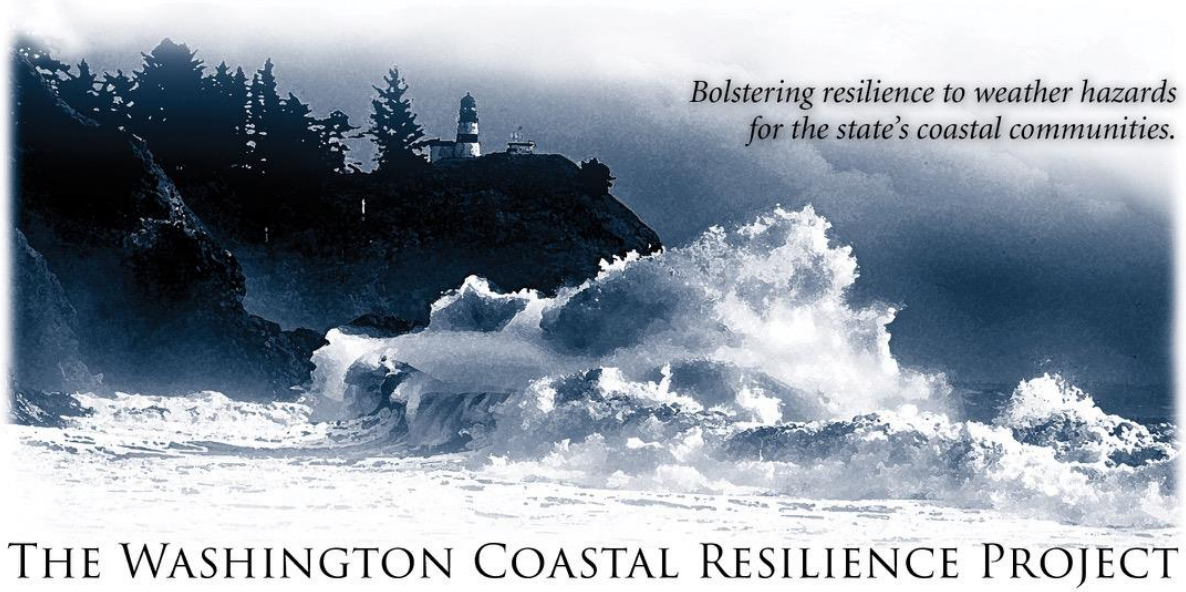

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October 10, 2018

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Coastal Resilience Project Partners

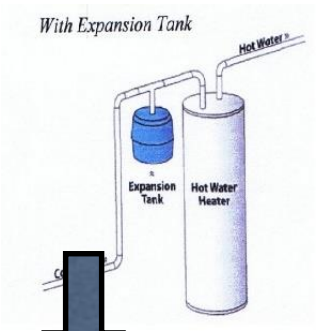
FACTOR #1
Melting ice sheets

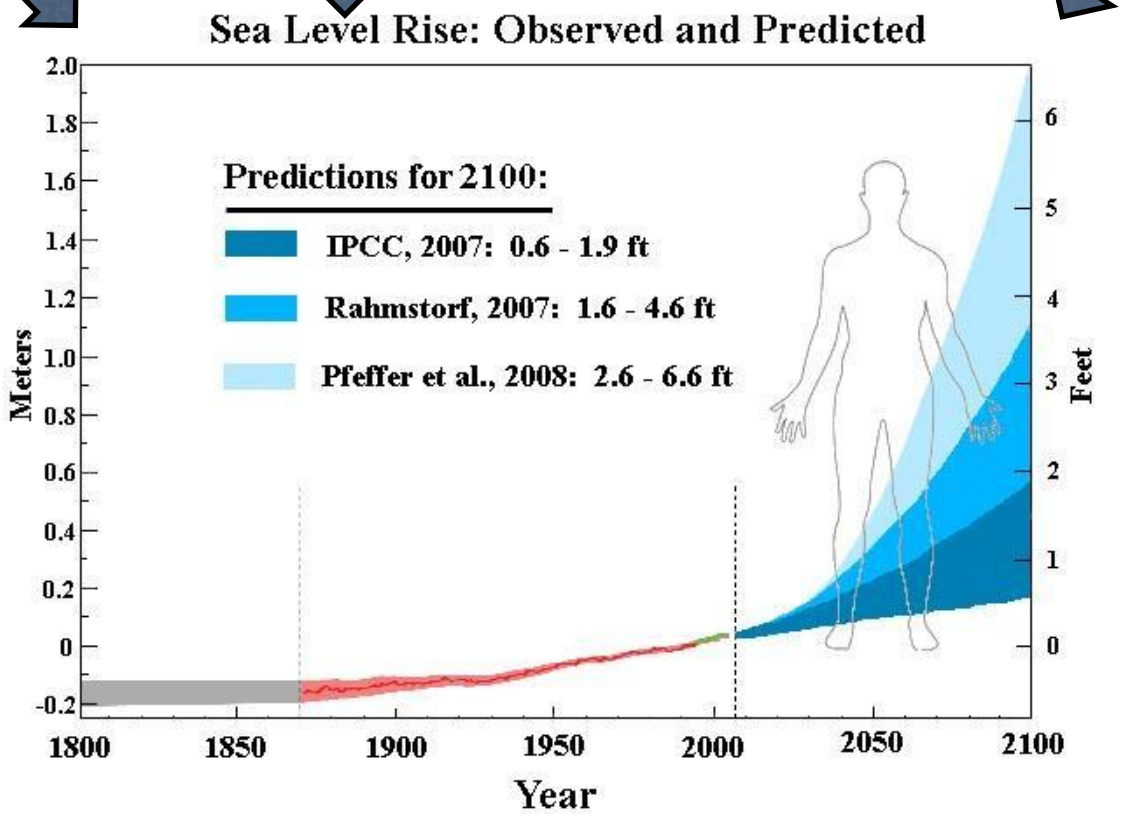
FACTOR #2

Melting Glaciers


FACTOR #3
Thermal
Expansion

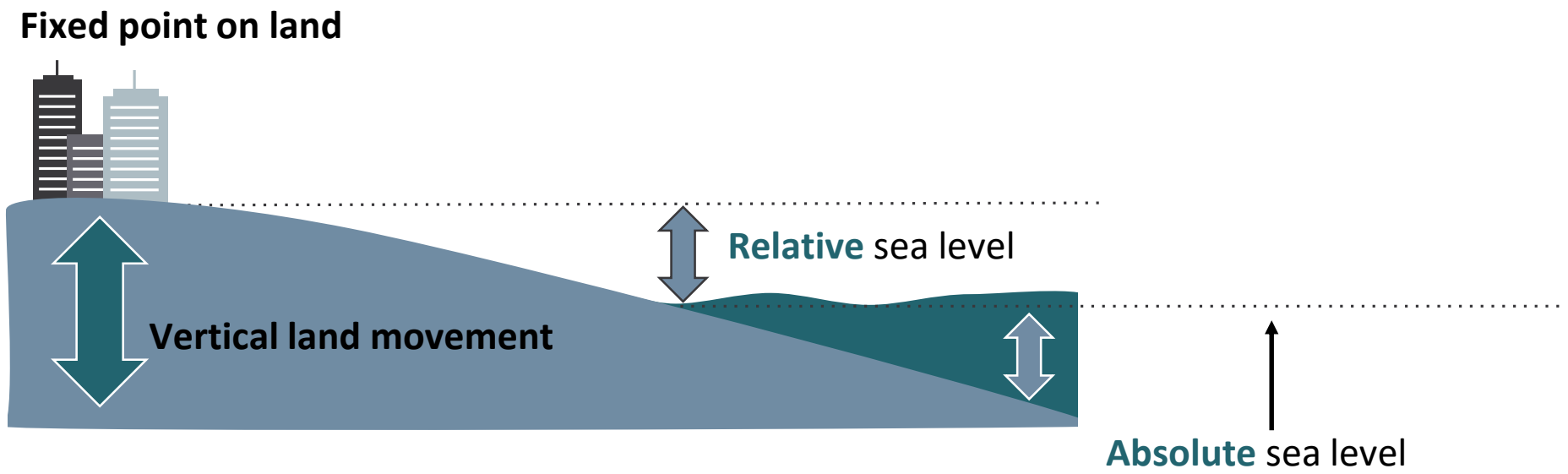
Add ‘em all up and….





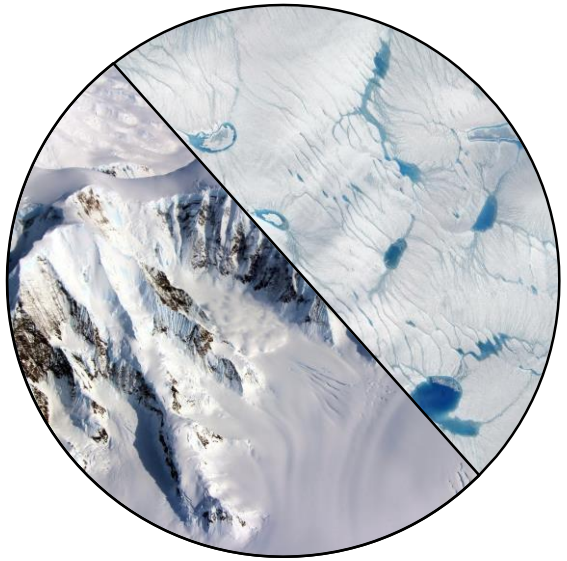
note the Uncertainty!

Absolute vs. Relative Sea Level Rise



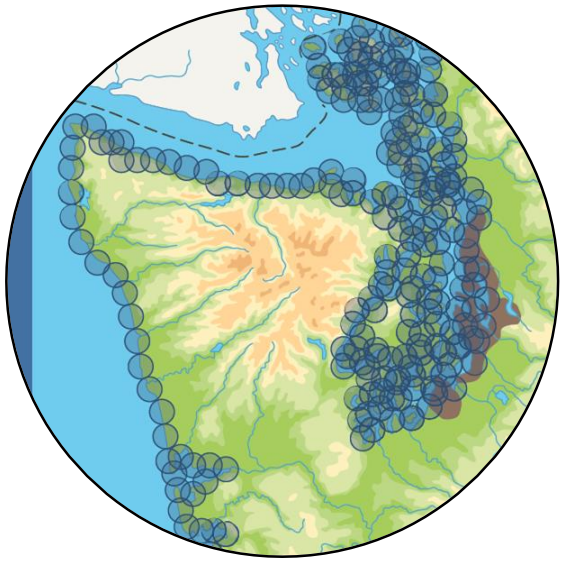
What makes these projections different?

New Science



The potential for a higher sea level is larger than we thought

Local



Accounting for local differences in relative sea level rise along WA's coastline

Probabilistic

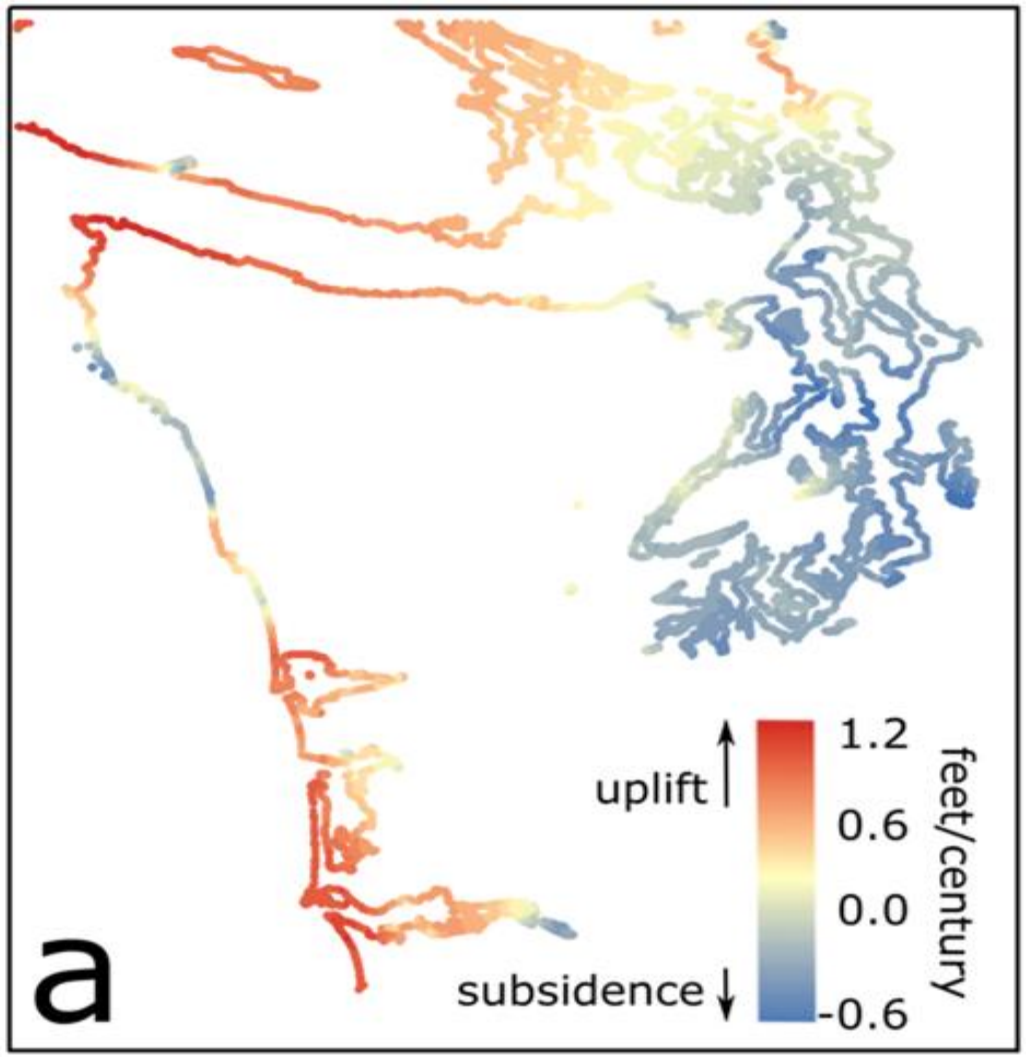
Estimating the probabilities that various amounts of sea level rise will occur for a given greenhouse gas scenario

Our results differ from past projections

For example for 2100….

Study	Central Estimate	High End
Miller et al. (2018)	1.6 ft to 2.0 ft	7.2 ft to 8.3 ft
NRC (2012)	2.3 ft	4.1 to 4.8 ft

Vertical Land Movement (VLM): best estimate rates



There are **two key factors** to selecting Sea Level Rise projections

1) **Timeframe** (e.g., design lifetime, planning horizon)
2) **Risk tolerance** (i.e.: *probability* of failure)

TIME FRAMES

- General Planning
- Project Specific
- Restoration

Risk

Decision	Strategy	Approach
Risk Averse	Avoid worst-case outcomes	Low probability, high impact sea level rise projections. **(5%, 1%, and 0.1%)**
Risk tolerant	Adaptive management	Best case or central projection. (**50% - 99%**)
Robust	Works for a wide range of scenarios	Bracketing scenarios and an even number of scenarios to avoid perception of middle estimate.

Probability of Exceedance (risk factor)

Time Frames

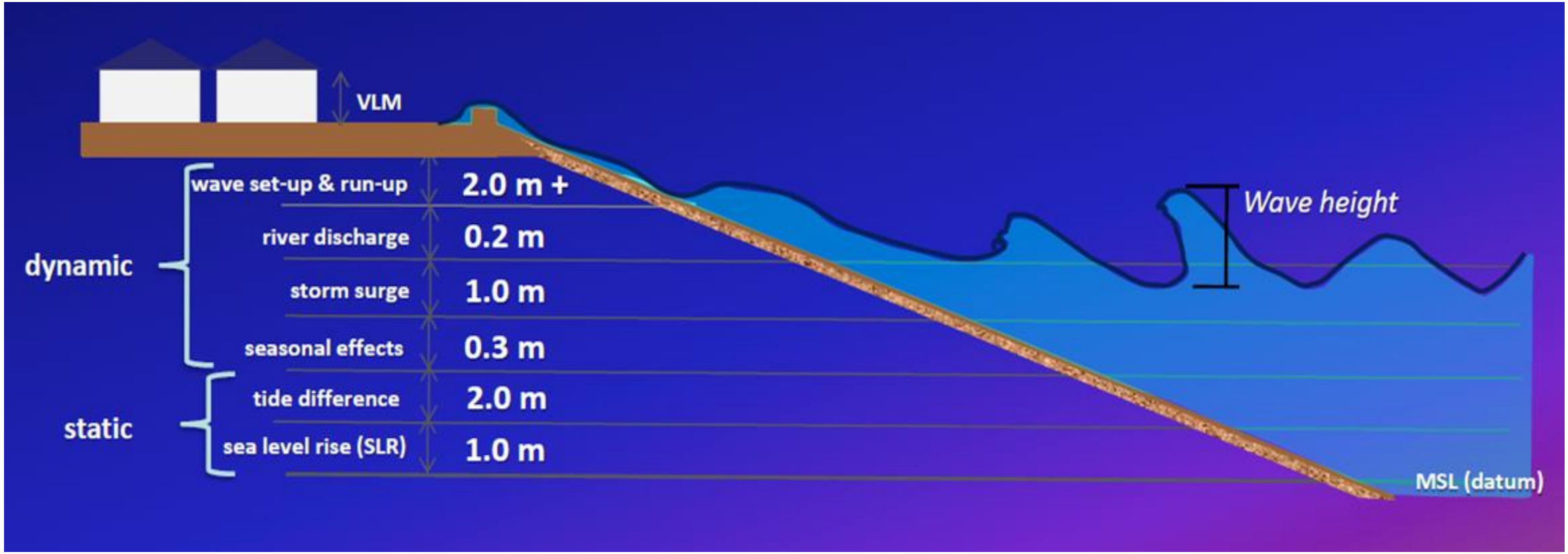
TACOMA DRAFT Sea Level Magnitudes, in Feet for different probabilities and dates.
NOTE: These probabilities include Vertical Land Movement but not Storm Surge.

	Probabilities									
	99	**95**	**90**	**83**	**50**	**17**	**10**	**5**	**1**	**0.1**
2010	0	0	0	0	0.1	0.2	0.2	0.2	0.2	0.3
2020	0	0.1	0.1	0.1	0.2	0.3	0.3	0.4	0.4	0.5
2030	0.1	0.2	0.2	0.3	0.4	0.5	0.5	0.6	0.7	0.8
2040	0.1	0.3	0.3	0.4	0.6	0.7	0.8	0.9	1	1.4
2050	0.2	0.4	0.5	0.5	0.8	1	1.1	1.2	1.5	2.1
2060	0.3	0.5	0.6	0.7	1	1.3	1.5	1.6	2	3
2070	0.4	0.7	0.8	0.9	1.3	1.7	1.9	2.1	2.6	4.1
2080	0.5	0.8	1	1.1	1.6	2.1	2.3	2.6	3.3	5.6
2090	0.6	1	1.2	1.3	1.9	2.5	2.8	3.1	4.1	6.9
2100	0.7	1.1	1.4	1.6	2.3	3	3.3	3.7	5	8.4

How are Sea Level Rise projections different from FEMA flood maps?

Sea level rise (ft)	0 ft	0.5 ft	1 ft
Return Period Current 100-yr Flood Level	100 yr	18 yr	2 yr

Component to Estimate Coastal Impacts



What's in the pipeline?

Waves & Surge

Extreme still water level. Added to RSLR projections. Jan 2019.

How to Choose

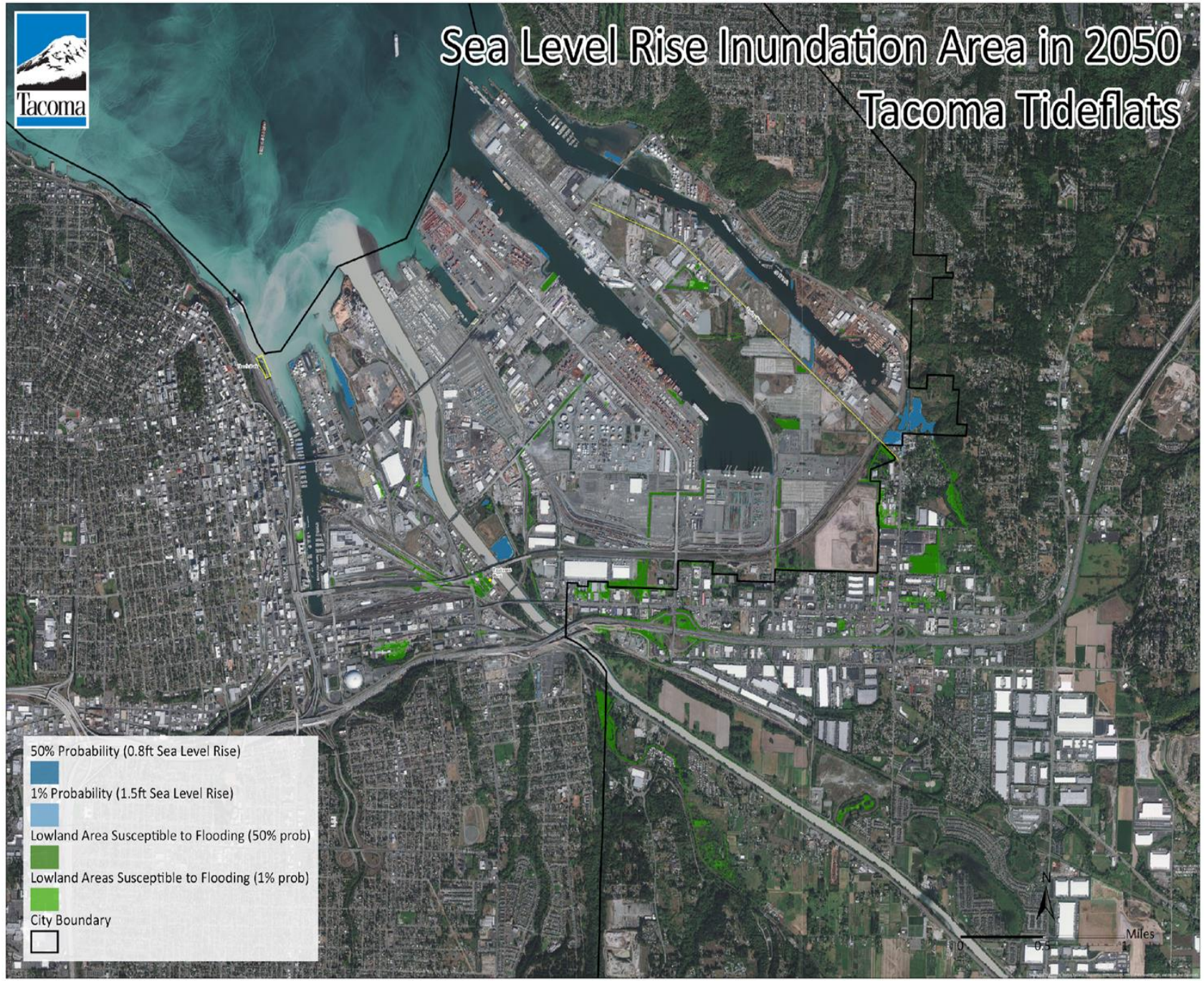
Framework for identifying the appropriate timeframe, GHG scenario, & risk tolerance when evaluating projections.

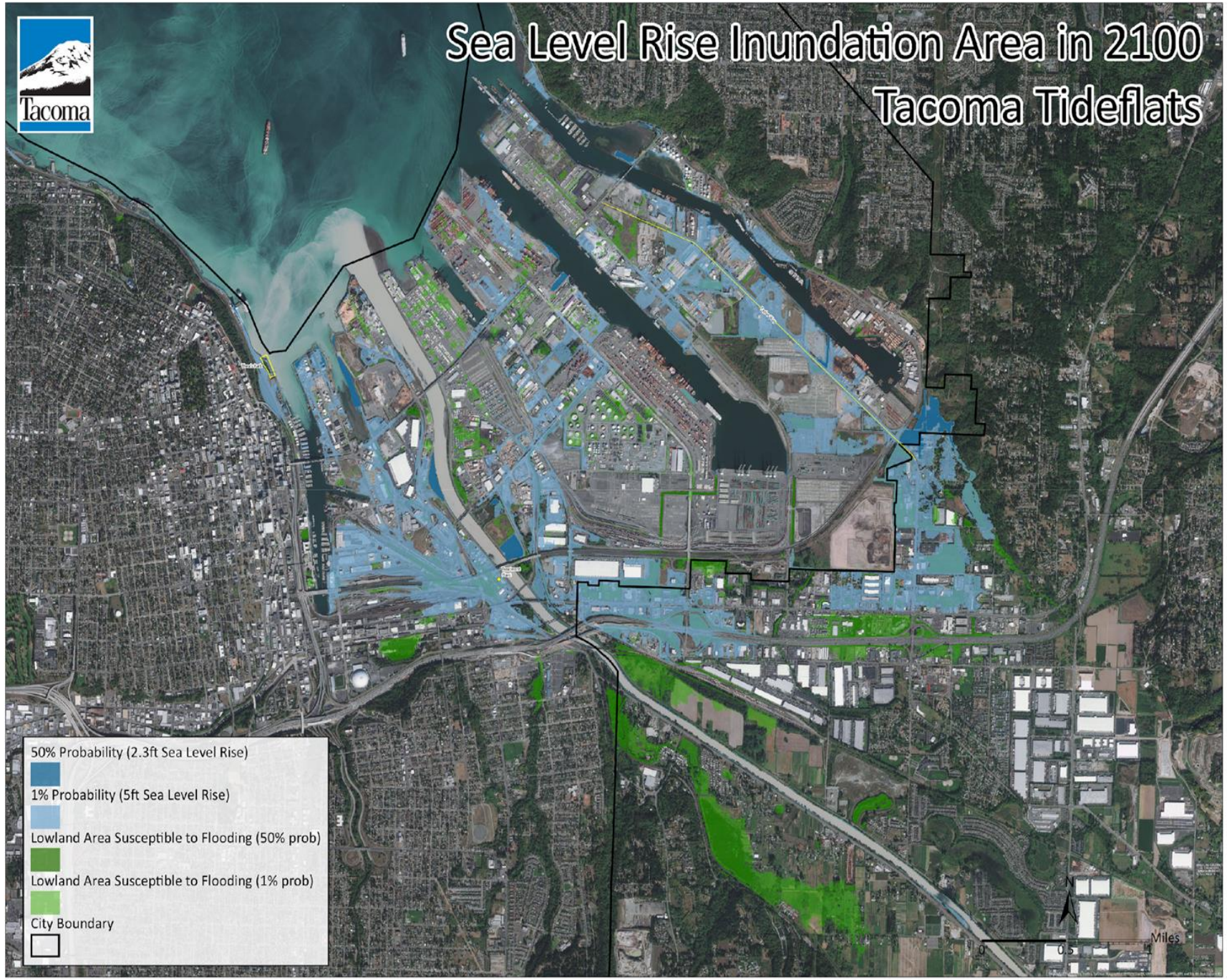
Mapping SLR Inundation

Guidelines for mapping SLR inundation using the localized projections.

SLR & Restoration

A considerations document for incorporating the projections into nearshore restoration projects.


Tacoma
Sea Level Rise Inundation Area in 2050
Tacoma Tideflats
50% Probability (0.8ft Sea Level Rise)
1% Probability (1.5ft Sea Level Rise)
Lowland Area Susceptible to Flooding (50% prob)
Lowland Areas Susceptible to Flooding (1% prob)
City Boundary
N
0
0.5
1
Miles


Tacoma
Sea Level Rise Inundation Area in 2100
Tacoma Tideflats
50% Probability (2.3ft Sea Level Rise)
1% Probability (5ft Sea Level Rise)
Lowland Area Susceptible to Flooding (50% prob)
Lowland Area Susceptible to Flooding (1% prob)
City Boundary
N
0
0.5
1
Miles

Total water level (Flooding Extent) with sea level rise

- Sea level = 1.3’ 2070 50%:
- Sea level = 2.8’ 2120 50%:

NEAR TERM ADAPTATION - EXAMPLES

Urgent needs

1. Ensure that near-term capital improvement projects consider climate change risks.
2. Increase preparedness for greater climate variability and more frequent and/or more severe extreme events, including heat waves and floods.
3. Prioritize South Tacoma, New Tacoma near downtown, the southwest area of West End, and Eastside in capital improvement, development, and planning activities as relevant.

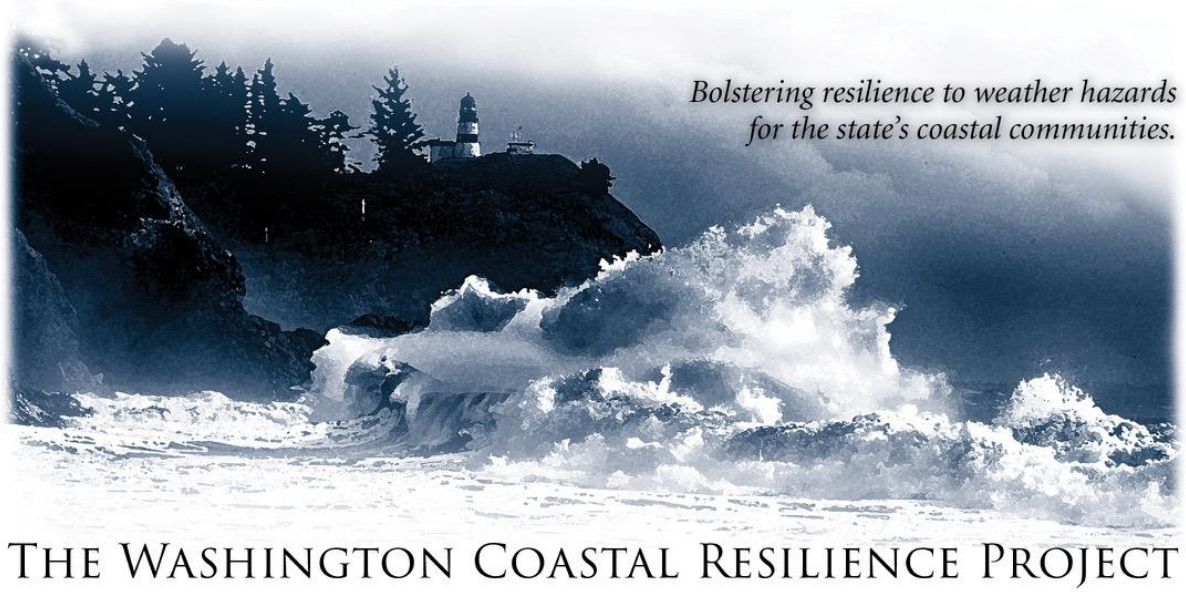
NEAR TERM STUDIES - EXAMPLES

Urgent needs

1. Invest in further research on key risks, particularly sea level rise and Puyallup River flooding. This would consist of detailed marine inundation area mapping, including update/review of topographic data for specific infrastructure assets and examination of flow connectivity.
2. Conduct additional studies to reduce uncertainty around the vulnerability of specific natural systems in the city, including through detailed spatial mapping.

NEXT STEPS

- Additional data
  - Wave Set-up and Run-up
  - Storm Surge
- Raising Awareness
  - Workshop
  - Staff Training
  - Incorporate in planning efforts
- Climate Adaptation (resilience) Study 2019/2020



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