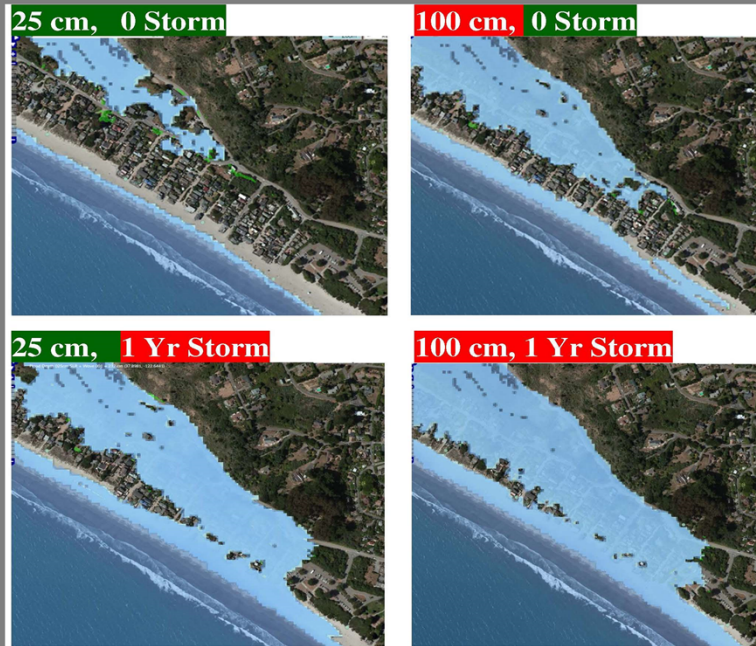
## 40 different SLR scenarios

	No storm	Annual storm	20-year storm	100-year storm
0cm SLR	Baseline			
25cm SLR		*	*	
50cm SLR			*	
75cm SLR				
100cm SLR				*
125cm SLR				
150cm SLR				
175cm SLR				
200cm SLR				*
500cm SLR				

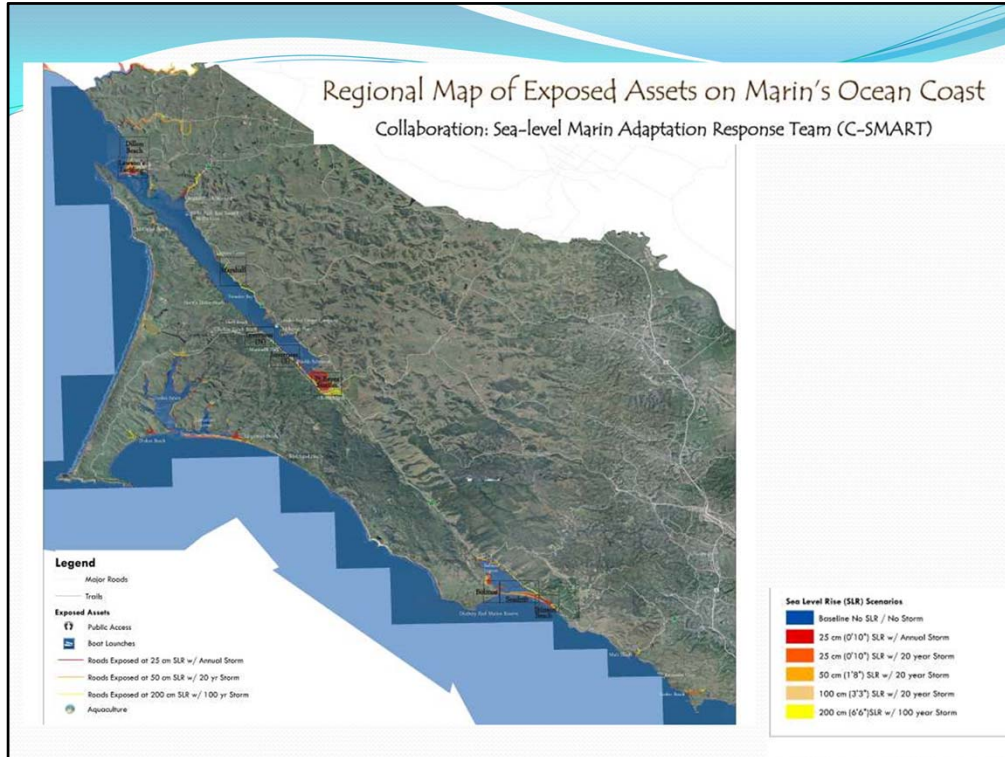
\* Marin County selected SLR scenarios

40 scenarios bracket the expected range of sea level rise that tend to overlap in extent of impact. The “Asset Exposure Maps” at the end of this presentation and on the website show a representation of potential conditions.

## EXPOSURE – SLR vs. ANNUAL STORM



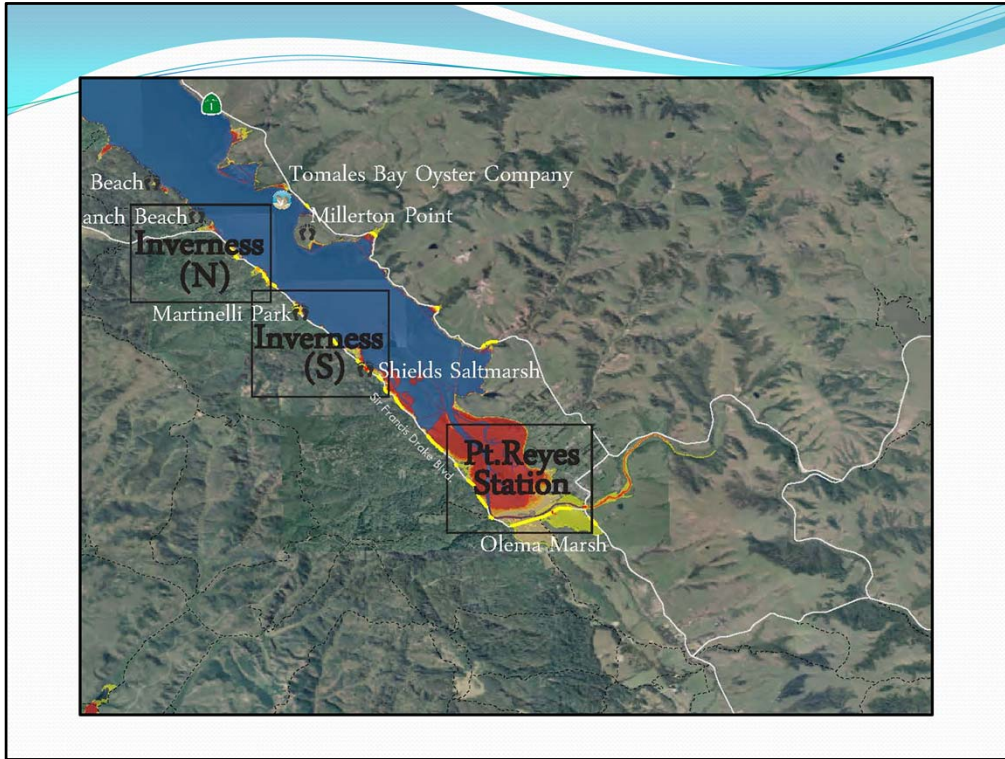
For example: How do storms affect exposure? Again baseline of 25 with no storm and across is 100 cm perhaps 40 years later, with no storm  
But look what happens when an annual storm occurs at just 25cm of Sea Level Rise– more exposure than 100cm of Sea Level Rise alone, and almost as much as the annual storm at 100cm Sea Level Rise. This tells us that we need to look at the different impacts of periodic storms and progressing Sea Level Rise and develop strategies to fit the different characteristics of those exposures.



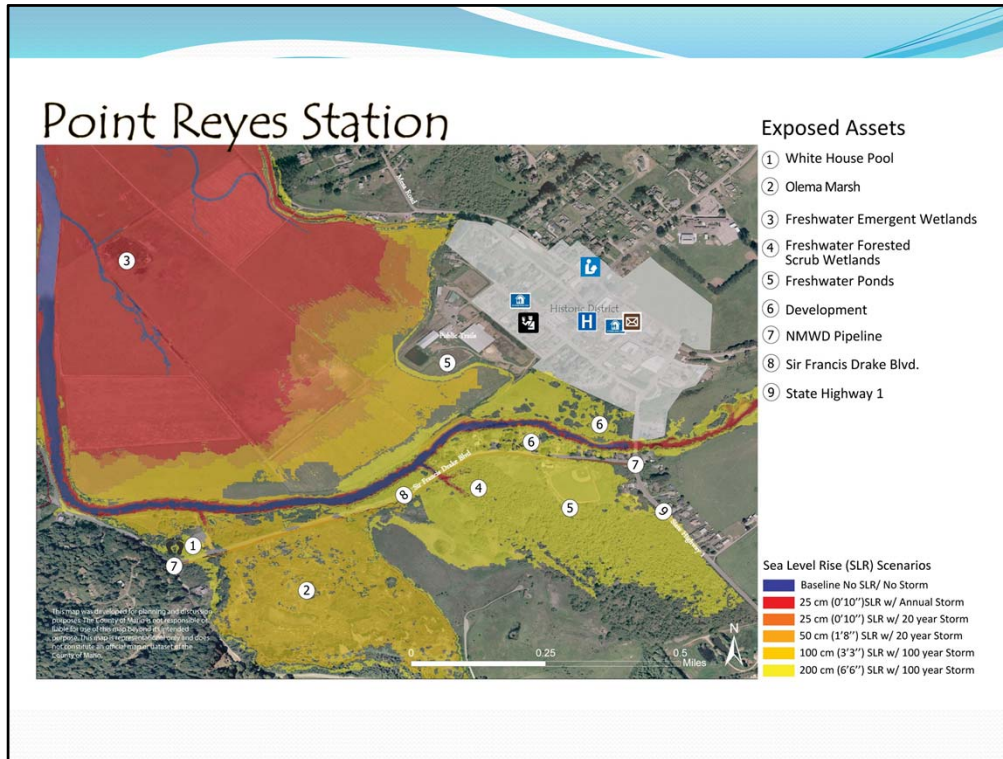
WE HAVE SCoured THE COUNTY'S FILES AND CONTINUE TO WORK WITH OTHER AGENCIES TO COMPILE INFO **TO IDENTIFY** WHERE THE IMPORTANT THINGS THAT COULD BE AFFECTED BY SLR.

Please ADD TO THE INFO. If you know someone who could not attend the meeting, they can view and comment on the maps on Open Marin ([www.countyofmarin.org/openmarin](http://www.countyofmarin.org/openmarin))



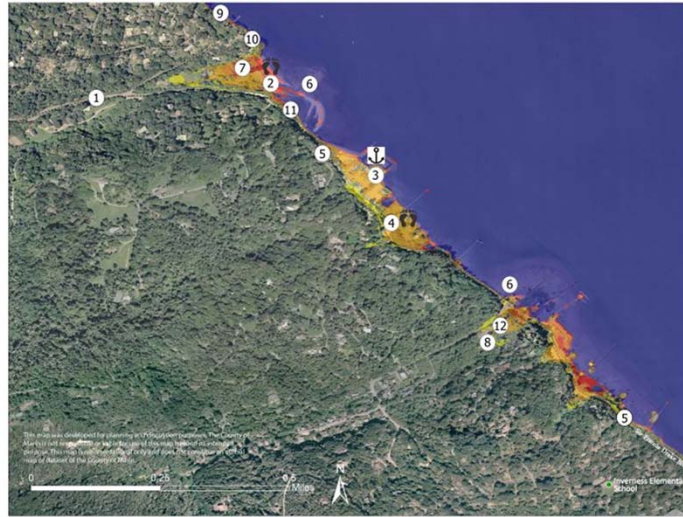


Looking closely at it you can see the thick colored lines which show where Highway 1 may be flooded. You will also see where we zero in on our communities for the community specific maps.



Each map displays the scenarios which we just discussed overlaid. **We have started to identify a number of assets** which may be of importance that **fall within one** or more of the scenarios and therefore have the potential to be impacted by sea level rise and storm surges. These **can be places** important to you and your daily lives and livelihoods that make your community what it is and contribute to its 'sense of place' places of importance socially, culturally, ecologically, economically, aesthetically, infrastruc,turally, etc.

# Inverness North



## Exposed Assets

- ① California Coastal Trail
- ② Chicken Ranch Beach
- ③ Golden Hinde Inn & Marina
- ④ Dana Marsh / Path to Beach
- ⑤ Sir Francis Drake Blvd. (emergency route)
- ⑥ Estuarine and Marine Wetlands
- ⑦ Freshwater Wetland
- ⑧ Freshwater Forested/Shrub Wetland
- ⑨ Tomales Bay State Park
- ⑩ Shell Beach
- ⑪ Kayak Launch
- ⑫ 2nd valley Creek
- ⑬ Water Main Along Sir Francis Drake

*Additional Natural Resources in area include eelgrass beds*

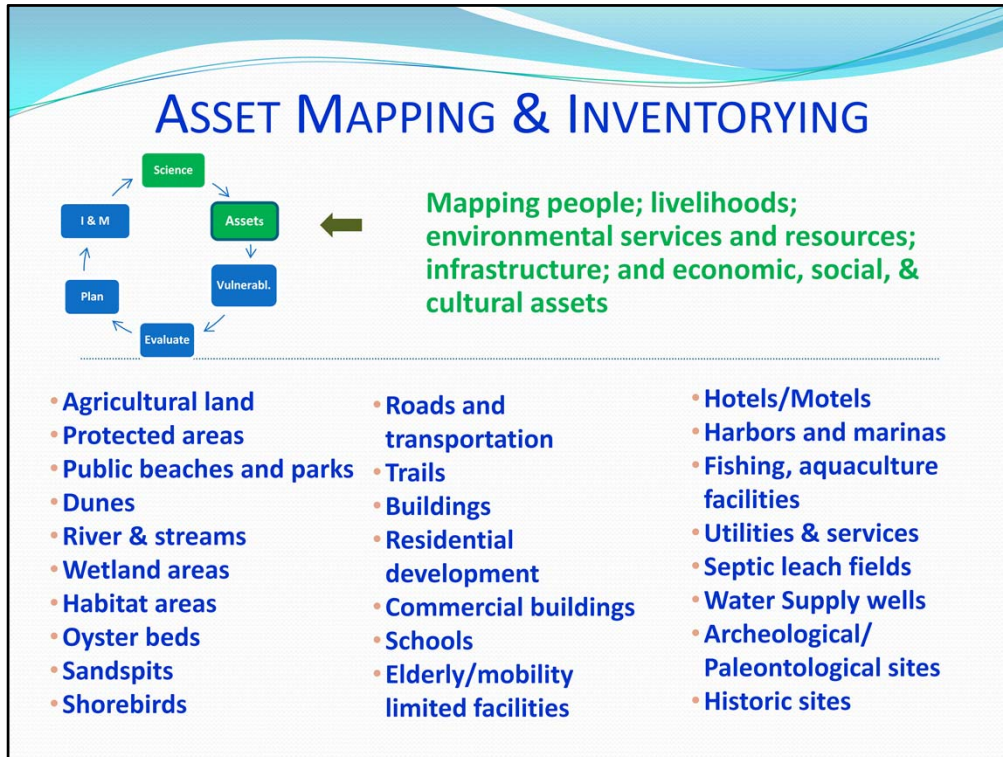
## Sea Level Rise (SLR) Scenarios

- Baseline No SLR/ No Storm
- 25 cm (0'10") SLR w/ Annual Storm
- 25 cm (0'10") SLR w/ 20 year Storm
- 50 cm (1'8") SLR w/ 20 year Storm
- 100 cm (3'3") SLR w/ 100 year Storm
- 200 cm (6'6") SLR w/ 100 year Storm

## Properties Exposed (Inverness total)

- 3
- 4
- 23
- 28
- 32

This project is developed for purposes of providing information to the public. It is not intended to be used for any other purpose. The information is provided as a service to the public and is not intended to be used for any other purpose. The information is provided as a service to the public and is not intended to be used for any other purpose.



With some idea of where the **water may go**, we look to **what is there**. This is a beginning list of the individual types of resources we will be identifying and mapping. The County already has a lot of this information, such as the footprints of residential and commercial buildings., and we will be getting more from our partners and Technical Advisory Committee agencies. But we want to **ground truth** this data with local knowledge, and we hope you can help with that.

# WWW.MARINSLR.ORG



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