

# **Adapt Waikīkī 2050**

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## **Mayor Rick Blangiardi**

**Charrette #1**

May 13, 2024 | 8:30 AM – 11:30 AM  
Ala Wai Golf Course Clubhouse, 2<sup>nd</sup> Floor



# Introductions and Agenda

Noelle Cole, DPP

# Project Team



Client

**Noelle Cole**  
Dina Wong  
Imelda Fernandez



Lead Consultant

**Kitty Courtney**  
Carol Hufnagel



**Melissa May**  
Malachi Krishok  
Ollie Lau  
Alice McLean  
Rachael Han

Workshop Green, LLC

**Wendy Meguro**

**Project Manager**  
Team member



# Meeting Objectives

- Introduce the 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.







# Climate Risk Scenarios

Kitty Courtney, Tetra Tech, Inc.

# AW2050 Plan Results Statement

*Within the next 25 years, recommendations have been implemented to:*

- Protect public safety from temporary but extreme rainfall-driven flood events;
- Improve the indoor/outdoor environment of Waikīkī through ecological enhancement of stormwater management;
- Extend the useful life of subsurface infrastructure exposed to shallow groundwater in a cost-effective manner; and
- Identify and plan for viable adaptation pathways based on level of service determinations for land use and infrastructure in the WSD over the long term.



# Scenario Overview

## 1 – Rainfall-Driven Compound Flooding (1 ft SLR, ~2040)

**Strategy Objective:** Mitigate temporary and widespread flooding from extreme rainfall events compounded by high tides and storm surge

## 2 – SLR-Driven Shallow Groundwater Exposure (1 ft SLR, ~2040)

**Strategy Objective:** Extend the useful life of subsurface infrastructure exposed to permanent and widespread shallow (<5 ft below land surface) groundwater

## 3 – SLR-Driven Groundwater Inundation (4 ft SLR, ~2080)

**Strategy Objective:** Address permanent and localized flooding from groundwater above land surface

## 4 – SLR-Driven Groundwater Inundation (6 ft SLR, ~2100)

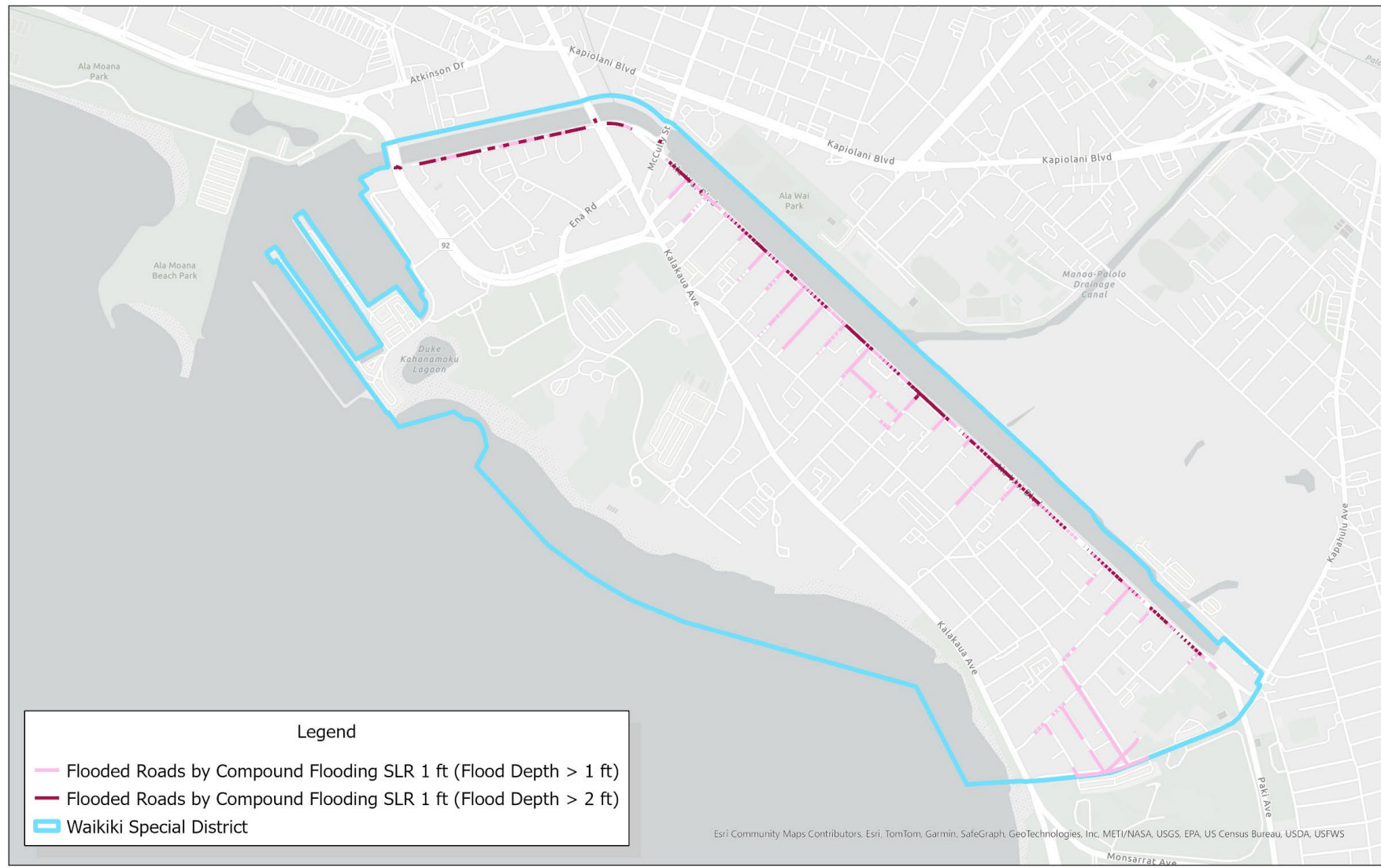
**Strategy Objective:** Address permanent and widespread flooding from groundwater above land surface







# 1 RAINFALL-DRIVEN COMPOUND FLOODING (1 FT SLR, ~2040)



Esri Community Maps Contributors, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, US Census Bureau, USDA, USFWS



# 1 RAINFALL-DRIVEN COMPOUND FLOODING (1 FT SLR, ~2040)

## STRATEGY OBJECTIVE

- Mitigate temporary and widespread flooding from extreme rainfall events compounded by high tides and storm surge



## ADAPTATION STRATEGIES

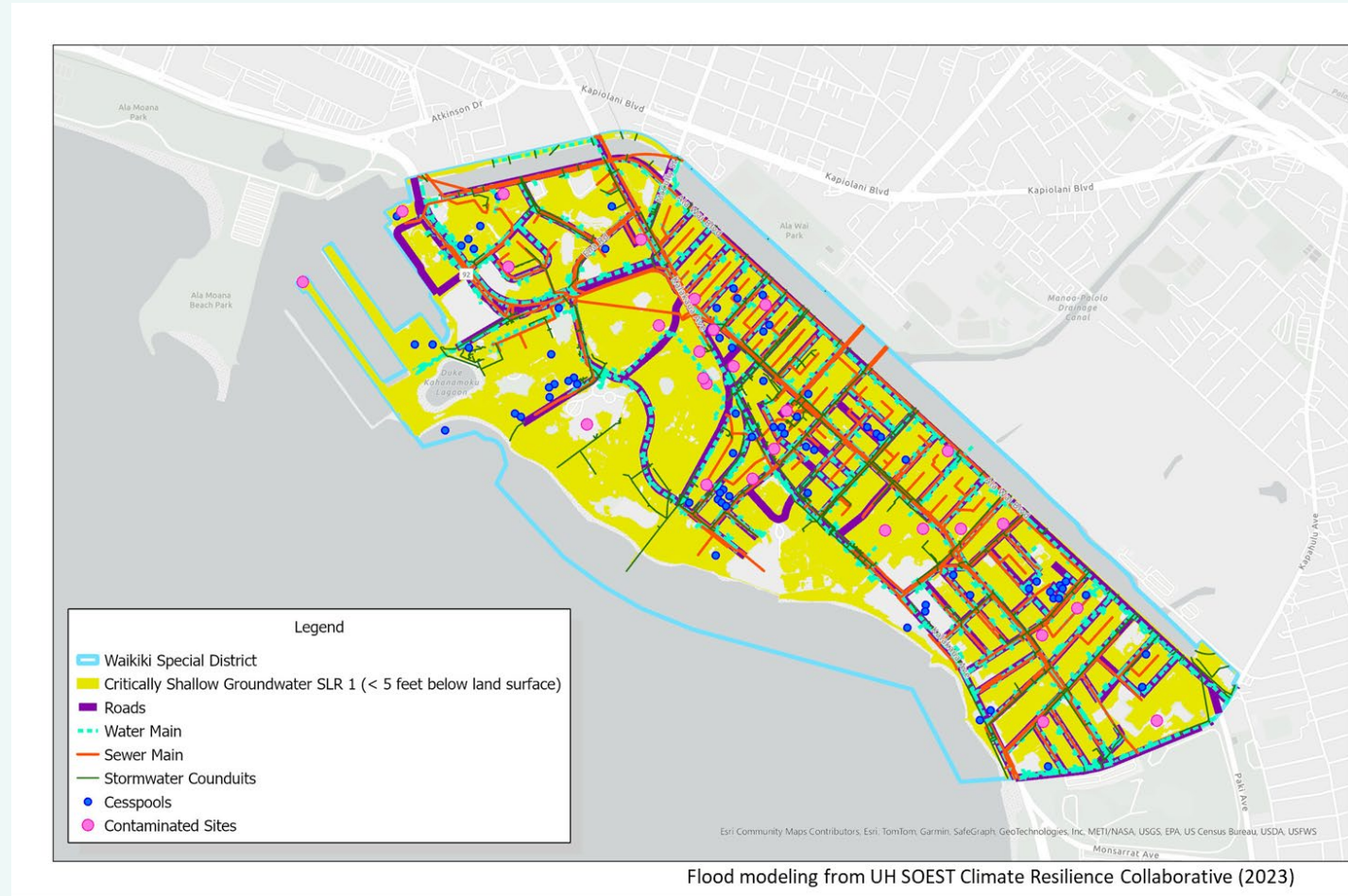
- Tidal Backflow Preventer
- Stormwater delay, storage, and discharge system
- Green/Blue Roofs
- Floodable Open Spaces
- Stormwater Pumps
- Trench Drains
- Permeable Pavers
- Elevate/Floodproof Electrical Systems, Pump Stations, and Critical Facilities in Buildings
- Emergency Response Routes & High-Water Rescue Vehicles





## IMPACTS

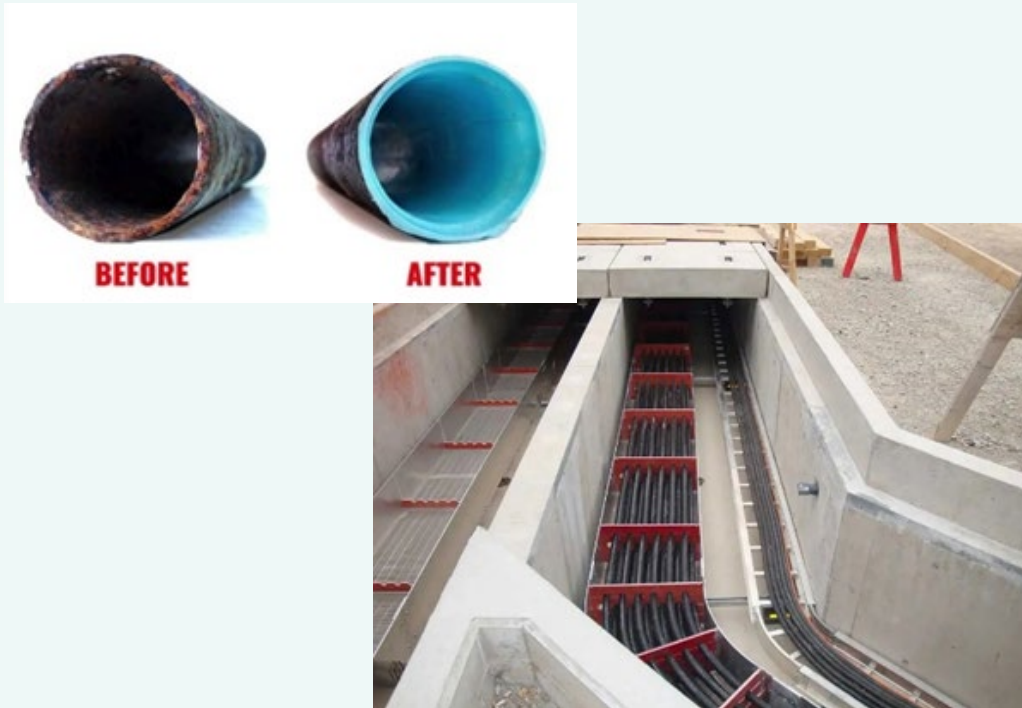
- Widespread, permanent exposure of below-ground infrastructure
- Damage to below-ground infrastructure
  - Below grade parking/building foundations
  - Road base instability and potholes
  - Corrosion of subsurface utilities
- Difficulty in subsurface construction



## 2 SLR-DRIVEN SHALLOW GROUNDWATER EXPOSURE (1 FT SLR, ~2040)

### STRATEGY OBJECTIVE

- Extend the useful life of subsurface infrastructure exposed to permanent and widespread shallow (<5 ft below land surface) groundwater



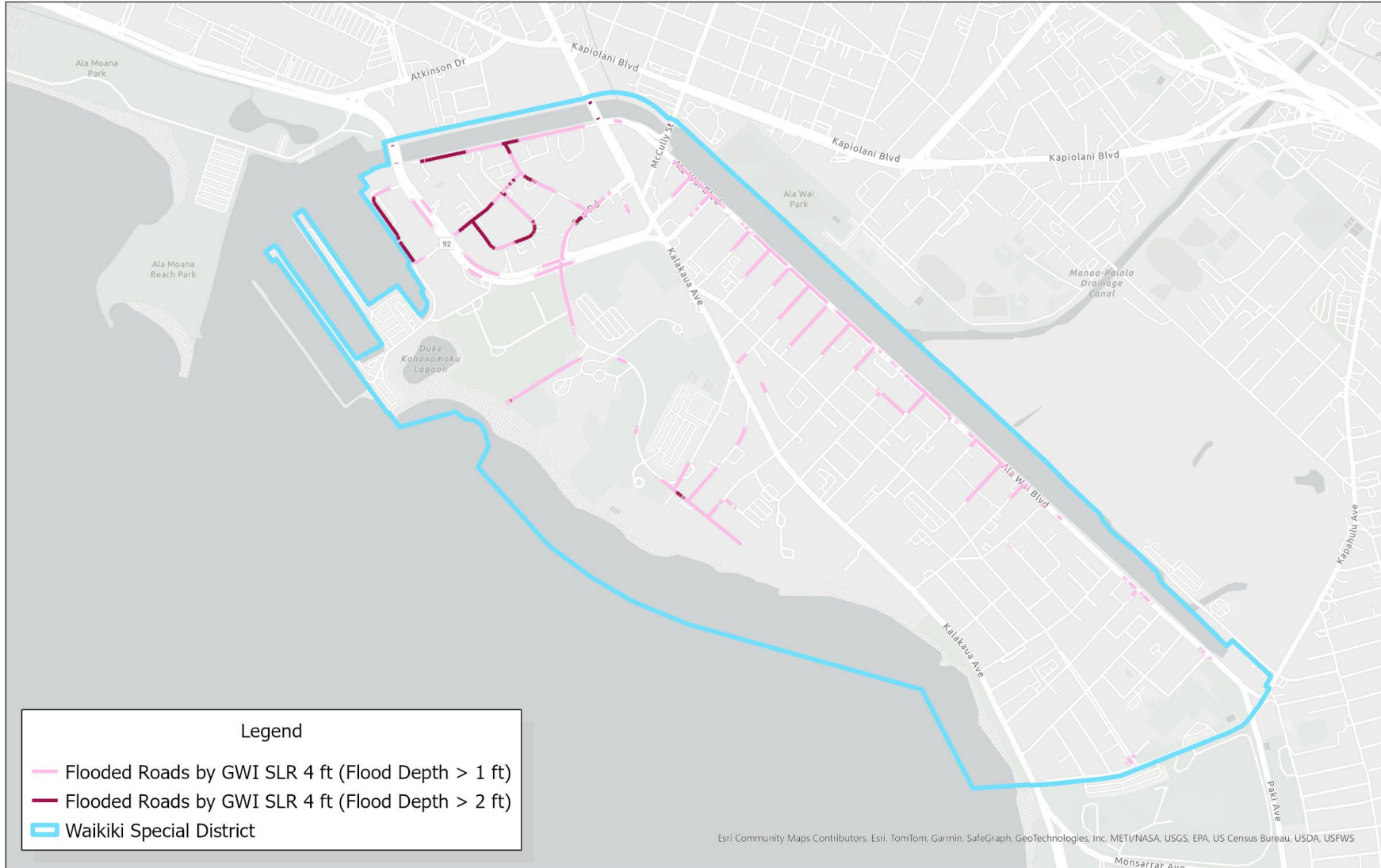
### ADAPTATION STRATEGIES

- Water/wastewater lining
- Vaulted utilities/utility vaults
- Economic analysis of adaptation strategies for subsurface infrastructure
- Low-pressure sewage system
- Improve roadway strength and durability

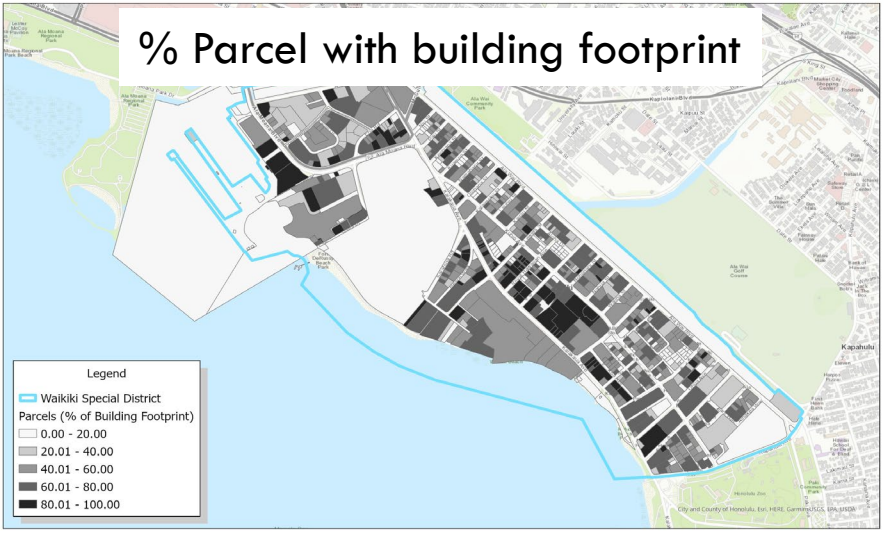




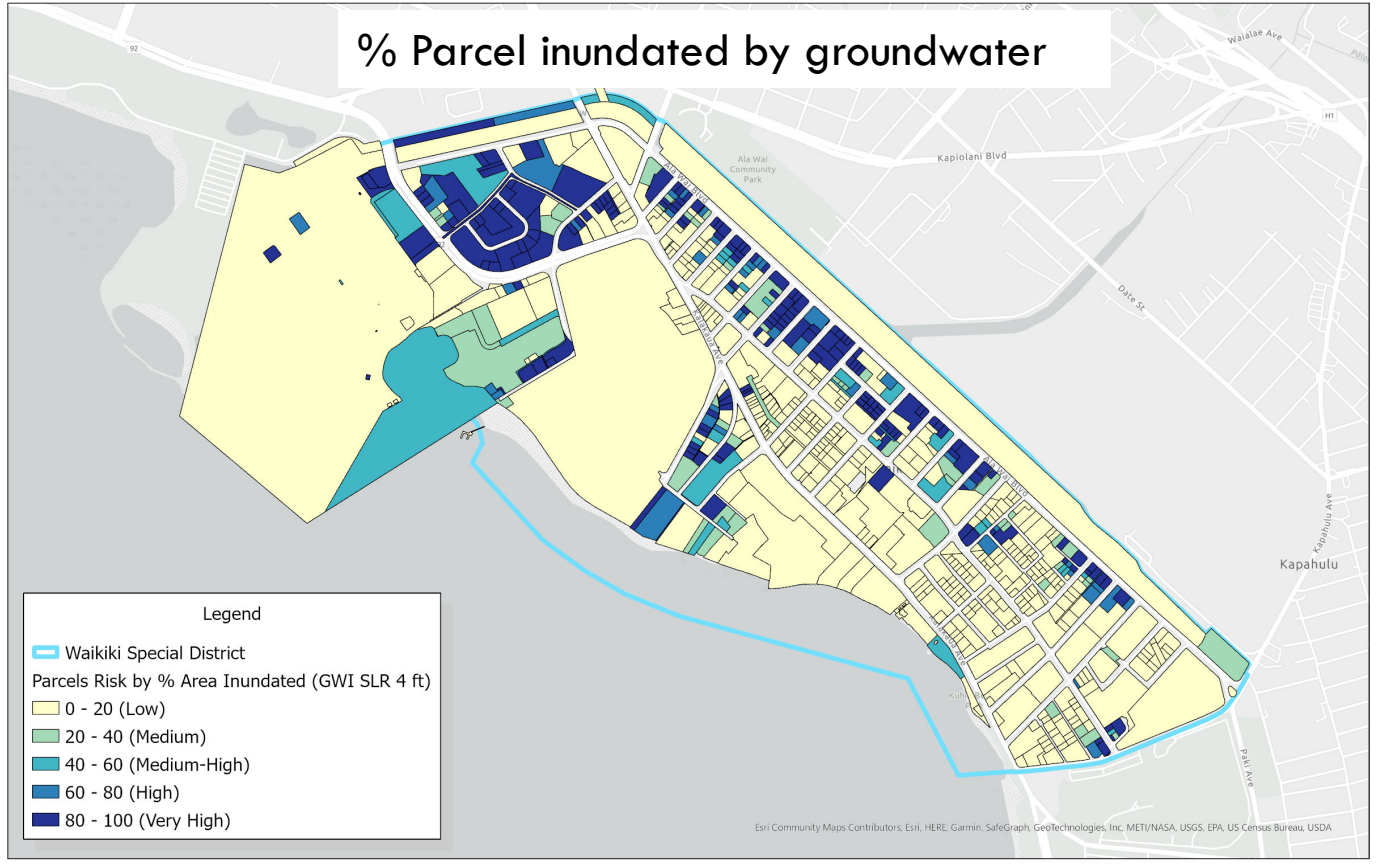
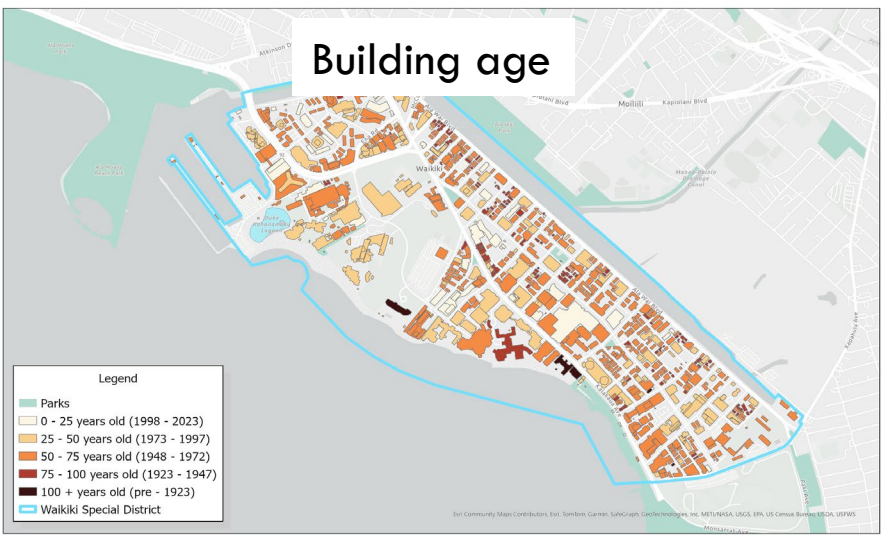
# 3 SLR-DRIVEN GROUNDWATER INUNDATION (4 FT SLR, ~ 2080)



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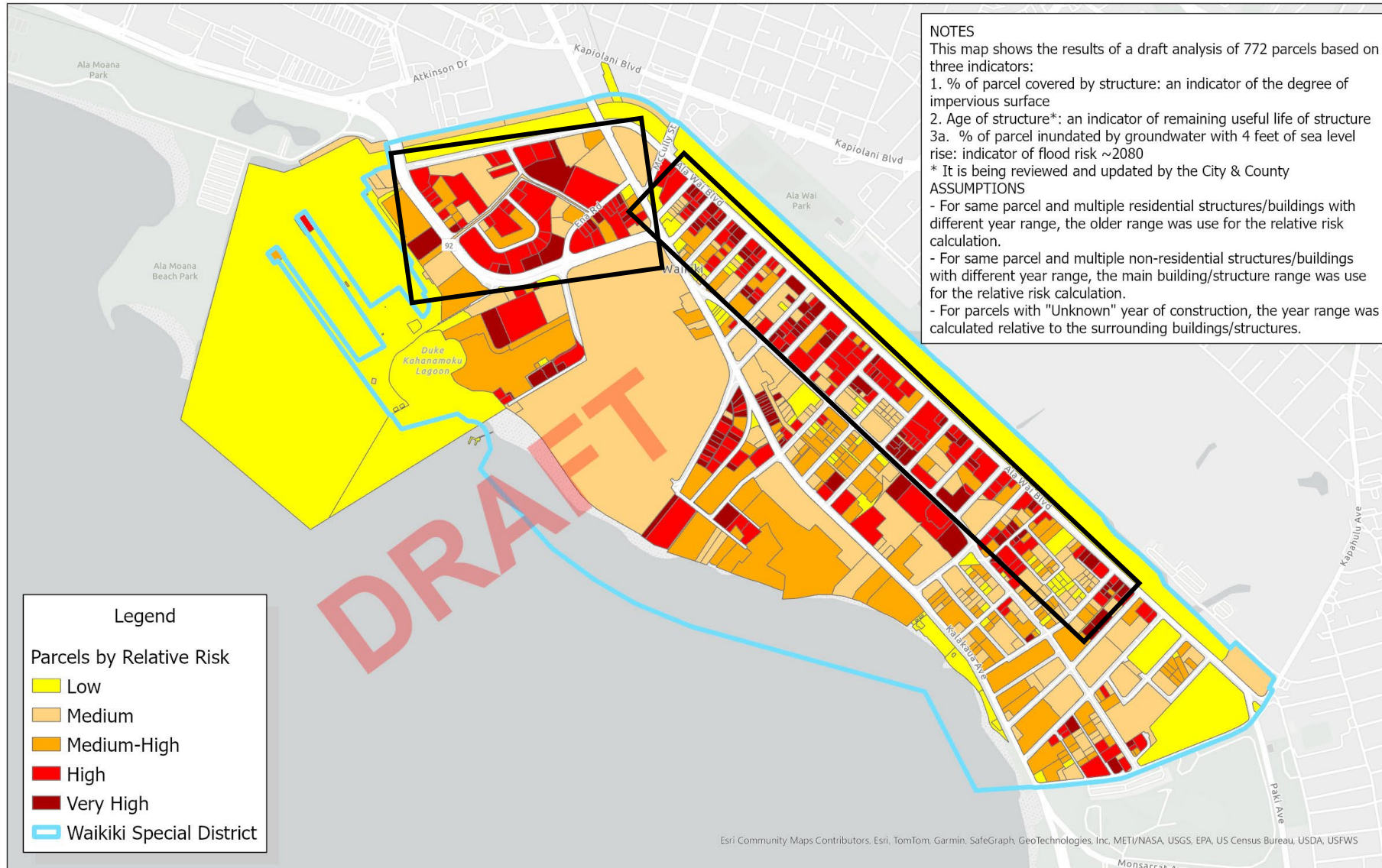
**RISK INDEX:** function of building footprint, building age, and groundwater inundation





# 3 RELATIVE RISK INDEX - SLR-DRIVEN GROUNDWATER INUNDATION (4 FT SLR)

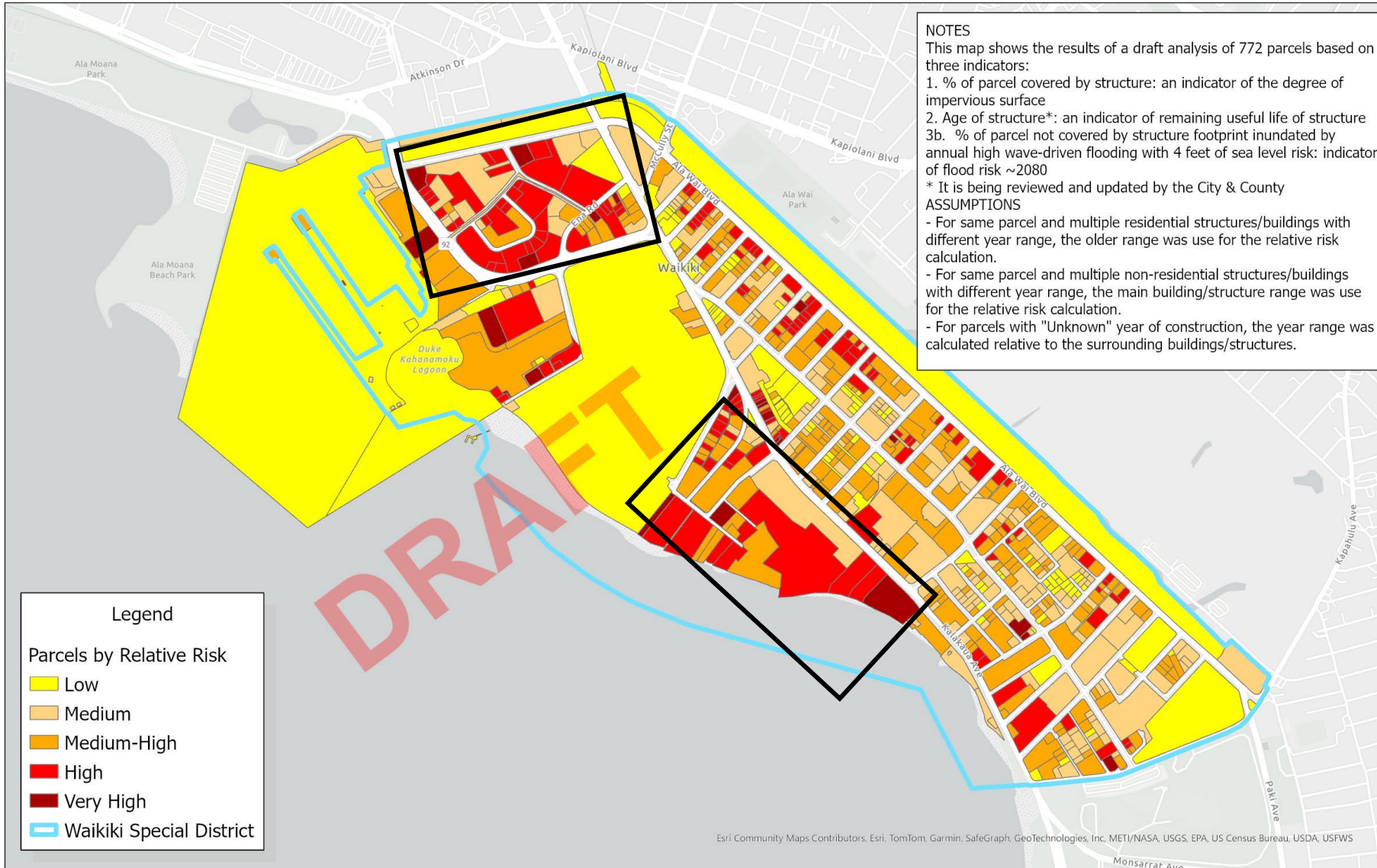
## Relative Risk Index for Groundwater Inundation (4ft SLR)





# RELATIVE RISK INDEX - ANNUAL HIGH WAVE-DRIVEN FLOODING (4 FT SLR)

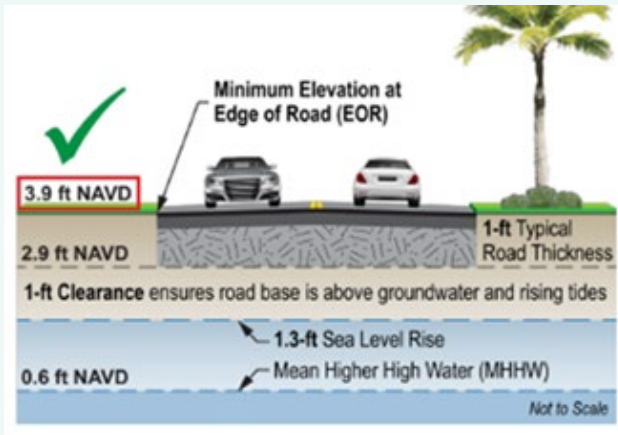
## Relative Risk Index for Annual High Wave-Driven Flooding (4ft SLR)



# 3 SLR-DRIVEN GROUNDWATER INUNDATION (4 FT SLR, ~ 2080)

## STRATEGY OBJECTIVE

- Address permanent and localized flooding from groundwater above land surface



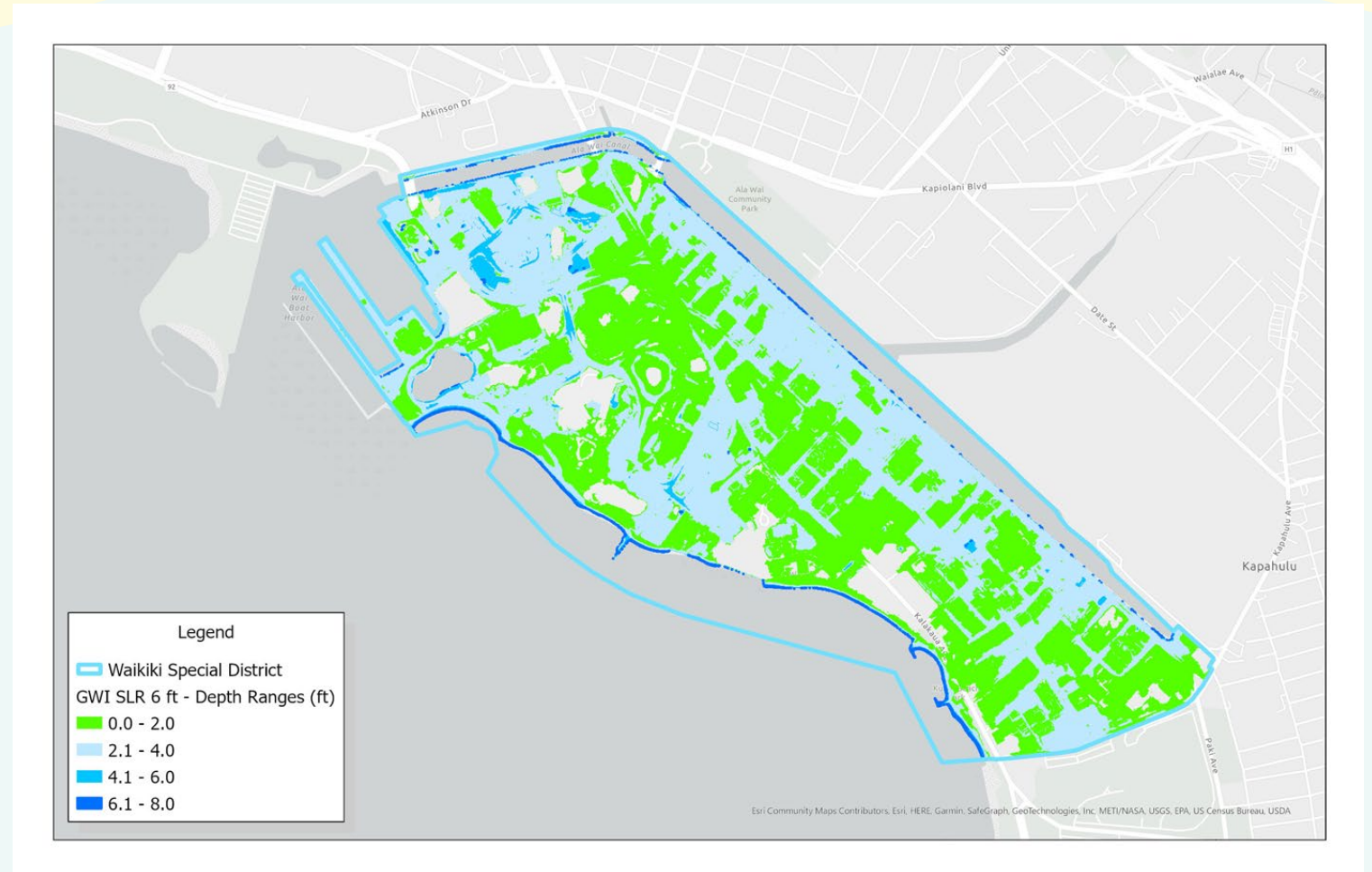
## ADAPTATION STRATEGIES

- Elevated Roads and Associated Utilities in Localized Area
- Right-of-Way Harmonization Agreements
- Above Grade Utilities
- Utilities Elevated under Bridges and Elevated Walkways
- Resilient Transition Zone
- Transportation Connectivity /Infrastructure Design and Feasibility Study
- Level of Service Phase Out Study

# 4 SLR-DRIVEN GROUNDWATER INUNDATION (6 FT SLR, ~2100)

## IMPACTS

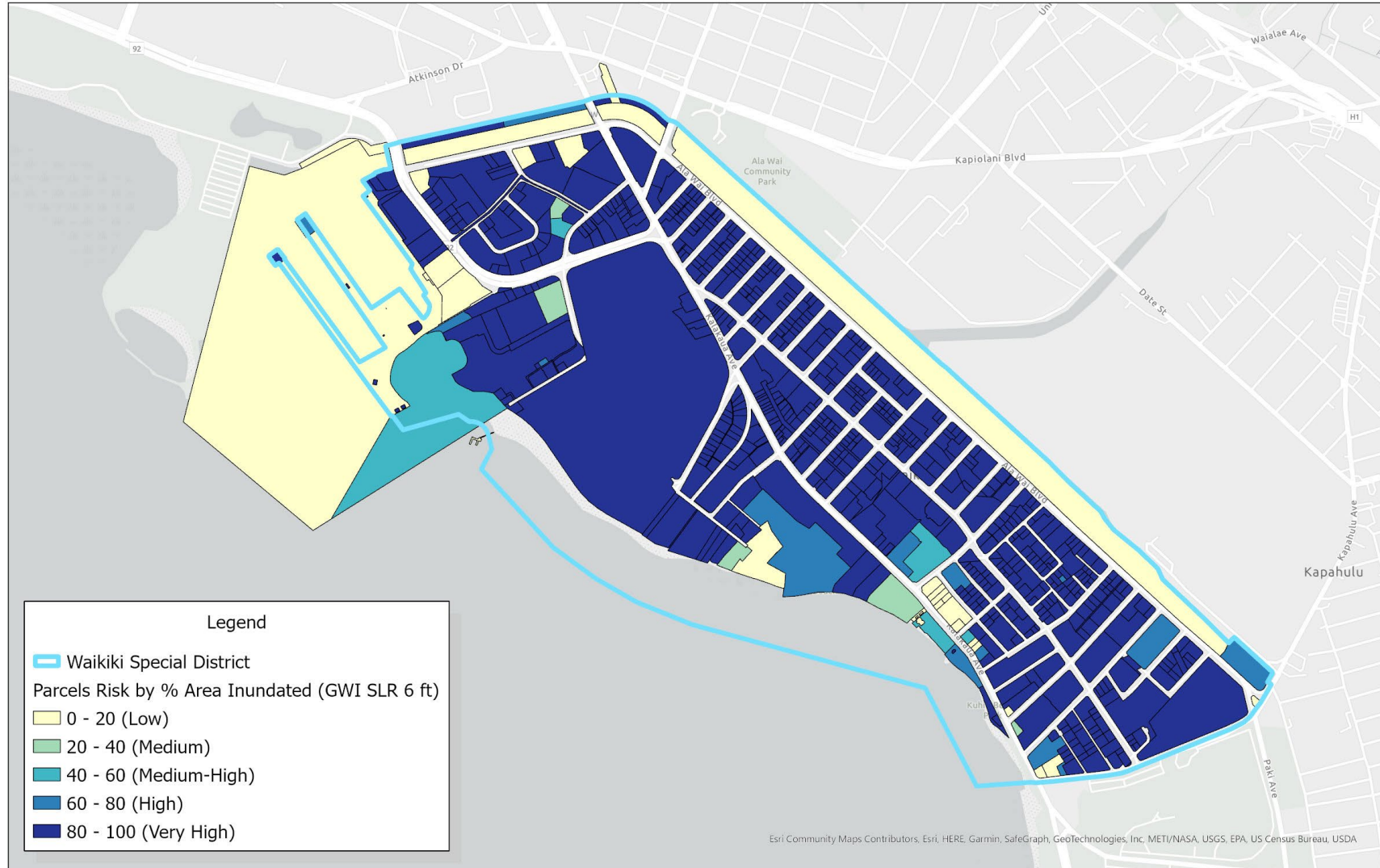
- Widespread, permanent flooding of infrastructure and structures
- Road flood depths greater than 1 and 2 ft throughout WSD







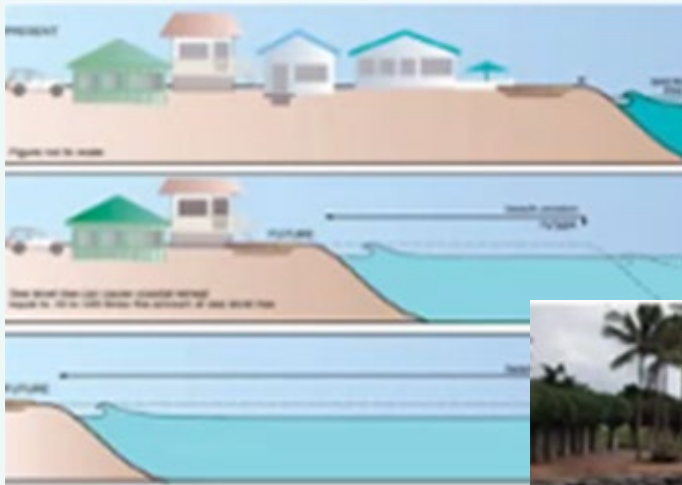
# 4 SLR-DRIVEN GROUNDWATER INUNDATION (6 FT SLR, ~2100)



# 4 SLR-DRIVEN GROUNDWATER INUNDATION (6 FT SLR, ~2100)

## STRATEGY OBJECTIVE

- Address permanent and widespread flooding from groundwater above land surface



## ADAPTATION STRATEGIES

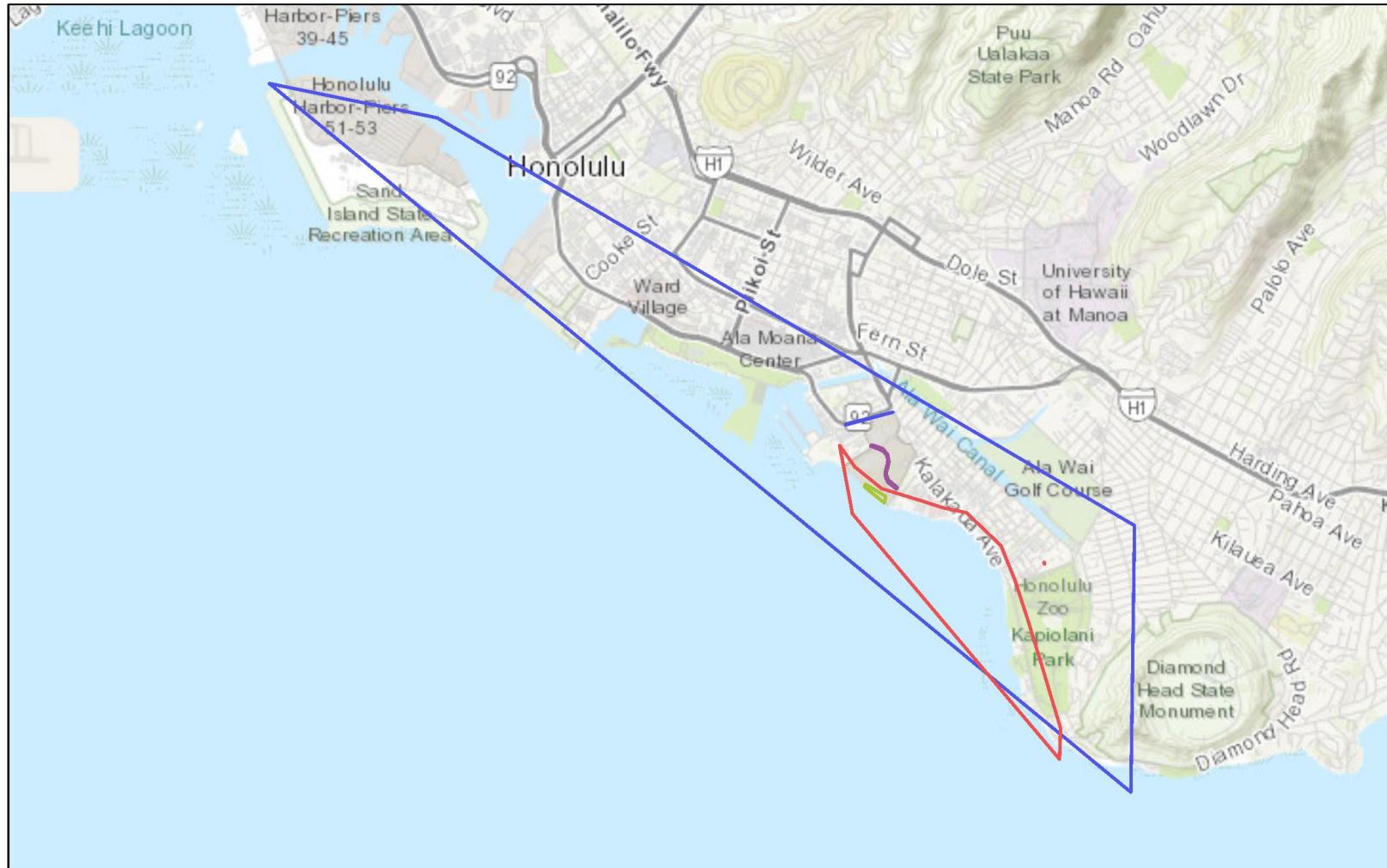
- Protect (Harden)
- Accommodate (Adapt in Place)
- Preserve and Restore (Nature-Based)
- Managed Retreat (Relocation)
- Managed Elevation
- Hybrid Strategy



# Summary of pre-meeting homework

Ollie Lau, SSFM

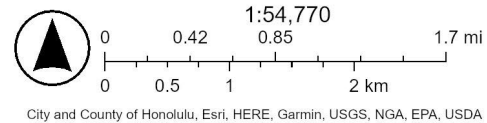
# Problem Area Map



5/10/2024

Adapt Waikiki 2050 Charrette #1 Hotspot Mapping\_form

- Erosion
- Chronic Asset Failure
- Damage
- Inundation
- Other



# Planned Capital Improvement Projects

Agency	Project Useful Life										
	Estimated SLR		~1 ft		~2 ft	~3 ft	~4 ft	5 ft	6 ft		
	2020	2024	2030	2040	2050	2060	2070	2080	2090	2100	2110
U.S. Army			Replace Koa Oasis Beach Shack, Hale Koa Hotel								
USAGHI			Storm Drain Maintenance, Ft Derussy								
ENV			New Wastewater Pump Station, Ala Moana Beach Park								
ENV			Rehabilitate gravity sewer - Chinatown/Kaka'ako								
ENV			Rehabilitate and construct new sewer lines - Iwilei								
USAGHI			Repair Kalia Rd and sidewalk								
USAGHI			Repair pathway lights, Hale Koa Hotel								





# Explanation of Activity

Malachi Krishok, SSFM

# Activity

- The color on your name tag corresponds to a group.
  - **Blue** go to Table 1
  - **Orange** go to Table 2
  - **Purple** go to Table 3
  - **Pink** go to Table 4
- Each group will have 25 minutes per station.
- There will be a 5 minute break after each station. Longer break after session 2.
- During the exercises feel free to take notes on post its, draw, and discuss with your group.
- Build on the work done by previous groups as you transition through the stations.



# Session 1



**5-Minutes Left!**



# Session 2

**5-Minutes Left!**





# Session 3

**5-Minutes Left!**



# Session 4



**5-Minutes Left!**





# Report Out

Noelle Cole, Department of Planning and Permitting

# Next Steps

Noelle Cole, Department of Planning and Permitting

# Next Steps





# Next Steps

- One Water Plan & Updates
- Working Group Meeting #3 (virtual)
  - Proposed for June 12th or July 1st 2024
  - Review Draft Recommendations
- Charrette #2 (in-person)
  - Proposed for August 14th or 29th 2024
  - Private Development Stakeholders
- Charrette #3
  - TBD



# Working Group Member Portal

Scan QR Code to access site



URL: <https://ssfm.konveio.com/adapt-waikiki-2050>

Working Group Password: 1 Water

