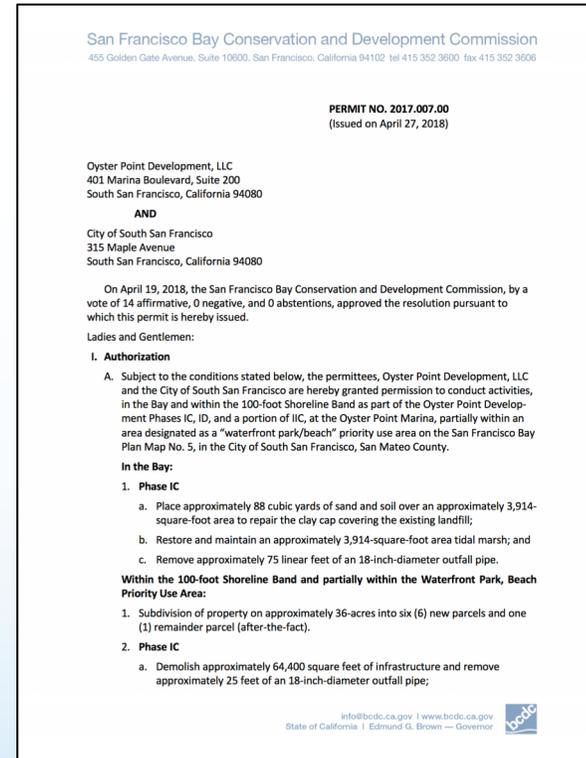
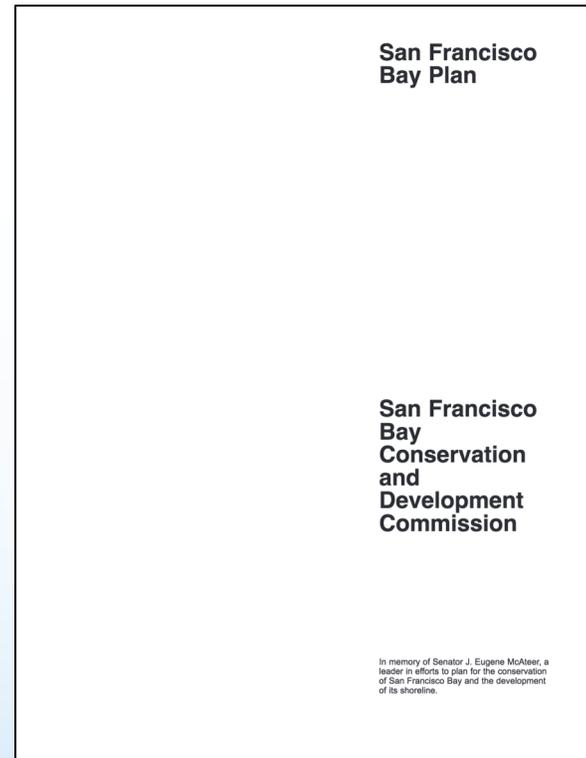
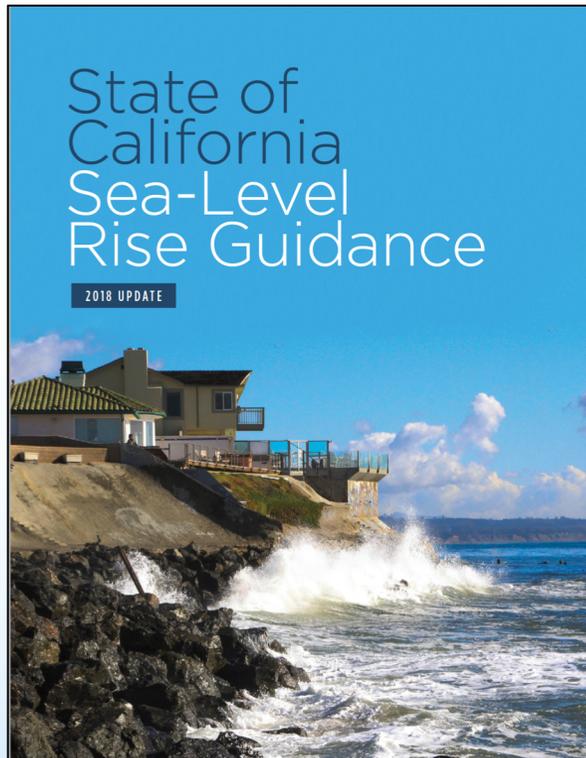


Policies to Permits: Applying State SLR Guidance – Part 2



Erik Buehmann
Chief of Federal Consistency and Permits

State Guidance

>> **STEP 1:** Identify the nearest tide gauge.

>> **STEP 2:** Evaluate project lifespan.

>> **STEP 3:** For the nearest tide gauge and project lifespan, identify range of sea-level rise projections.

>> **STEP 4:** Evaluate potential impacts and adaptive capacity across a range of sea-level rise projections and emissions scenarios.

>> **STEP 5:** Select sea-level rise projections based on risk tolerance and, if necessary, develop adaptation pathways that increase resiliency to sea-level rise and include contingency plans if projections are exceeded.

		Probabilistic Projections (in feet) (based on Kopp et al. 2014)				H++ scenario (Sweet et al. 2017) *Single scenario
		MEDIAN	LIKELY RANGE	1-IN-20 CHANCE	1-IN-200 CHANCE	
		50% probability sea-level rise meets or exceeds...	66% probability sea-level rise is between...	5% probability sea-level rise meets or exceeds...	0.5% probability sea-level rise meets or exceeds...	
		Low Risk Aversion			Medium - High Risk Aversion	Extreme Risk Aversion
High emissions	2030	0.4	0.3 - 0.5	0.6	0.8	1.0
	2040	0.6	0.5 - 0.8	1.0	1.3	1.8
	2050	0.9	0.6 - 1.1	1.4	1.9	2.7
Low emissions	2060	1.0	0.6 - 1.3	1.6	2.4	
High emissions	2060	1.1	0.8 - 1.5	1.8	2.6	3.9
Low emissions	2070	1.1	0.8 - 1.5	1.9	3.1	
High emissions	2070	1.4	1.0 - 1.9	2.4	3.5	5.2
Low emissions	2080	1.3	0.9 - 1.8	2.3	3.9	
High emissions	2080	1.7	1.2 - 2.4	3.0	4.5	6.6
Low emissions	2090	1.4	1.0 - 2.1	2.8	4.7	
High emissions	2090	2.1	1.4 - 2.9	3.6	5.6	8.3
Low emissions	2100	1.6	1.0 - 2.4	3.2	5.7	
High emissions	2100	2.5	1.6 - 3.4	4.4	6.9	10.2
Low emissions	2110*	1.7	1.2 - 2.5	3.4	6.3	
High emissions	2110*	2.6	1.9 - 3.5	4.5	7.3	11.9
Low emissions	2120	1.9	1.2 - 2.8	3.9	7.4	
High emissions	2120	3	2.2 - 4.1	5.2	8.6	14.2
Low emissions	2130	2.1	1.3 - 3.1	4.4	8.5	
High emissions	2130	3.3	2.4 - 4.6	6.0	10.0	16.6
Low emissions	2140	2.2	1.3 - 3.4	4.9	9.7	
High emissions	2140	3.7	2.6 - 5.2	6.8	11.4	19.1
Low emissions	2150	2.4	1.3 - 3.8	5.5	11.0	
High emissions	2150	4.1	2.8 - 5.8	7.7	13.0	21.9

Climate Change Policies



Public Access Policies:

- Public Access “permanently guaranteed”
- Design public access to avoid impacts to flooding
- Public access must be viable in the event of future sea level rise and flooding

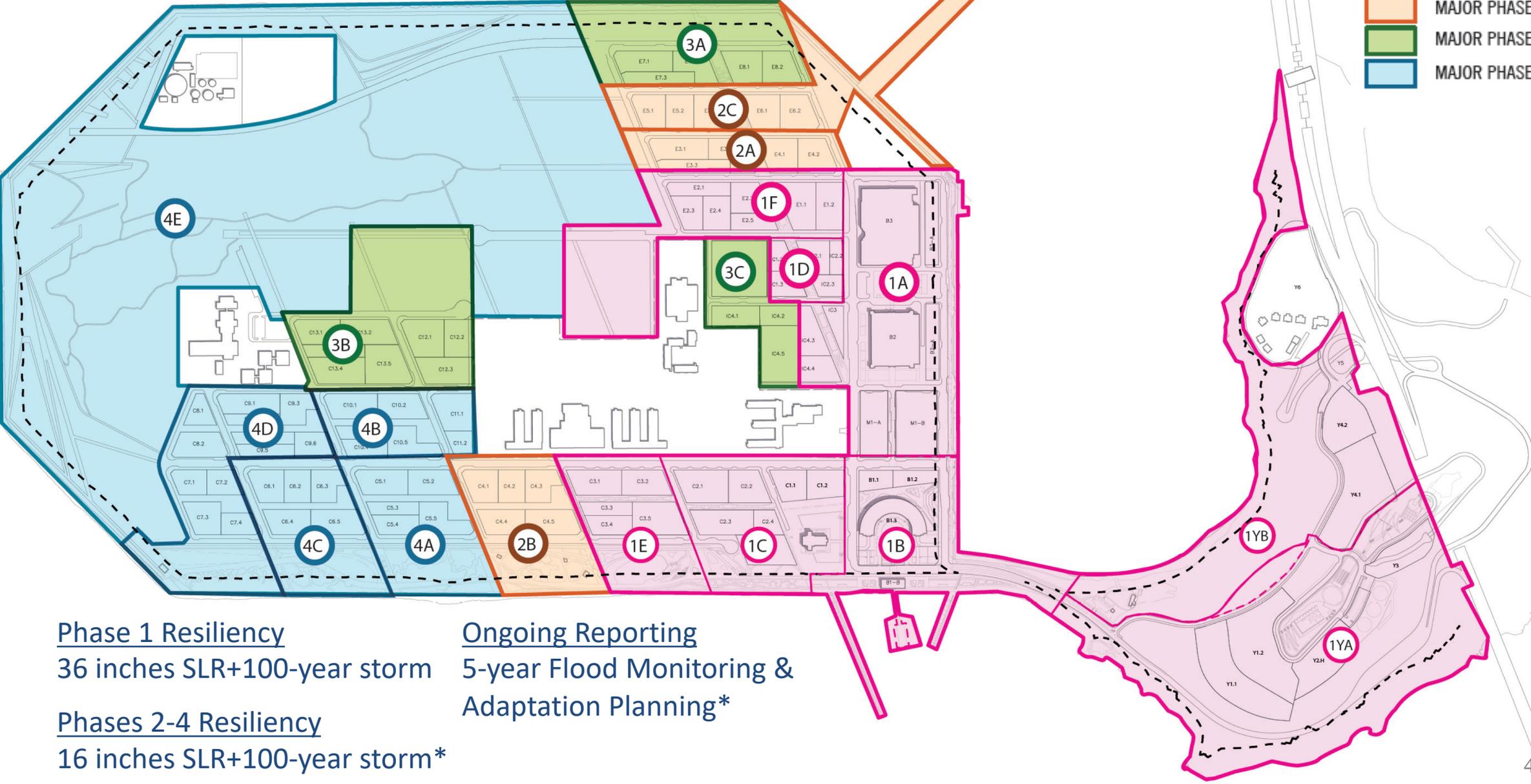
Climate Change Policies:

- Larger shoreline projects require a Risk Assessment
- IF risk to public safety, THEN Resilient to mid-century of sea level rise projections
- IF project life beyond mid-century, THEN Adaptation Plan

Treasure Island (Permitted 2016)

LEGEND

- MAJOR PHASE 1
- MAJOR PHASE 2
- MAJOR PHASE 3
- MAJOR PHASE 4



Phase 1 Resiliency
36 inches SLR+100-year storm

Ongoing Reporting
5-year Flood Monitoring & Adaptation Planning*

Phases 2-4 Resiliency
16 inches SLR+100-year storm*

Jack London Square Hotel Sea Level Projected Impacts



Bay Trail 11
Water Street 12

White cell shows freeboard in (##) feet Blue means asset is flooded by amount shown (-##) feet	Curent Elevation in feet (NAVD88)			Projected Sea Level Rise (feet)	Year: 2050		Projected Sea Level Rise (feet)	Year: 2100	
	Water Level	Bay Trail	Water Street		Emissions Level: High Emissions	Risk Category: Medium - High Risk		Emissions Level: High Emissions	Risk Category: Medium - High Risk
					Bay Trail			Water Street	
				1.9			6.9		
Seasonal Water Level									
Mean lower low water (MLLW)	-0.11	11.11	12.11	1.79	9.21	10.21	6.79	4.21	5.21
Mean low water (MLW)	0.97	10.03	11.03	2.87	8.13	9.13	7.87	3.13	4.13
Mean tide level (MTL)	3.34	7.66	8.66	5.24	5.76	6.76	10.24	0.76	1.76
Mean sea level (MSL)	3.28	7.72	8.72	5.18	5.82	6.82	10.18	0.82	1.82
Mean high water (MHW)	5.71	5.29	6.29	7.61	3.39	4.39	12.61	-1.61	-0.61
Mean higher high water (MHHW)	6.28	4.72	5.72	8.18	2.82	3.82	13.18	-2.18	-1.18
Flood Event									
FEMA 1 year stillwater elevation (100%) (AKA King Tide)	7.55	3.45	4.45	9.45	1.55	2.55	14.45	-3.45	-2.45
FEMA 2 year stillwater elevation (50%)	7.83	3.17	4.17	9.73	1.27	2.27	14.73	-3.73	-2.73
FEMA 5 year stillwater elevation (20%)	8.22	2.78	3.78	10.12	0.88	1.88	15.12	-4.12	-3.12
FEMA 10 year stillwater elevation (10%)	8.50	2.50	3.50	10.40	0.60	1.60	15.40	-4.40	-3.40
FEMA 25 year stillwater elevation (4%)	8.91	2.09	3.09	10.81	0.19	1.19	15.81	-4.81	-3.81
FEMA 50 year stillwater elevation (2%)	9.24	1.76	2.76	11.14	-0.14	0.86	16.14	-5.14	-4.14
FEMA 100 year stillwater elevation (1%)	9.60	1.40	2.40	11.50	-0.50	0.50	16.50	-5.50	-4.50
FEMA 500 year stillwater elevation (0.2%)	10.57	0.43	1.43	12.47	-1.47	-0.47	17.47	-6.47	-5.47
FEMA Base Flood Elevation (1%)	10.00	1.00	2.00	11.90	-0.90	0.10	16.90	-5.90	-4.90

FEMA/AECOM2016 Tidal Datum Location ID	562									Water Depth Color/Value Range
										< 0
										< -0.5
										< -1
										< -1.5
										< -2
										< -2.5
										< -3
										< -3.5
										< -4
										< -4.5
										< -5
										< -5.5
										< -6
										< -6.5
										< -7
										< -7.5
										< -8

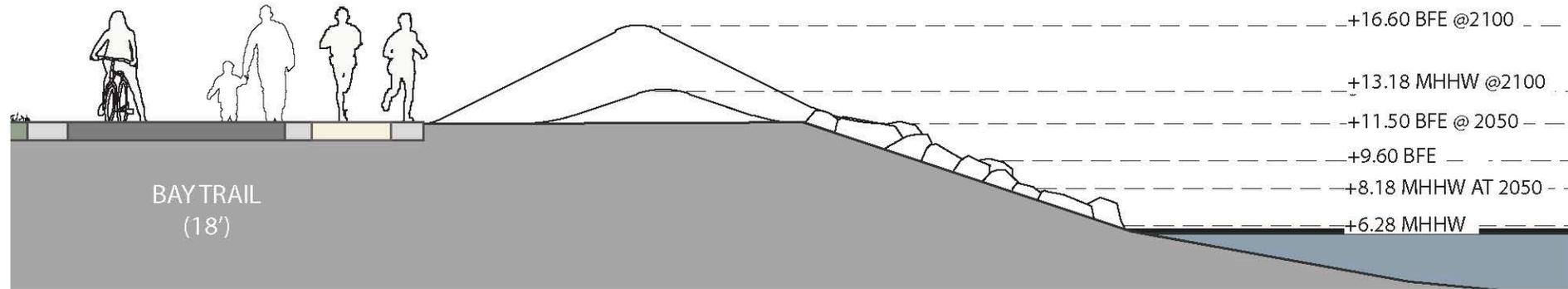
Orange value to be manually entered

Blue values are variable and are tied to formulas and conditional formatting in cells with black values/text

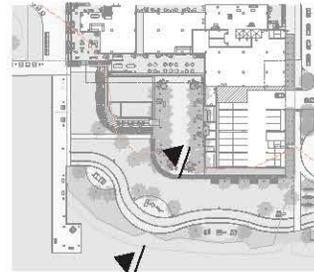
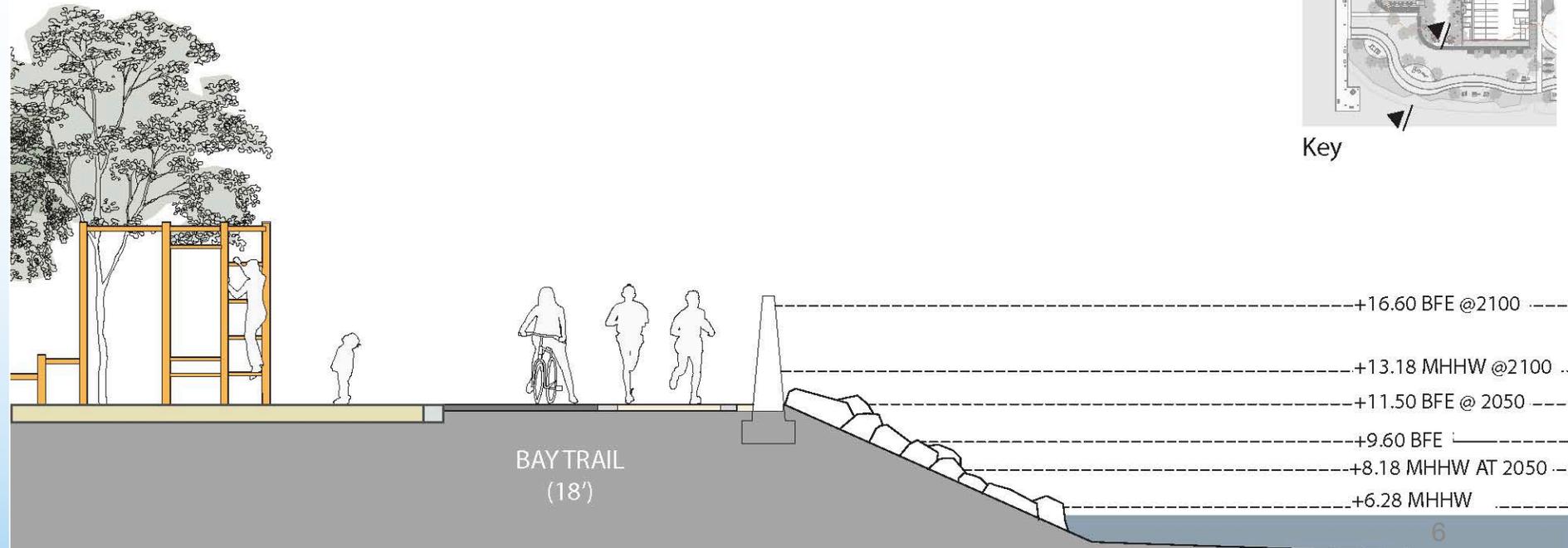
Revised May 3, 2018

Jack London Square

Hotel Site F3

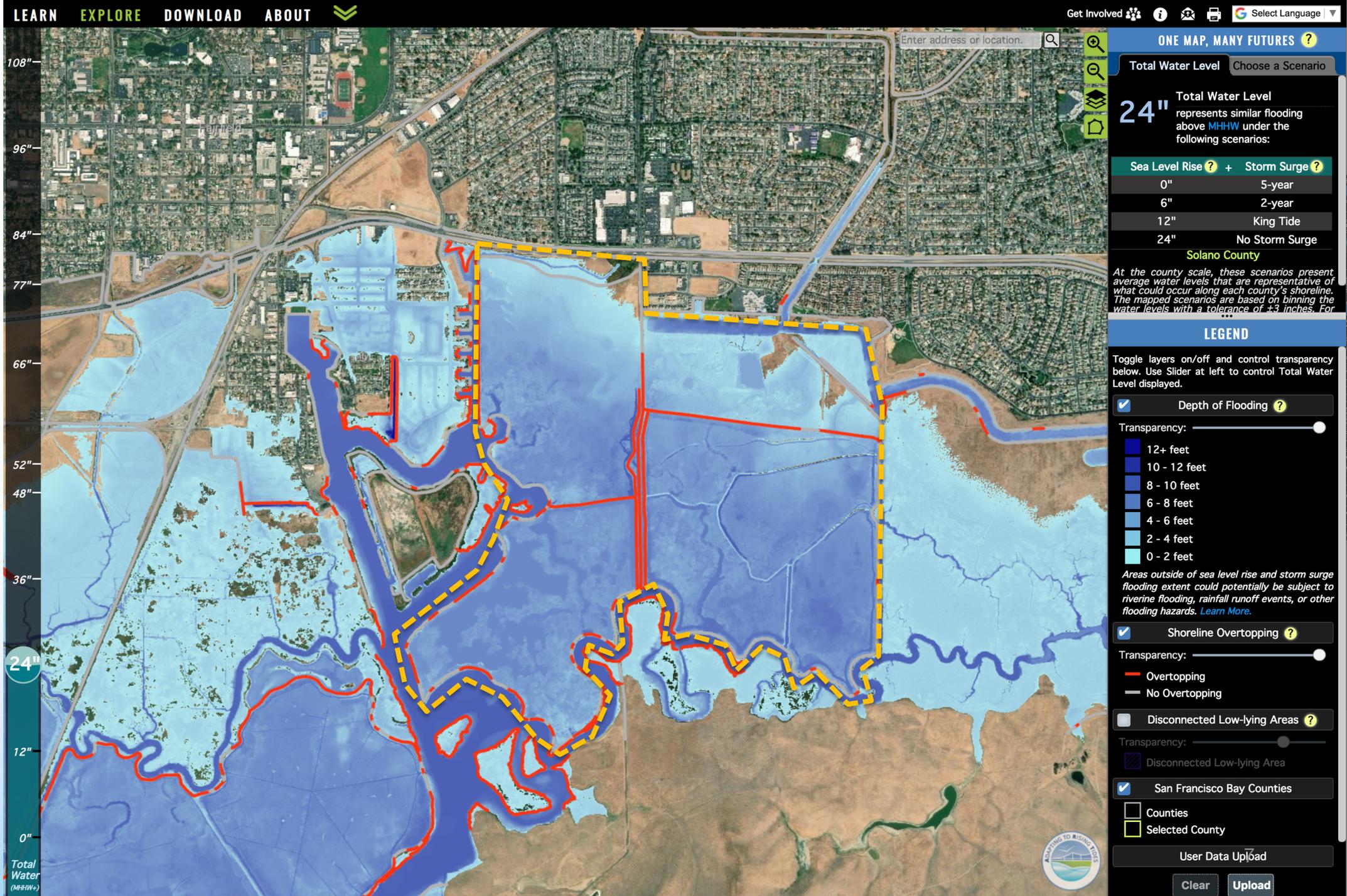


SCALE 1/8"=1'



Key

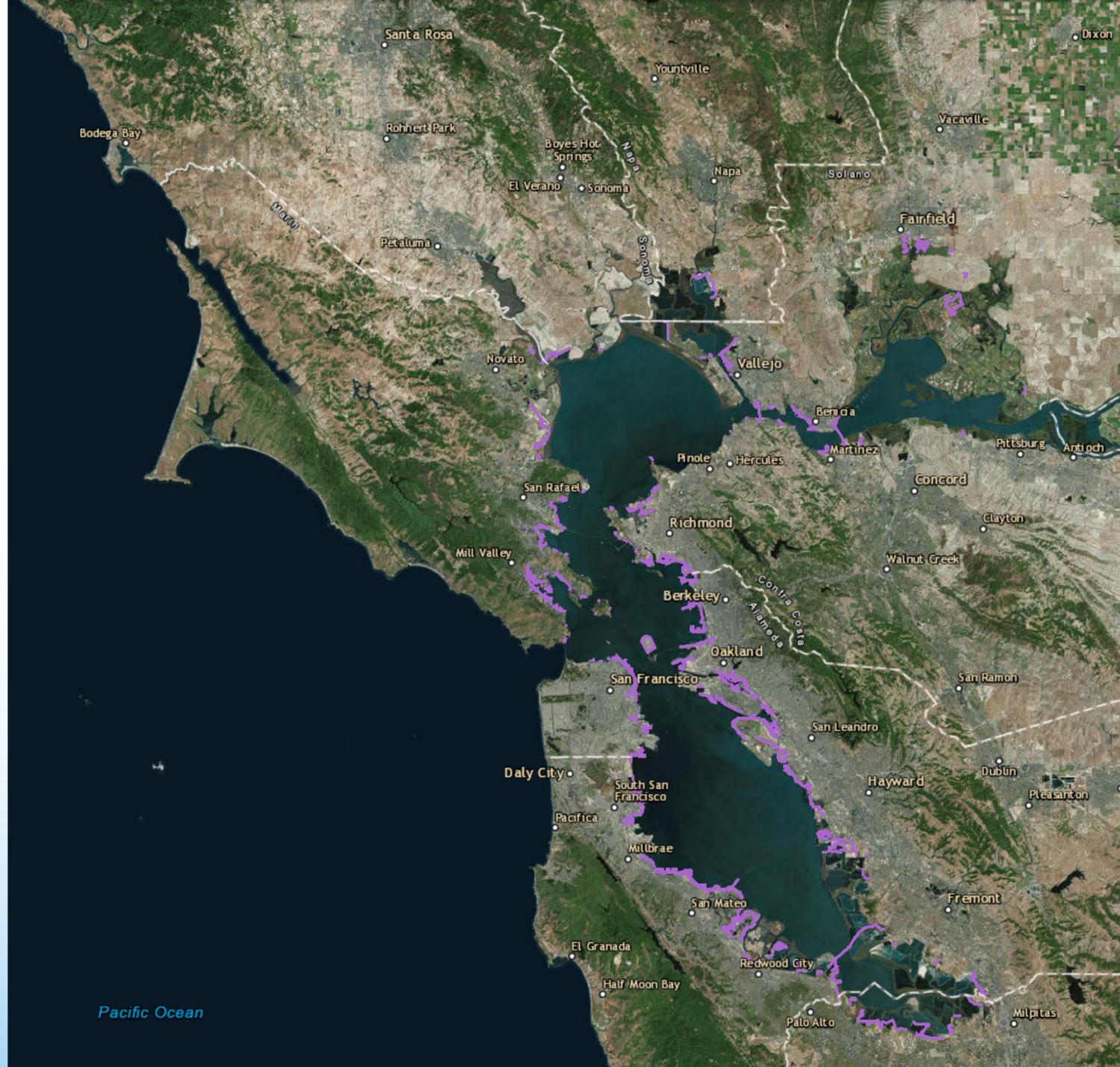
Hill Slough 24" SLR



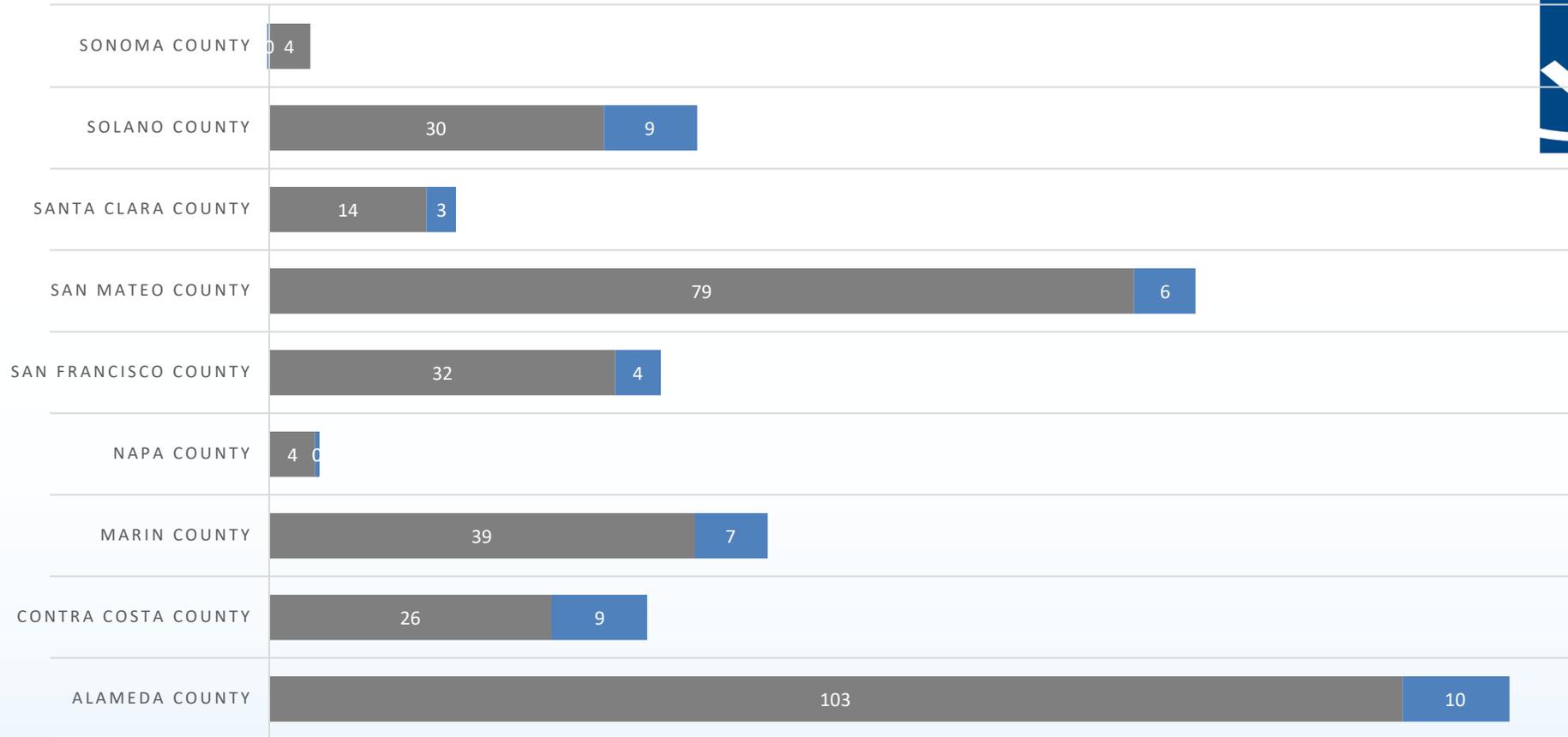
Existing Public Access & Potential Impacts from Flooding



Public Access for Existing Permits
*Very Rough Approximation
= 377 Miles



MILES PUBLIC ACCESS FLOODED WITH +108 INCHES SLR



Public Access Miles Flooding

Public Access Miles Not Flooding

100-year Storm at +66" SLR Water Level
 Medium-High Risk Aversion @ 2100
 (331 miles)

RISK AVERSION

- 1. Consequences of Impact
- 2. Adaptive Capacity
- 3. Who/What Affected?
- 4. Economic Impact



RISK CONSIDERATIONS & EVALUATION	Consequences of Impact or Disruption	LOW <i>Minimum Disruption, Limited Scale and Scope</i>	MEDIUM TO HIGH <i>Inconvenience, but Limited in Scope and Scale</i>	EXTREME <i>Unacceptable Risk and/or Extensive Scale and Scope</i>
	Adaptive Capacity	<ul style="list-style-type: none"> • Future flexibility maintained • People or systems readily able to respond or adapt 	<ul style="list-style-type: none"> • Limited future flexibility 	<ul style="list-style-type: none"> • Irreversible • Threat to public health and safety
	Who or What is Affected?	<ul style="list-style-type: none"> • Low impact on communities, infrastructure, or natural systems 	<ul style="list-style-type: none"> • Communities, systems, or infrastructure readily able to adapt or respond to change 	<ul style="list-style-type: none"> • Vulnerable populations • Critical infrastructure • Critical natural systems • Areas of economic, historic, or cultural significance
	Economic Impacts	LOW	MEDIUM	HIGH

Applying State SLR Guidance



- Emissions: Are low emissions scenarios worth considering?
- Risk Aversion: Low, Medium-High, H++.
 - How do we determine risk to public access?
 - How should risk be considered for restoration?
 - Should the amount of space available to adapt be considered in risk aversion?
 - H++ projects on the horizon – when to apply this risk category?
- Next Steps: Maintenance of public access and finance conditions in permits.