

**Adapt Waikīkī 2050  
Charrette 1 Summary  
May 13, 2024, 8:30 AM-11:30 AM  
Ala Wai Golfcourse**

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**Attendees:**

**Project Team:**

- ✓ Noelle Cole, DPP Project Manager
- ✓ Dina Wong, DPP Planning Division Chief
- ✓ Imelda Fernandez, DPP Planning Division
- ✓ Min Bu, DPP Planning Division
- ✓ Kitty Courtney, Tetra Tech, Lead Consultant Project Manager
- ✓ Carol Hufnagel, Tetra Tech, Project Engineer
- ✓ Wendy Meguro, Workshop Green, Architect
- ✓ Melissa May, SSFM, Project Manager & Senior Planner
- ✓ Malachi Krishok, SSFM, Senior Planner
- ✓ Ollie Lau, SSFM, Planner
- ✓ Rachael Han, SSFM, Civil Design Engineer

**Working Group Attendance List:**

<b>Name</b>	<b>Agency</b>
Barry Usagawa	BWS
Dominic Dias	BWS
Lenny Fabro	DES
Paul Christiansen	DES
Randall Wakumoto	DFM
Saani Fong	DFM
Steve Young	DPP: Civil Engineering
Kaily Pascua	DPP: Traffic Review
Alex Beatty	DPP: Urban Design
Jen Barra	DPR
Scott Brady	DTS
Alex Yee	OCCSR
Matt Gonser	OCCSR
Christin Reynolds	One World One Water
Rachel Beasley	State OPSD CZM

Name	Agency
Darrin Dukes	U.S. Army Garrison Hawai'i
Lexa Mederohernandez	U.S. Army Garrison Hawai'i
Michelle Ogman	U.S. Army Garrison Hawai'i
Jayson Abayon	U.S. Army Garrison Hawai'i
Eugene Nam	U.S. Army Garrison Hawai'i

**Guest Attendance List:**

- ✓ Chase McDaniel, OCCSR
- ✓ Jason Bolling, Hale Koa Hotel
- ✓ Corey Matsuoka, SSFM, Civil Engineer
- ✓ Kitty Wong, SSFM, Structural Engineer

**Meeting Objectives**

- Introduce project and consultant team.
- Present Climate Change scenarios facing public infrastructure in Waikīkī.
- Identify and discuss feasibility of potential adaptation solutions to mitigate flood risk.

**Meeting Summary Notes**

**Introductory Presentation:**

- AW2050 Plan aims to create recommendations to be implemented over the next 25 years to:
  - Protect public safety from rainfall-driven flood events.
  - Improve the environment of Waikīkī through better stormwater management.
  - Extend the useful life of subsurface infrastructure exposed to shallow groundwater.
  - Create adaptation pathways informed by level of service determinations in the long term.
- The project is in early stages and will be collecting input from stakeholders including City/State agencies, landowners, businesses, residents, and community organizations. This is the first of three charrettes and is focused on exploring potential adaptation strategies around public infrastructure and facilities for three climate risk scenarios.
- Climate Risk Scenarios (described and accompanied by projected hazard and risk maps):

- Scenario 1: Rainfall-Driven Compound Flooding (1 ft SLR, ~2040)
  - Objective: Mitigate temporary and widespread flooding from extreme rainfall events compounded by high tides and storm surge.
- Scenario 2: SLR-Driven Shallow Groundwater Exposure (1 ft SLR, ~2040)
  - Objective: Extend the useful life of subsurface infrastructure exposed to permanent and widespread shallow (<5 ft below land surface) groundwater.
- Scenario 3: SLR-Driven Groundwater Inundation (4 ft SLR, ~2080)
  - Objective: Address permanent and localized flooding from groundwater above land surface.
- Scenario 4: SLR-Driven Groundwater Inundation (6 ft SLR, ~2100)
  - Objective: Address permanent and widespread flooding from groundwater above land surface.
- Pre-Meeting Homework
  - Task: Identify current infrastructure problem areas and impacts within Waikīkī, and the timing of planned Capital Improvement Projects relative to SLR projections.
  - Summary:
    - Erosion is occurring approximately from Kapi'olani Park to Fort DeRussy.
    - Inundation is occurring throughout the entire WSD.
    - Damage to infrastructure assets is occurring along Kalia Road.
    - Chronic asset failure is occurring along Fort DeRussy Beach.
    - All reported CIP is estimated to start in 2030 with varying projected useful lives from 20 to 70 years.
- Activity Overview
  - Attendees were split into four groups, with members from the same agencies placed into different groups.
  - Each group started at a different station that focused on one of the four scenarios listed above and discussed the scenario's impacts, related concerns, and feasibility/limitations of pre-identified adaptation strategies relative to each agency. A facilitator and note-taker from the project team were present at each table.
  - Groups rotated after 20 minutes to the next scenario until each group had discussed all scenarios.
  - The group reconvened for a summary de-brief from each facilitator.

**Post-Charrette Key Takeaways:**

### **Scenario 1: Rainfall-Driven Compound Flooding (1 ft SLR, ~2040)**

- Physical Adaptation Strategies Identified/Discussed:
  - Revise existing open space requirements to include more explicit requirements for pervious over impervious paving.
  - Consider updating floodproofing requirements to require elevation of equipment, not just dry floodproofing.
  - Increase detention within existing green spaces (such as Fort DeRussy, Kapi‘olani Park, etc.).
  - Maximize green infrastructure in existing developed/undeveloped areas with capacity/potential (i.e., permeable pavers, pocket parks, blue/green roofs, bioswales).
  - Look at making mauka-makai streets permeable, pedestrian oriented.
  - Revisit building setback requirements along Kalākaua (20 ft), Kūhiō (15 ft), etc. This would allow for increased feasibility of green infrastructure and create a smooth transition from street to buildings.
- Long-Term Considerations/Needs Identified/Discussed:
  - The critical challenge is stormwater/drainage, in need of a stormwater drainage master plan that considers the entire watershed.
  - Need an overall economic study for Waikīkī to determine cost-effectiveness of infrastructure investment.
  - If considering stormwater pumping, the current stormwater system would need to be significantly upgraded.
  - Green infrastructure and gravity-fed solutions are temporary measures (~20 years?) given groundwater rise.
  - Need a long-term plan for replacing/upgrading water and sewer infrastructure, as many sewer lines are already inundated with saltwater.
  - Compromised emergency access should be a trigger for adaptation.

### **Scenario 2: SLR-Driven Shallow Groundwater Exposure (1 ft SLR, ~2040)**

- Physical Adaptation Strategies Identified/Discussed:
  - Cured-in-place pipe lining (CIPP) and low-pressure sewage system (LPSS) have already been used by the Department of Environmental Services (ENV) but are limited in their effectiveness/applicability.
    - For CIPP to work to reduce flow, private properties would also have to line their laterals to prevent inflow and infiltration (I&I) into the municipal sewer system.
  - Road elevation is foundational to adaptation and precedes other actions by utility agencies.
    - Raising buildings and/or sidewalks is complementary to road elevation.

- Physical adaptation strategies should currently be more prioritized in areas vulnerable to flooding/sand/saltwater intrusion.
- Long-Term Considerations/Needs Identified:
  - Increased salinity of groundwater is detrimental to the condition of water mains and affects wastewater treatment when infiltration into wastewater pipes occurs.
  - All utility agencies need standards and policies to be developed and/or adopted to be resilient to sea level rise and its impacts. Guidance on incorporating SLR scenarios into risk assessments/planning for CIP is needed.
  - Asset management, including condition and risk, is critical to decision-making for future investment. Some agencies are further along in asset management than others.
  - Agencies are in need of guidance on decision-making on asset resilience/adaptation and level of service requirements in the context of limited resources. May require protection legislation or policy to phase out or decrease service to areas.
  - When and where road elevation occurs is the critical first step to adaptation.
  - Coordination required between CCH and Military concerning jurisdictional areas and corresponding regulations.

### **Scenario 3: SLR-Driven Groundwater Inundation (4 ft SLR, ~2080)**

- Physical Adaptation Strategies Identified/Discussed:
  - The existing gravity system for stormwater management will be insufficient—adaptation will require pumping.
  - Drainage modeling will be required if roads are elevated.
  - In need of a drainage master plan for Waikīkī for adaptation guidance.
  - The existing Roadway Management System could be adapted to be used in planning which roads are elevated when.
  - Elevating utilities above grade may be easier to repair but the tradeoff is that the utility is less protected from elements or tampering when compared to subsurface placement.
  - Transition zones between the road and building could be planned block by block, but grade alignment issues could arise.
    - Incentives may need to be developed to entice private property owners to follow the accompanying criteria.
- Long-Term Considerations/Needs Identified:
  - Where do we invest? Agencies need guidance on which areas to focus on considering limited resources.

- If elevating the roads and utilities, coordination between all parties involved would be necessary. One Water could establish a “Road Panel.”
- Existing infrastructure will require rehabilitation or replacement to maintain functionality in 2080.
- Emergency access should be prioritized in adaptation decisions.
- Agencies need updated guidance, standards, design criteria, and/or directives to consider SLR in their asset management and planning process.
- Military and CCH policy alignment should be coordinated to prioritize funding.

#### **Scenario 4: SLR-Driven Groundwater Inundation (6 ft SLR, ~2100)**

- Physical Adaptation Strategies Identified/Discussed:
  - Place-based adaptation can be used to determine which adaptation strategies are fit for specific areas of Waikīkī and surrounding infrastructure.
  - Road elevation and/or infrastructure improvement in Waikīkī should also consider the impacts on surrounding community infrastructure.
- Long-Term Considerations/Needs Identified:
  - In need of an economic study to evaluate the cost of various adaptation strategies, including No Action to evaluate economic loss.
  - Who pays for adaptation? Adaptation will require private sector involvement too.
  - Public-Private Partnerships could be employed to develop and fund strategies.
  - In need of guidance from CCH to establish a SLR threshold that determines permitting of development/redevelopment.
  - In need of guidance for service phase out or level of service downgrading.
  - Studies of existing foundations of tall buildings is needed if future plans include letting parts of Waikīkī flood.
  - In need of tools and regulations to regulate development and manage asset damage/public safety risk in the face of sea levels rise and its impacts.