Sea Change Burlingame
Proposed Sea Level Rise Adaptation Strategies
Update to City Council

December 2nd, 2019
Meeting Agenda

- Overview
- Project Process
- Key Findings
- Next Steps
Strategy Selection Process

Identify Vulnerabilities → Goals & Objectives → Strategies → Evaluate
Project Milestones

June
• Task 2, Stakeholder Outreach Plan
• Task 3, Decision Making Framework
• Task 4, Risk and Vulnerability Assessment

July
• Technical Advisory Committee Meeting – 7/10
• Stakeholder Meeting – 7/10

August
• Task 5, Identify and Screen Adaptation Strategies
• Task 6, Advance and Illustrate 3 Concepts

October
• 2nd Technical Advisory Committee Meeting – 10/16
• Community Meeting (50 people in attendance) – 10/16

November
• Task 7, Road Map and Next Steps
Takeaways

1. Burlingame’s shoreline is at risk from SLR, particularly starting at 100-year/1% flood

2. Burlingame will need to decide what to protect and to what level

3. Adaptation strategies recommended for Burlingame include raising levees at low points, managing creeks and sediment, and maintaining flood walls

4. Next steps include feasibility and hydrology studies to develop more fine-tuned understandings of how to implement solutions
Vulnerability Assessment Conclusions

- 1% Annual Chance Flood expected to flood:
  - Hwy 101 and adjacent neighborhoods, west of Broadway
  - Areas adjacent to Burlingame Lagoon
- 1% Annual Chance Flood + 3.3’ SLR expected to expand flood area to portion of Caltrain tracks
- Bay shoreline and Creek levees are the most likely pathway for flood waters
- Results suggest significant flooding could occur at less than 100-year (1% annual chance) flood event

Source: OCOF
Raise Levees

Regulatory constraints for wet side fill

Source: USACE (2000), Rebecca Nelson
Install Sheet Pile Floodwalls

Vinyl Sheet Pile Floodwall
(Max. 3 feet above grade)

Steel Sheet Pile Floodwall
(6+ feet above grade)
Tide Gates and Active Barriers

Palo Alto Flood Basin

Venice, Italy

Project MOSES: How it will work

1. Barrier stays on seabed until high tides and storms are forecast
2. Air is pumped into each hollow gate to raise barrier
3. Gates move independently, allowing barrier to deal with rough seas
Nature-based Solutions

Source: SFEI & SPUR (2019)
Burlingame Shoreline Reaches
Reach 1

- Coordinate with County and City of Millbrae to perform study of combined runoff and high tide design flood elevation along El Portal Creek
- Coordinate with City of Millbrae on appropriate adaptation measures along El Portal Creek/Canal
- Coordinate with City of Millbrae on placing tide gate and pump station at Hwy 1 and Bayshore crossings

- Raise low-lying portions of the levee & Bay Trail to 13’ NAVD88
- Where space allows, reduce slope and vegetate Bay side of levee

Maintain-enhance concrete flood wall in areas where room for levee raising is currently limited

Consider placing seepage-cutoff along old Bayshore Rd
Reach 2

- Consider installing tide gate & pump station at Mills, Easton Creek crossings.

- Consider raising banks of Mills and Easton Creeks based on findings of County study of combined watershed runoff and Bay flooding.

- Maintain-enhance concrete flood wall in areas where room for levee raising is currently limited.

- Raise low-lying portions of the levee/Bay Trail.
- Where space allows, reduce slope and vegetate Bay side of levee.

- Consider actions upstream on Easton and Mills Creeks that would increase sediment delivery to the Bay to support Bay front mudflats.
- Assess potential for creating beach fronting levee.

Ground Surface Elevation (feet NAVD88)

- Streams: 6.01 - 7
- Streets: 7.01 - 8
- Ground Elevation: 0.24 - 1, 1.01 - 2, 2.01 - 3, 3.01 - 4, 4.01 - 5, 5.01 - 6
- Bay Elevation: 10.01 - 11, 11.01 - 12, 12.01 - 13, 13.01 - 14

- Pump Stn
Reach 3

- Explore feasibility for reducing wave energy on the shoreline through construction of bay beaches with beneficial reuse of local dredge sediment
- Raise low-lying portions of the levee/Bay Trail
- Consider more in-depth assessment of waste-water treatment plant
- Continue to track SLC development of 450 Airport Blvd parcel
Reach 4

Consider actions upstream that could increase sediment delivery to the Burlingame Lagoon.

Raise levee and path and tie into path along the shoreline west of Anza Blvd.

Assess feasibility of tide gate / active barrier for creek mouth.

Raise low-lying portions of levee and path.

Consider protecting Hwy 101 with shoreline enhancements to capture sediment and decrease slope, such as horizontal levee construction and marsh vegetation enhancement with cordgrass.

Consider protecting Hwy 101 with shoreline enhancements to capture sediment and decrease slope, such as horizontal levee construction and marsh vegetation enhancement with cordgrass.
Reach 5

Coordinate with Burlingame Point on the extent and elevations of site grading and integrating perimeter levees with open space.

Consider raising shoreline levee as part of a long-term strategy.

Coordinate with County Parks and City of San Mateo on tying Bay Trail improvements together with shoreline fronting Airport Dr.

Consider extending Coyote Point beach.
Summary

- Raising the shoreline in Reaches 1 and 2 (from Millbrae boundary to Broadway) would have substantial benefits.

- In the short-term, raising the shoreline will likely require a combination of raising or building new levees and improving existing flood walls.

- Aesthetic and recreational impacts of raising the shoreline can be mitigated by integrating the Bay Trail on the improved shoreline.

- Raising the shoreline should be combined with a similar effort raising low-lying portions of the banks of El Portal, Mills, and Easton Creeks.

- Just offshore along parts of Reaches 2, 3, and 5, there are opportunities to create or enhance Bay habitats (e.g. ‘living shorelines’). Where feasible, they should be combined with an improved flood barrier system along the shoreline.
Levee

SEA CHANGE
BURLINGTON ADAPTATION
Floodwall removed and replaced with levee

Existing

Floodwall is removed

Built levee includes public access trail at peak

One row of parking may be eliminated

Existing levee raised (approx. 4 ft shown)

Extended levee may eliminate a row of parking

Proposed levee detail

Proposed
Levee to Floodwall Transition

**SEA CHANGE**
**BURLINGAME ADAPTATION**

Floodwall transition to levee

- **Existing**
  - Existing floodwall in front of building is raised multiple feet
  - Trail is enhanced with additional plantings

- **At transition**
  - Floodwall is embedded into levee for 50 ft
  - At transition, floodwall is embedded into levee for 50 ft

- **Proposed**
  - Levee stops downward behind floodwall

**Transition from Levee to Floodwall Detail**
Next Steps – 5-Year Work Plan

**STUDY AND COORDINATE**

2020

1. Shoreline Survey (2-3 months)
2. Integrate Creek and Coastal Flood Hazard Assessments (6-9 months)
3. Shoreline Land Ownership Inventory (2-9 months)
4. Groundwater Study (3 months)

2021

Feasibility Study (1-1.5 years)

2022

Cost-Benefit Analysis (1-1.5 years)

2023

Final Gap Studies (2-6 months)

**EVALUATE AND DESIGN**

2023

DECISION POINTS
- Decide on Design Criteria
- Determine Funding Source

Design (1-3 years)

2024

Environmental Compliance (1-1.5 years)

**COORDINATION**

1. Leverage existing and new resources on the topics of land use tools, funding options, and groundwater studies
2. Craft and Sign MOU with OLU Cities, SFO, FSLRRD on Creek and Shoreline Protection
3. Begin Public and Stakeholder Outreach

**CRITICAL PATH**
# 5-year Work Plan with Costs

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**Milestones:**
1. Technical Advisory Committee (TAC/Community Meeting to discuss outcome of feasibility, and to lay out approach of the feasibility study)
2. (TAC/Community Meeting to discuss outcome of feasibility study)
3. City, state, and design entities addressing SURE Defiant funding sources
4. (TAC/Community design schematics)
5. City determines funding sources
Beyond 5 years

• **5-15 Years**
  – Complete Design & Environmental Review
  – Decide on and Implement Priority Projects

• **15-30 Years**
  – Implement Full Adaptation Strategy
  – Continue to make improvements to raise shoreline
  – Raise creek levees
  – Participate in regional efforts
  – Plan for realignment of buildings in footprint of levee
Thank you
• March
  – Task 2, Strategic Outreach Plan - Draft
  – Task 3, Decision Making Framework - Draft
  – Task 4, Risk and Vulnerability Assessment - Draft
• June
  – Task 3, Decision Making Framework – Final
  – Task 4, Risk and Vulnerability Assessment - Final
  – Task 5, Identify and Screen Adaptation Strategies – Draft
• July
  – TAC and Stakeholder Meeting – July 10th
• August
  – Task 5, Identify and Screen Adaptation Strategies – Final
October
- Task 6, Advance and Illustrate 3 concepts – Draft
- Task 6, Advance and Illustrate 3 Concepts – Final
- Task 5, Identify and Screen Adaptation Strategies – Final
- **TAC and Community Meeting – October 16th**
  - 50 members of the public in attendance

November
- Task 7, Road Map & Next Steps – Draft
- Task 7, Road Map & Next Steps - Final
5-year Work Plan

• 2020
  – Complete background studies for Feasibility Study
    • Shoreline Survey for Topography, Infrastructure Condition
    • Integrated Creek and Coastal Flood Hazards
    • Shoreline Land Ownership Inventory
    • Groundwater Study
  – Leverage existing and emerging resources on key topic areas
    • Land Use tools
    • Funding options
    • Regional Groundwater
5-year Work Plan

• **2021**
  - Complete Feasibility Study
  - Cost-Benefit Analysis
  - Craft and Sign MOU with Operational Landscape Unit partners (Millbrae, San Mateo, SFO, FSLRRD)
  - Begin public and stakeholder outreach

• **2022**
  - Complete any final gap studies that were not studied regionally
5-year Work Plan

• **2023**
  - Begin Design
  - Decide on design criteria
  - Determine funding source
  - Continue MOU agreement coordination
  - Continue public and stakeholder outreach

• **2024**
  - Continue Design
  - Begin Environmental Compliance
  - Continue public and stakeholder outreach
Next Steps

Burlingame Road Map to Sea-Level Rise Adaptation

5-YEAR WORK PLAN

STUDY AND COORDINATE

2020
1. Shoreline Survey (2-3 months)
2. Integrate Creek and Coastal Flood Hazard Assessments (6-9 months)
3. Shoreline Land Ownership Inventory (2-9 months)
4. Groundwater Study (3 months)

2021
Feasibility Study (1-1.5 years)

2022
Cost-Benefit Analysis (1-1.5 years)

2023
Design (1-3 years)
DECISION POINTS
- Decide on Design Criteria
- Determine Funding Source

2024
Environmental Compliance (1-1.5 years)

IMPLEMENT

DECISION POINTS
- Decide on Priority Projects
- Raise Funds
- Implement Priority Projects

PRIORITY PROJECTS
1. Implement Adaptation Strategy
2. Additional Improvements to Raise Shoreline Crest Elevations
3. Raise Creek Levees

15-30 YEARS

MONITOR AND ADAPT

LONG-TERM PROJECTS

COORDINATION

1. Leverage existing and new resources on the topics of land use tools, funding options, and groundwater studies
2. Craft and Sign MOU with OLU Cities, SFO, FSLRRD on Creek and Shoreline Protection
3. Begin Public and Stakeholder Outreach

1. Monitor SLR and Flooding Projections
2. Follow and participate in Regional SLR Adaptation
3. Plan for Retrofit/Realignment of Buildings in Footprint of Levee
Beyond 5 years

• 5-15 Years
  – Complete Design & Environmental Review
  – Decide on and Implement Priority Projects

• 15-30 Years
  – Implement Full Adaptation Strategy
  – Continue to make improvements to raise shoreline
  – Raise creek levees
  – Participate in regional efforts
  – Plan for realignment of buildings in footprint of levee