City of Berkeley

Berkeley Marina by Daderot [Public Domain], via Wikimedia Commons

The City of Berkeley was granted sovereign salt marsh, tide and submerged lands in trust in 1913 for the establishment, improvement, and conduct of a harbor and other utilities, structures, and appliances necessary or convenient for the promotion and accommodation of commerce and navigation. In 1961, the grant was amended to approve additional uses that were in the general statewide interest, including airports, highways, bridges, beltline railroads, public recreation, small boat harbors, restaurants, and landscaped areas.

City of Berkeley

AB 691 Sea Level Rise Impact Assessment

Annual Financial Statements

Granting Statutes

Staff Reports

Modified Assessment

Assessment Summary

AB691 Modified Assessment Criteria

1. **Name of AB 691 Trustee/Grantee (i.e. name of jurisdiction):** City of Berkeley

2. **Please provide a couple paragraphs summarizing the granted lands area, including total area covered, history of public trust uses on the granted lands, and a brief summary of anticipated SLR impact and vulnerabilities:**

   The granted lands area can be visualized as the area in the Berkeley Marina west of Marina Blvd where the western terminus is at the last section of the old Berkeley Municipal Pier. Grant of Tide Land map is attached below.

   East of the granted lands area (east of Marina Blvd) is the McLaughlin Eastshore State Park's Berkeley Meadow site, it is operated by the East Bay Regional Park District. The shoreline at the southside of University Ave is also in the Eastshore State Park jurisdiction.

   The Berkeley Marina, primarily in the granted lands area, has over 100 acres of park space, 7 miles of trails, picnic areas, a 17-acre off-leash dog area, bird-watching, educational programming at the Shorebird Park Nature Center, the nationally celebrated Adventure Playground, unparalleled panoramic views, and amenities for boaters and non-boaters alike.

   The anticipated SLR impact and vulnerabilities are:

   The still-water values for the low risk aversion sea level rise plus 100- year extreme tides are 10.1, 10.7 and 13.0 feet North American Vertical Datum of 1988 for years 2030, 2050 and 2100, respectively. Extreme wave runup and storm surge most impact the north, west and upper portion of the east side of the Marina.

   Damages to the Berkeley Marina are projected to be moderate by 2030 and rise considerably by the end of the century without mitigation. By 2030 there will be some roadway and parking facility inundation, particularly on Marina Boulevard and northeast of the protected area of the Marina, and flooding of McLaughlin Eastshore State Park's Berkeley Meadow site (operated by the East Bay Regional Park District).

   By 2050, parts of the Double Tree buildings will be flooded with finished floor elevations below the projected water surface elevation, as well as most of Marina Boulevard, portions of the trail, parking areas near the Doubletree Hotel, most of the Berkeley Meadow site and the revetment protecting University Avenue.

   By 2100, most of the land surrounding the protected area of the Marina, several buildings, significant parking areas, and the majority of University Avenue and Marina Boulevard will be inundated. By that time, there will be significant risk to the revetment, particularly by wave action and storm surge. Access to the Berkeley Marina via University Avenue will begin to be an issue periodically by 2030 and become more consistently difficult by near the end of the century. By 2050, access to some existing docks will be inundated and by 2100, the access to all the docks in the protected area of the Marina will be impacted by high water.

3. **Using examples from the list below, please identify your primary (critical to your operation) and secondary (important, but not critical) uses.**

   Primary uses: Recreation, safety and navigation, and Environmental Stewardship.

Recreation on both water-related and land based. Water-related includes non-profit sailing clubs, boating, and fishing…etc. Land-based recreation includes areas of Cesar Chavez Park, Shorebird Park, Horseshoe Park, nature center, Adventure Playground.

Cesar Chavez Park features a bird habitat, and an off-leash dog area.

There are about 1,100 boat slips including about 100 liveaboard slips. Also two small-scale commuter ferries operate out of the Berkeley Marina along with fishing charter boats.

Secondary uses: water-based commercials such as restaurants, hotel, boat repair/storage facilities, and stores.

4. **Please identify the nearest tidal gauge to your granted lands area (for a map of tidal gauges, please see Appendix 2 of the OPC 2018 Guidance):**

   The nearest tide gauge is at: BERKELEY,S.F.BAY, CA - Station ID: 9414816, https://tidesandcurrents.noaa.gov/stationhome.html?id=9414816#info.

   Per OPC 2018, the nearest tidal gauge is San Francisco.

5. **Please list the SLR projections for the 66% (Likely, or 'Low Risk Aversion') range and the 0.5% ('Medium-High Risk Aversion) range for your nearest tidal gauge. Planning and designing adaptation strategies for the H++, or 'Extreme Risk Aversion' scenario is encouraged, especially for assets that have a design life beyond 2050 that have little to no adaptive capacity, would be irreversibly destroyed or significantly costly to relocate/repair, or would have considerable public health, public safety, or environmental impacts should this level of sea-level rise occur (e.g. coastal power plant). For SLR projections tables for each tidal gauge, please see Appendix 3 of the OPC 2018 Guidance.**

   Year 2030: 0.5' (Low Risk Aversion), 0.8' (Medium-High Risk Aversion)

   Year 2050: 1.1' (Low Risk Aversion), 1.9' (Medium-High Risk Aversion)

   Year 2100: Low Emissions: 2.4' (Low Risk Aversion), 5.7' (Medium-High Risk Aversion)
   High Emissions: 3.4' (Low Risk Aversion), 6.9' (Medium-High Risk Aversion)

6. **Please choose one of the following SLR viewers to model the 2030, 2050, and 2100 projections in #5. Please indicate which viewer you used and provide a screen shot for each year.**

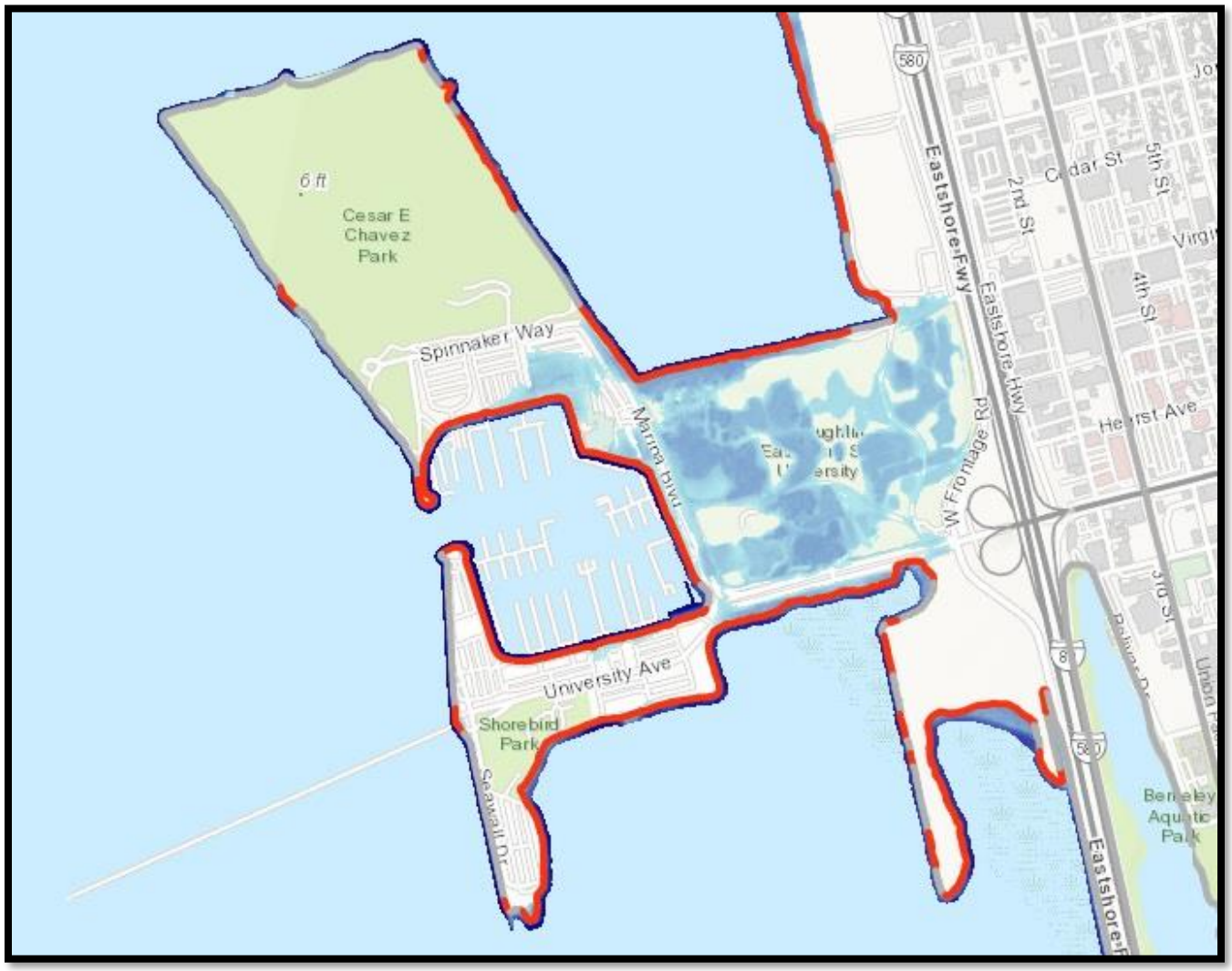
   The following maps are produced from BCDC ART Flood Explorer:

Map 1: 12” Rise. Captures 2030 @ 0.5’ (Low Risk Aversion) & 0.8’ (Medium-High Risk Aversion)

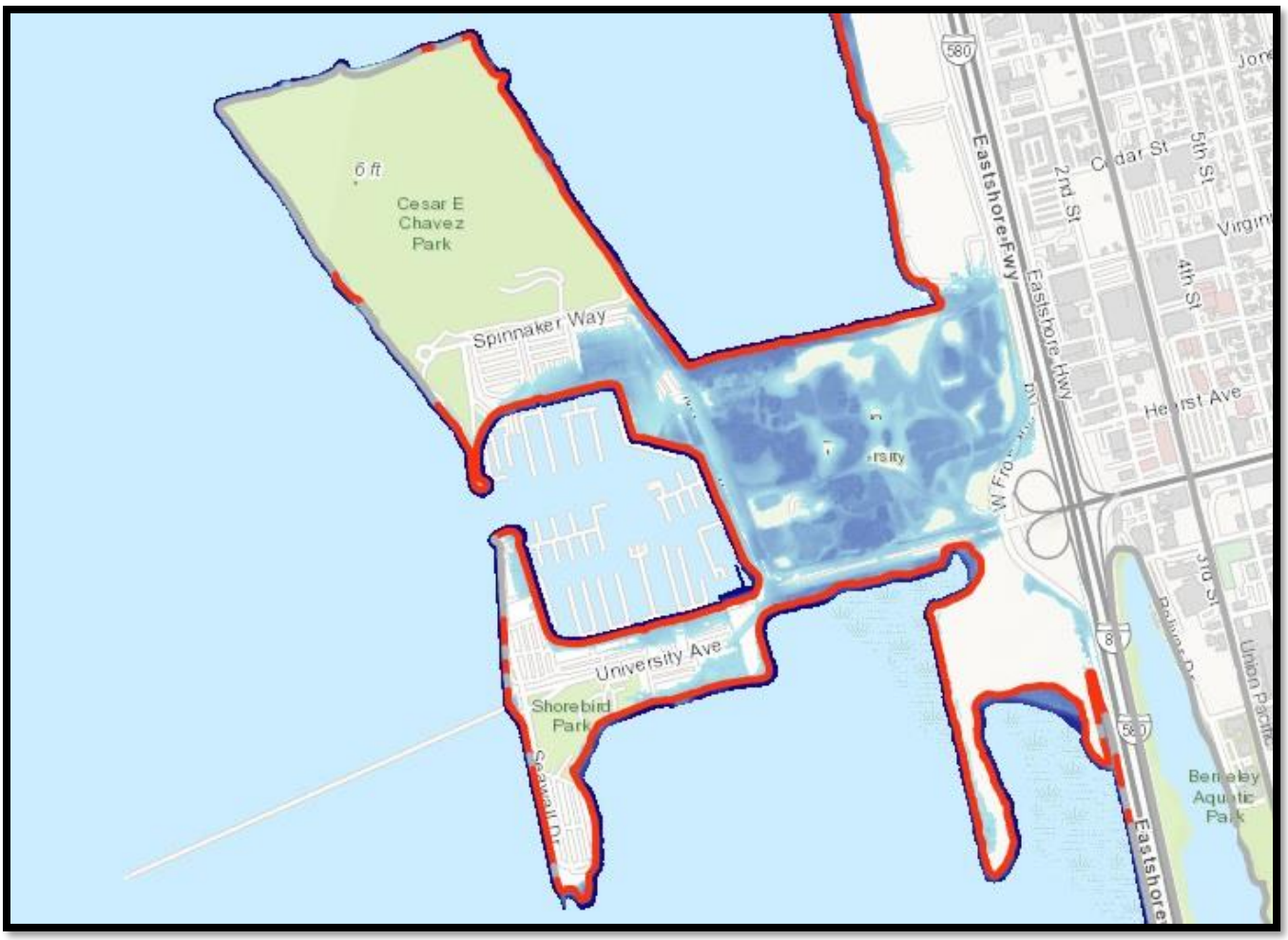
Map 2: 24” Rise. Captures 2050 @ 1.1’ (Low Risk Aversion) & 2050 @ 1.9’ (Medium-High Risk Aversion)

MAP 3: 36” 2100 @ 2.4’ (<u>Low Emissions</u> Low Risk Aversion) & 2100 @ 3.4’ (<u>High Emissions</u> Low Risk Aversion)

MAP 4: 66” Rise. Captures 2100 @ 5.7’ (<u>Low Emissions</u> Medium-High Risk Aversion)



Map 5: 84" Rise. Captures 2100 @ 6.9' (<u>High Emissions</u> Medium-High Risk Aversion)



7. **Identify public trust assets within granted lands area that are vulnerable to SLR between now and 2100.**

   a. Built Facilities and assets: Within the granted lands area, base on "Map 5: 84" Rise. Captures 2100 @ 6.9' (High Emissions Medium-High Risk Aversion)", the vulnerable facilities are: recreation trails, public streets, parking lots, and various buildings.

   b. Natural Assets: Almost all natural assets, primarily The Berkeley Meadow site, and area south of University Ave are located in Eastshore State Park jurisdiction. These areas are operated by the East Bay Regional Park District. The vulnerable natural assets in City of Berkeley jurisdiction, such as, Cesar Chavez Park, and Shorebird Park, are limited to shoreline overtopping as indicated in red from the BCDC ART Flood Explorer projection.

8. **Estimate anticipated costs of sea-level rise:**
   Note: These figures do not need to be exact, and you do not need to consult with an economist to estimate these figures. Consider costs of 2030, 2050, and 2100 high sea-level rise projection with a 100-year storm.

   Review these completed AB691 assessments from [County of San Mateo - Coyote Point]() or [City of Crescent City]() for examples to help you conduct your economic analysis. There are specific resources available on our [AB691]()

***page* to help you further understand how to complete this section, including an informational webinar on *natural capital economics* among other webinars and PowerPoint presentations. Please contact us if you need support with this section.**

	Current	2030	2050	2100
Repair, Replacement, Maintenance[1]	$0	$0	$3,019,000*	$17,0940,000*
Losses in non-market value[2]	$0	$0	$0	$12,000,000*
Adaptation costs[3]	$0	$1,050,000*	$11,050,00*	$15,59,600*

Notes:

[1] Per DRAFT Berkeley Marina Sea Level Rise AB 691 Assessment Study, Dated August 30, 2019 by NCE, Appendix G

[2] Per DRAFT Berkeley Marina Sea Level Rise AB 691 Assessment Study, Dated August 30, 2019 by NCE, page 17, 4.4.1 Non-Market Losses

[3] Per DRAFT Berkeley Marina Sea Level Rise AB 691 Assessment Study, Dated August 30, 2019 by NCE, Appendix H, Low Risk Aversion

*All above cost figures are based on the scenario of Low Risk Aversion PLUS 100-year Extreme Tide. These figures may be lower if only still-water is considered.

9. What adaptation measures or strategies are being considered to protect the public trust assets and granted lands area?

Year 2030: To accommodate the scenario base on Low Risk Aversion only, no adaptation is necessary.

Year 2050: Base on Low Risk Aversion PLUS 100-year Extreme Tide, flood walls are proposed per Figure 5.7 below.

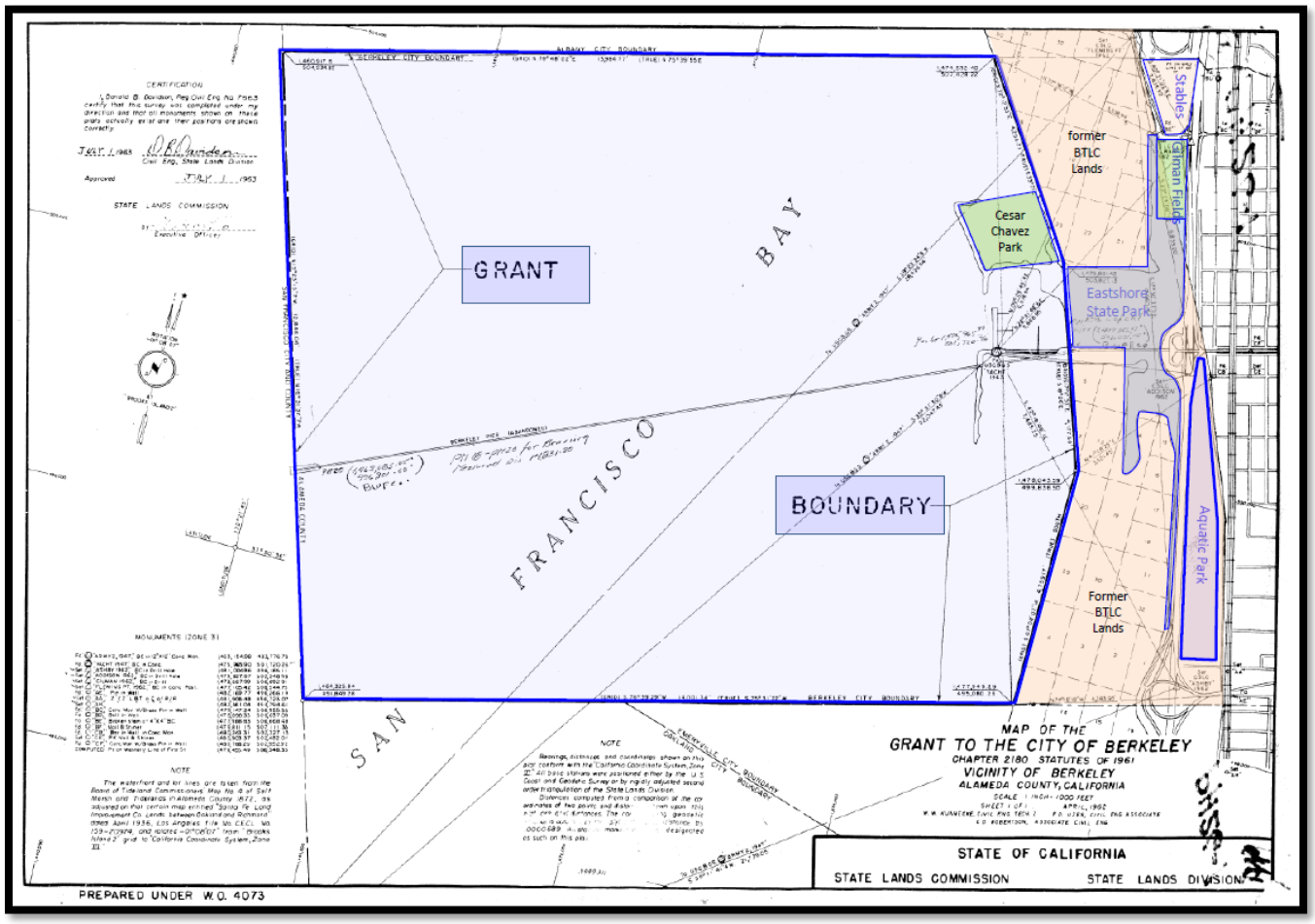
Year 2100: Base on Low Risk Aversion PLUS 100-year Extreme Tide, flood walls are proposed per Figure 5.8 below.

10. Please describe any existing or potential partnerships, or collaborations, related to sea-level rise vulnerability assessment or adaptation planning:

We plan to collaborate with the East Bay Regional Park District on adaptation planning at the areas adjoin the Eastshore State Park. We are in an existing partnership with San Francisco Bay Ferry aka WETA on a ferry terminal planning study. If the ferry terminal is feasible, the terminal location, an area near the existing Pier on Seawall Drive, will be designed to mitigate sea level rise.

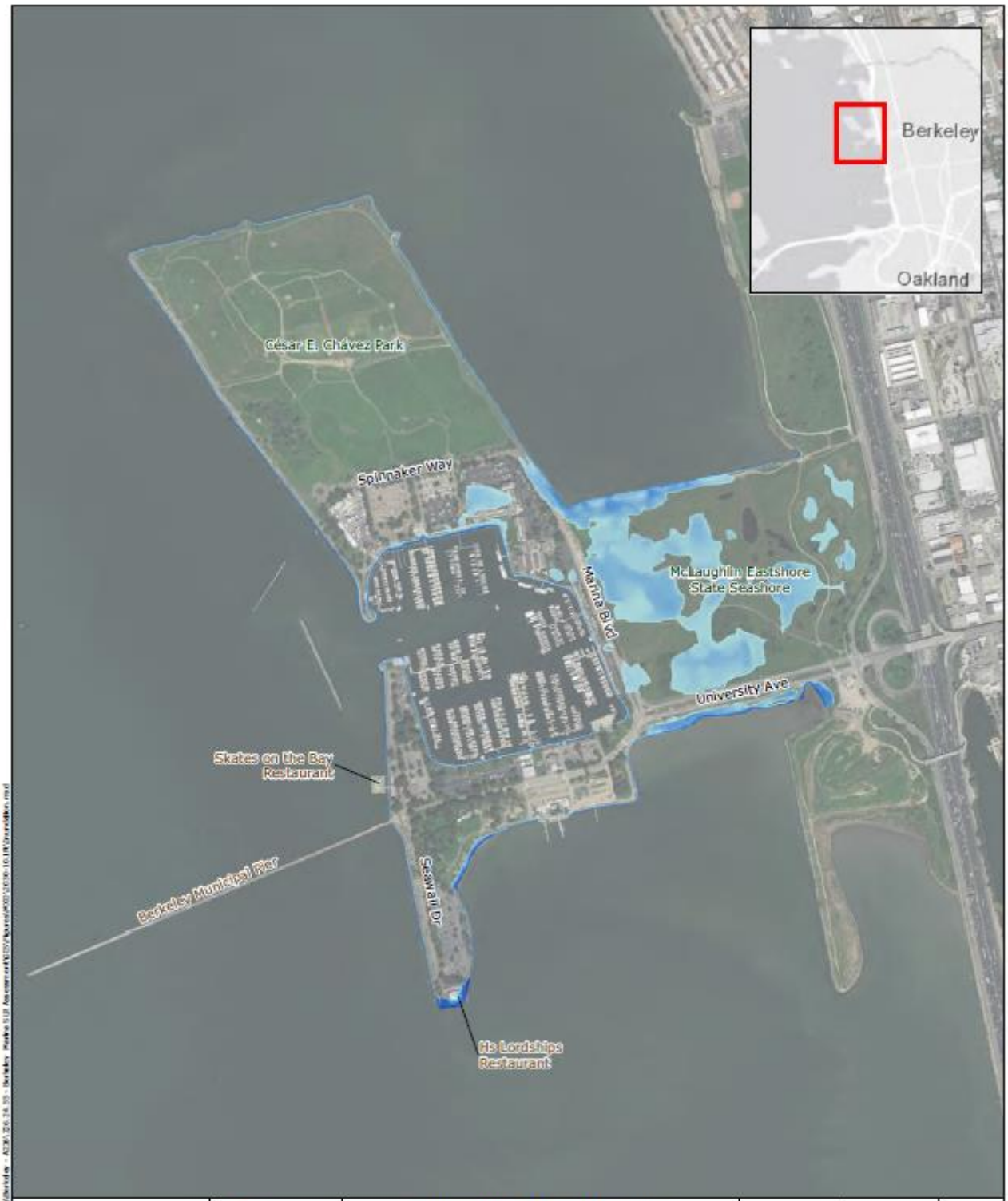
With your submission, please also include attachments in PDF, JPG, PNG or similar formats:

1. **One image or map displaying your granted lands area**



2. **SLR projection maps for years 2030, 2050, and 2100**

Maps below demonstrate Years 2030, 2050, and 2100 Sea Level Rise based on the scenario of Low Rise Aversion PLUS 100-year Extreme Tide. The 100-year extreme tide (based on the Alameda Gage data from the Federal Emergency Management Agency/San Francisco Bay Conservation and Development Commission "San Francisco Bay Tidal Datums and Extreme Tides Survey"). Therefore, these maps are more conservative than the above BCDC ART Flood Explorer projection maps. These maps are also located in the DRAFT Berkeley Marina Sea Level Rise AB 691 Assessment Study, Dated August 30, 2019 by NCE.



Legend
Depth
7.0 ft.
Trace

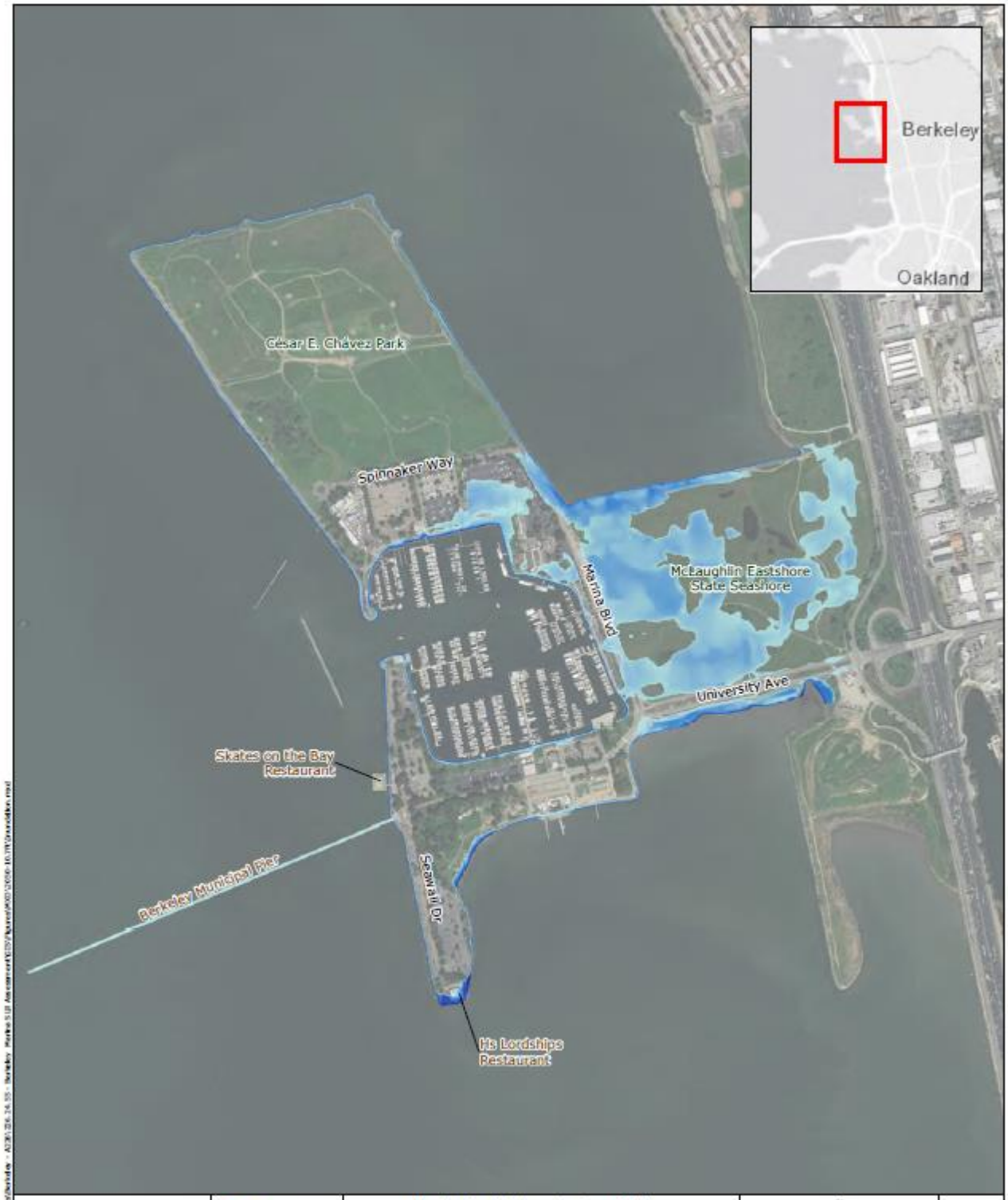
NCE

Berkeley Marina Sea Level Rise
AB 691 Assessment Study
2030 SLR Inundation
100-year Extreme Tide + Low Risk Aversion
(10.1 ft. WSEL NAVD 88)

1 in. = 1,000 ft.
0 500 1,000 ft.

FIGURE 3.1

SOURCE	JOB NUMBER	DRAWN	DATE	REVISED	APPROVED
ESRI World Imagery basemap	226.24.55	skobs	5/17/2019	5/23/2019	mhorvath



Legend
Depth
7.0 ft.
Trace

NCE

Berkeley Marina Sea Level Rise
AB 691 Assessment Study
2050 SLR Inundation
100-year Extreme Tide + Low Risk Aversion
(10.7 ft. WSEL NAVD 88)

1 in. = 1,000 ft.
0 500 1,000 ft.

FIGURE
3.2

SOURCE	JOB NUMBER	DRAWN	DATE	REVISED	APPROVED
ESRI World Imagery basemap	226.24.55	skobs	5/17/2019	5/23/2019	mhorvath

These maps are also located in the DRAFT Berkeley Marina Sea Level Rise AB 691 Assessment Study, Dated August 30, 2019 by NCE.

3. **At least one other relevant photo or image. This could include photos of past flooding, images of implemented or planned adaptation examples, maps, or similar**

Past Flooding Photos – Taken at King Tide at the intersection of Virginia Street Extension & Marina Blvd:

Planned Shoreline Adaptation by Phase

4. Optional: any vulnerability assessments or similar (complete or in progress)

Attached is the DRAFT Berkeley Marina Sea Level Rise AB 691 Assessment Study, Dated August 30, 2019 by NCE

Original Assessment Criteria:

1. **Assessment of impacts of sea-level rise**
    a. **Inventory vulnerable natural and built resources and facilities**
    b. **Consider impacts and recommendations described in the current State Sea Level Rise Policy Guidance: http://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20180314/Item3_Exhibit-A_OPC_SLR_Guidance-rd3.pdf**
    c. **Consider impacts of storms and extreme events**
    d. **Consider changing shorelines**
    e. **Consider trends in relative local sea level**
    f. **Consider impacts to public trust resources and values, including but not limited to public access, commerce, recreation, coastal habitats, and navigability**
    g. **Prioritize vulnerabilities to be addressed**

2. **Maps of 2030, 2050, and 2100 impacts**
    a. **FEMA flood hazard maps can be accepted, if projected timeframe is appropriate**
    b. **Refer to online mapping tool resources if the trustee does not have in-house resources needed to complete**

3. **Estimate of financial costs of sea-level rise**
    a. **Replacement or repair costs of resources and facilities that could be impacted by sea-level rise and climate change processes**
    b. **Non-market values, including recreation and ecosystem services, of public trust resources that could be impacted by climate change and sea-level rise processes**
        i. **See Center for the Blue Economy library or Duke Marine Ecosystem Services Partnership**
    c. **Consider costs of 2030, 2050, and 2100 high sea-level rise projection with a 100-year storm**
    d. **Include anticipated costs of adaptation/mitigation measures, and potential benefits of such strategies and structures**

4. **Description of how trustee proposes to protect and preserve resources and structures that would be impacted by sea-level rise**
    a. **Describe proposed mitigation/adaptation measures, and how vulnerabilities will be addressed**
    b. **Describe timeframe of implementation of such measures**
    c. **Describe plans to monitor impacts of sea-level rise and climate change, as well as effectiveness of mitigation/adaptation measures**
    d. **Describe any regional partnerships the trustee is party to or intending to form that would address sea-level rise and climate change vulnerability or increase resiliency**