

APPENDIX I | TRIGGER-BASED IMPLEMENTATION PLAN

CONNECTING TO THE ONE WATER PLAN

This appendix provides additional detailed information that supports the following sections of the Plan.

CORRELATING SECTIONS AND INFORMATION

8 Implementation Plan

8.3 Project Sequencing and Triggers

App. I Sec. I.1.2 provides definitions and an explanation of triggers, thresholds, and monitoring metrics.

8.5 OWH Project Implementation Plan

App. I Sec. I.1.3 depicts the sequence of OWH projects and includes potential triggers that may influence this sequence.

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SECTION I.1 PURPOSE AND OVERVIEW

I.1.1: OVERVIEW

This appendix presents the detailed trigger-based implementation plans. The trigger-based framework supports sequencing of projects and incremental adaptation over time, reducing risk as climate hazards intensify. The One Water Panel and Leadership Group will need to discuss and agree upon suggested triggers that are sufficiently conservative, both currently and as conditions change, to help monitor when actions should be taken for OWH projects. This provides foundational steps and near-term actions in the most vulnerable areas while preserving the City's ability to invest incrementally over time.

This approach increases protections just before they are needed, accommodating limited funding and implementation resources while remaining flexible to a range of potential climate futures.

The description of the implementation plan framework is repeated in I.1.2 so that Appendix I can be read as a standalone document.

The detailed implementation plan figures presented in Appendix I differ from the figures presented in Plan Section 8 in two ways:

- **Regional Goals are presented alongside the projects.** The regional goals were developed by aggregating the Hotspot goals presented in Plan Section 6. Hotspot priorities were retained where appropriate, while common themes across hotspots were consolidated. Within the implementation plan, projects are linked to these regional goals, illustrating how coordinated efforts will advance resilience across each region's people, 'āina, and infrastructure.
- **Both Lead and Support agencies for projects are shown.** As described in Plan Section 7, One Water Honolulu projects rely on coordination across multiple departments and agencies; the plan reflects this integrated approach by identifying lead and supporting roles throughout each phase of project delivery.

WHAT IS A TRIGGER?

A trigger is a defined change in condition used in the Plan to inform the timing of implementing mid-term and long-term projects or actions.

I.1.2: IMPLEMENTATION PLAN FRAMEWORK

REPRESENTING COLLABORATION IN THE IMPLEMENTATION PLAN

Implementing the Plan will require activation of the Collaboration Framework (Appendix A) to advance holistic, multi-benefit solutions that strengthen resilience across O'ahu. The Implementation Plan synthesizes the work described in previous sections and defines how City departments will work

together to deliver these outcomes. City departments will need to collaborate to develop triggers and mechanisms for project funding to support achievement of the Plan.

FRAMEWORK COMPONENTS

The implementation plan framework is designed to show the relationships between projects, policies, and actions, including:

Project Sequencing	Provides a priority for implementing projects, with triggers for mid- and long-term projects tied to changing conditions; near-term projects typically proceed without triggers.
Project Connections	Illustrates shared objectives between islandwide and regional efforts and identifies precursor projects and project dependencies.
Coordination and Resource Planning	Visualizes parallel initiatives, creating opportunities for alignment and more effective resource planning across departments.

PROJECT SEQUENCING AND TRIGGERS

A trigger is a defined change in condition used in the Plan to inform the timing of implementing mid-term and long-term projects or actions. As the Plan is implemented, the City departments will continue to work together through the One Water Honolulu Panel to collect and monitor information. This will help build an understanding of how conditions may change over time and support refining project triggers. In the current plan, there are three types of triggers: regulatory, financial, and climate hazard. Mid-term and long-term projects have associated triggers that indicate when changing conditions may warrant implementing a project ahead of the sequence identified in the regional implementation plans.

Regulatory Triggers	Regulatory triggers apply to projects that may be prioritized in the future if new regulations arise. For example, some mid-term or long-term projects that improve water quality but are not required under current regulatory mandates (e.g., Total Maximum Daily Loads) have regulatory triggers. These projects may be advanced in the absence of regulatory requirements if funding is available or if other co-benefits justify earlier implementation.
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Financial Triggers

The City's ability to implement projects may be constrained by available funding. Financial triggers indicate changes in funding conditions that could accelerate implementation of mid- and long-term projects. These projects are often needed under current conditions but have been deferred because of higher costs or lower priority relative to other needs. Financial triggers could also be met when economic or cost-benefit analyses conclude that investing in a higher up-front cost project is more cost-effective than completing many lower-cost projects over a long period of time (e.g., how many times would the City pay to fix a failing seawall before it became more cost-effective to rebuild, move or remove the seawall altogether). Additional information on funding opportunities is provided in Appendix K.

Climate Hazard Triggers

For each climate hazard, thresholds, triggers, and monitoring metrics have been developed to track changing conditions and impacts.

- **Thresholds** represent the point at which changes in climate conditions, such as increased rainfall or heat stress, increase hazard exposure to a level that requires expanded or new adaptation measures to mitigate adverse impacts.
- **Triggers** are set in advance of thresholds to allow for proactive decision-making and timely investment in infrastructure adaptation strategies.
- **Monitoring Metrics** track infrastructure performance and inform when a trigger has been reached.

CLIMATE HAZARD TRIGGERS AND THRESHOLDS

Climate hazard triggers and thresholds are used in the One Water Honolulu Project Implementation Plan and the Checklists by Hazard to connect changing conditions with recommended adaptation measures and One Water projects. The triggers represent critical points in changing conditions that may require a shift in pursued projects and actions in order to reduce climate risks and avoid adverse consequences. Figure I-1 illustrates the relationship between Thresholds, Triggers, and Monitoring metrics. Triggers are paired with monitoring metrics to help inform decision-making.

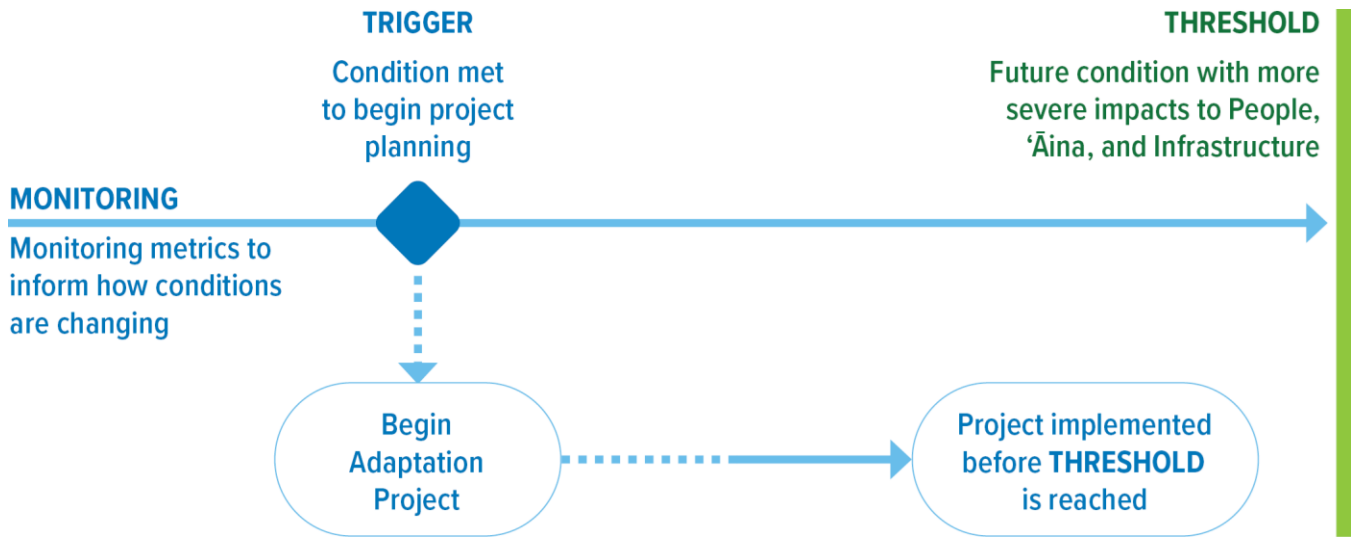


Figure I-1. Relationship between monitoring, triggers, and thresholds

Plan Section 8 provides examples of potential triggers for SLR, drought, wildfire, extreme heat, heavy rain to consider for OWH projects and actions. It is understood that the OWH Panel and Leadership Group will need to determine whether these suggested triggers are sufficiently conservative, both currently and as conditions change, and in order to reach agreement on which triggers to use and how they will be applied in the OWH project planning and implementation process. Figure I-2 presents an example of how monitoring metrics, triggers, and thresholds work together.

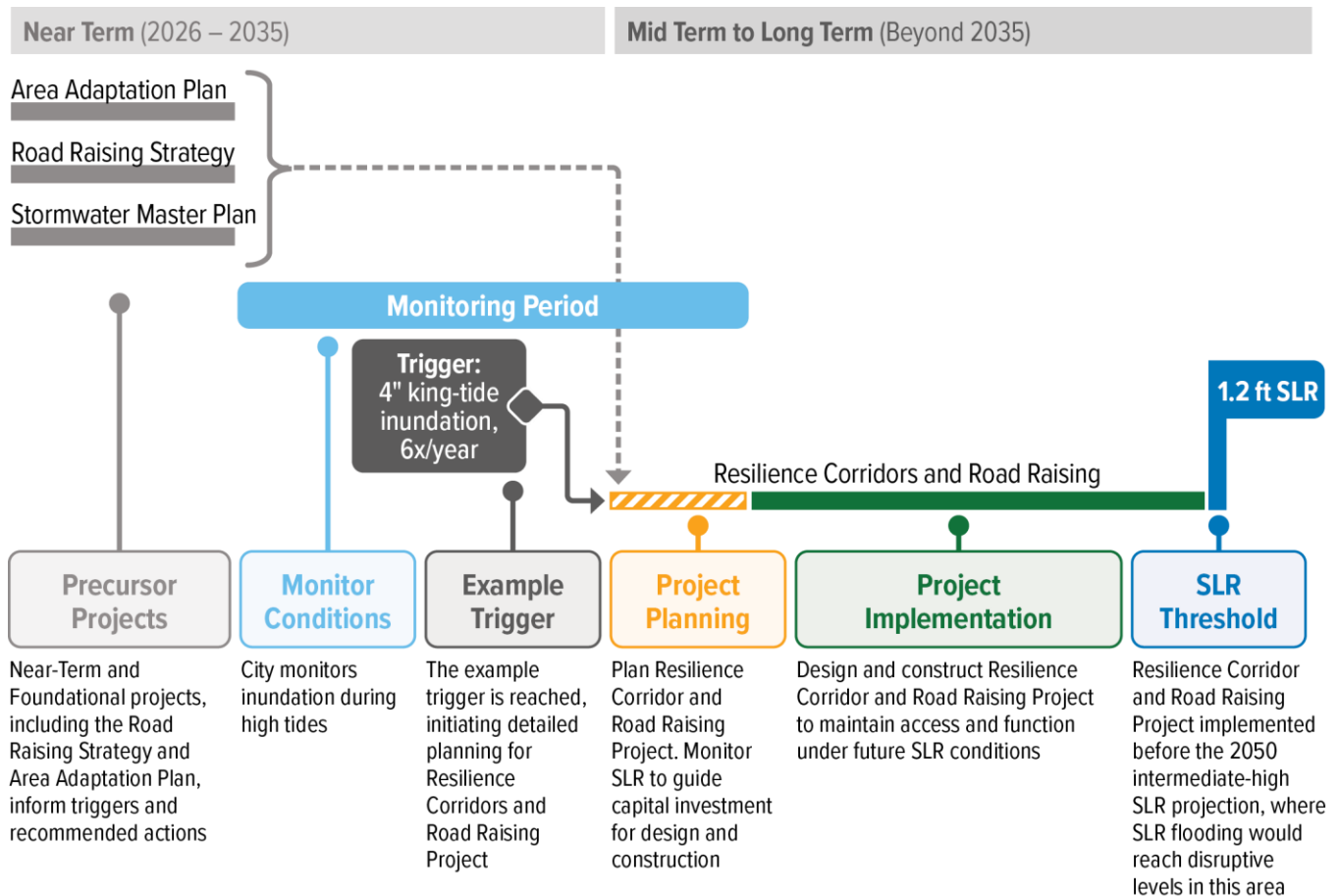


Figure I-2. Example of applying triggers to adaptation projects using Project #105 Resilience Corridors and Road Raising

In this example, an area is anticipated to be vulnerable to passive flooding during king tides under future SLR conditions. It is also assumed that funding will be pursued and secured to establish any additional monitoring networks and to fund or finance eventual road raising efforts. The content below is not an exhaustive list of actions but highlights the progression of actions needed to advance project implementation for this example.

After the **Area Adaptation Plan**, **Stormwater Master Plan** and **Road Raising Strategy** projects are completed in the near term, conditions are monitored for SLR flooding on high tide days, and inundation depths remain below the example 4-inch trigger condition.

In the future, monitoring data indicate 4 inches of inundation during king tide events, activating the example passive flooding **trigger**. Although roadway impacts are expected to occur at approximately 6 inches of inundation, the trigger provides advance notice to account for the time needed for planning and implementation.

After the trigger is reached, the project is prioritized in the City’s CIP process so that planning for the Resilience Corridors and Road Raising Project can begin. Planning includes engagement with key stakeholders and builds on previous work completed in the Area Adaptation Plan.

Following the planning phase, the Resilience Corridors and Road Raising project will advance through design and construction. The project will be implemented before reaching the **threshold**, to put adaptation measures in place before SLR flooding reaches disruptive levels.

I.1.3: DETAILED IMPLEMENTATION PLANS

This subsection includes the sequencing of proposed OWH projects and actions islandwide and for each Regional Planning District. This sequencing is identified through visualizations that include the proposed projects, potential lead agencies and supporting agencies, connections to other proposed projects, and implementation triggers.

READER'S GUIDE FOR DETAILED IMPLEMENTATION PLANS

SYMBOL	DESCRIPTION
	- Proposed OWH projects are symbolized with horizontal bars, labeled with the project name and ID. The length of the bar represents the time required to implement the project - Hatched bars represent Planning or Studies - Solid Bars represent Programs and Infrastructure projects. - Proposed agency participation is represented by color. Lead Agencies are represented by the larger, top bar Support Agencies are represented with the smaller bars underneath the top bar.
	Triggers¹ are shown with diamonds and labeled with the associated condition(s) or hazard(s) that may warrant implementing a project ahead of the sequence identified in the regional implementation plans.
	Thresholds² for Sea Level Rise are shown with vertical bars. These thresholds show the timing of future SLR conditions under the NOAA Intermediate High Scenario in alignment with the City's 2022 Climate Change Commission guidance documents.
	Regional goals³ are listed across the bottom of the Implementation Plan graphic. The goals each project supports are shown under the bars with the abbreviated goal, i.e., G1, with the symbols for people , 'āina , and infrastructure .
	Black arrows represent Dependent Projects, i.e., projects that are connected to, or rely on implementation of other projects in the region. For example, outcomes from an Area Adaptation Plan may inform future projects to mitigate Sea Level Rise impacts.
	Gray, dashed arrows represent Islandwide Project Connections, visualizing regional projects that are informed by plans, frameworks, or strategies developed in near-term islandwide projects

1. Triggers are only included in Regional Implementation Plan Graphics for Mid-Term and Long-Term Projects

2. Thresholds are only included for Sea Level Rise since the other Hazard Thresholds do not have an expected timeline.

3. Goals were developed for Regional Planning Districts and are only included in Regional Implementation Plan graphics.

FOUNDATIONAL AND ISLANDWIDE IMPLEMENTATION

The Islandwide Implementation Plan, shown in Figure I-3, includes projects focused on establishing the policies, plans, pilot programs, and technical analyses needed to enable long-term climate adaptation across O‘ahu. These near-term islandwide actions are foundational, informing and supporting the implementation of other One Water projects across O‘ahu. Detailed project information for each project can be found in the factsheets in Appendix H. Figure I-3 shows each project with its respective project number, which may also be referenced in Appendix H.

Table I-1. Key Foundational and Islandwide Actions

THEMES	KEY ACTIONS
Preparing for Sea Level Rise	• The Road Raising Strategy creates a framework and design guidance for approaching raising and adapting roads in areas exposed under future SLR and compound flooding conditions. • The Managed Retreat Legal and Policy Investigation Study supports policies and approaches for managed retreat in areas susceptible to coastal erosion and permanent inundation from SLR. • Expand Tidal Groundwater Well Monitoring Network calibrates the SLR model and identify trends in emergent groundwater.
Laying the Foundations for Enhanced Stormwater Management	• The Stormwater Utility Fee and Onsite Stormwater Incentives will help to fund projects to improve stormwater management and encourage onsite stormwater management strategies for private property owners. • The Stormwater Master Plan is an islandwide long-range plan that will model future hydrology and map the existing stormwater infrastructure to inform and prioritize future capital improvement projects, O&M needs, and funding pathways. • The Green Infrastructure Plan will follow the Stormwater Master Plan and identify and prioritize green infrastructure projects across O‘ahu to improve water quality, recharge groundwater, and reduce urban heat.
Increasing Water Supply Resilience through Conservation, Reuse, and Aquifer Recharge	• The Reuse Strategy for Redevelopment Areas will evaluate reuse strategies including decentralized treatment, on-site reuse, and centralized reuse to support future growth and long-term water supply resilience. • Expand Non-Potable Water to Large Parks and Water Loss Control reduces potable water use at large parks through converting parks to non-potable water and improving irrigation efficiency.

FOUNDATIONAL AND ISLANDWIDE IMPLEMENTATION PLAN

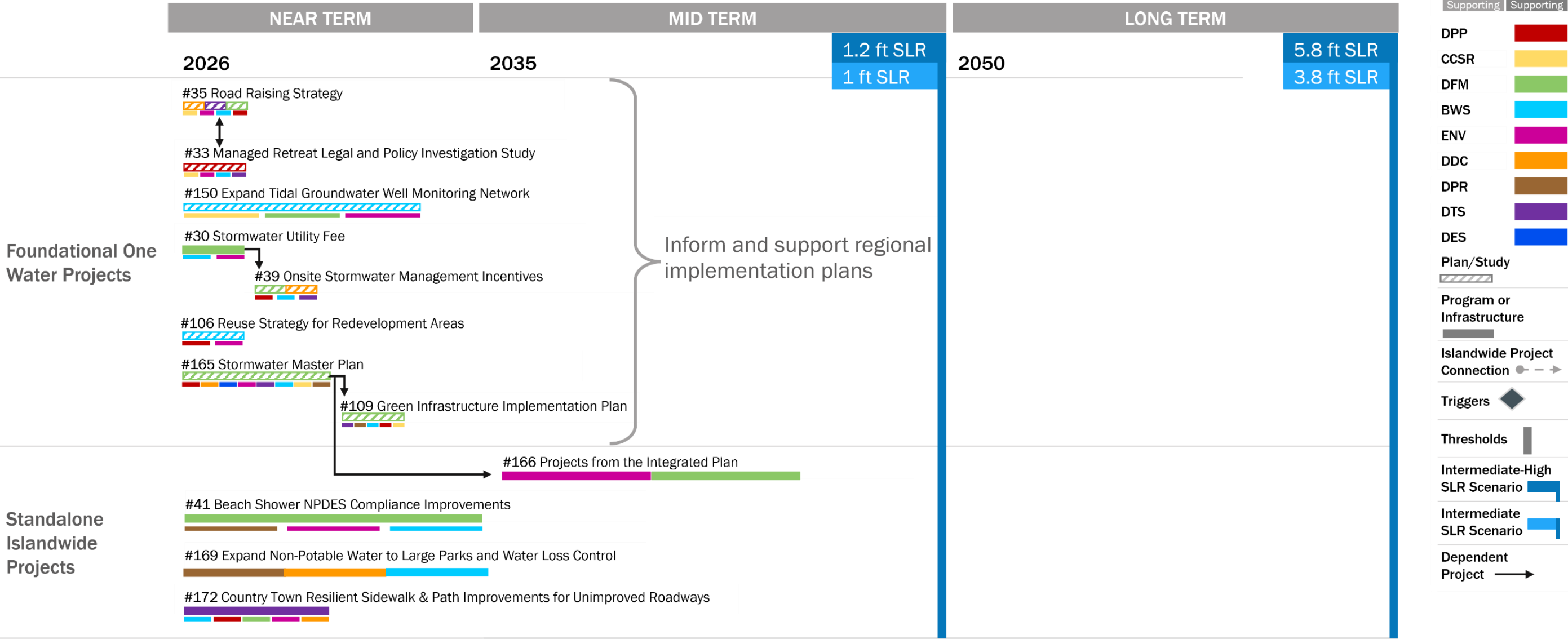


Figure I-3. Islandwide Implementation Plan

IMPLEMENTATION BY REGION

Proposed OWH projects are organized into regional implementation plans that provide a coordinated roadmap for improving resilience by region. The plans connect the near-term islandwide projects with regional project initiatives. Triggers associated with mid- and long-term projects help identify when implementation may be accelerated as regulations change, funding becomes available, and climate risks evolve. Figures I-4 through I-10 illustrate the regional implementation plans. Some regions with fewer projects are combined with nearby regions in the figures. Detailed project information for each project can be found in the factsheets in Appendix H. As in Figure I-3, Figures I-4 through I-9 show each project with its project number, that may also be referenced in Appendix H.

Table I-2. Key Actions for each Regional Planning District

REGION	KEY ACTIONS	FIGURE LINK
North Shore	Projects in the North Shore support planning for future climate change and improving watershed health to build resilience to flooding and drought through integrated stormwater management.	Figure I-4
Koʻolau Loa	The implementation plan in Koʻolau Loa proposes mitigating coastal erosion and extreme heat in beach parks.	Figure I-5
Koʻolau Poko	In Koʻolau Poko, increasing recycled water availability supports improved water resource stewardship. Mid-term priorities include reducing flood risk through stream restoration and drainage improvements while advancing sea level rise adaptation and coastal erosion reduction in Kāneʻohe.	Figure I-5
East Honolulu	East Honolulu projects support watershed restoration and coastal resilience to mitigate the impacts of SLR, flooding, and coastal erosion.	Figure I-6
Primary Urban Center (PUC)	Projects in the PUC seek to enhance water quality and improve resilience to compound flooding and future SLR. Projects also support increasing water supply reliability and reducing urban heat.	Figure I-7
Central Oʻahu	The projects proposed in Central Oʻahu support improving regional water supply reliability and reduce the pressure on the Pearl Harbor Aquifer.	Figure I-8
ʻEwa	The ʻEwa regional implementation plan supports developing reuse water supplies and addressing future impacts of sea level rise.	Figure I-9
Waiʻanae	Near-Term implementation in Waiʻanae focuses on reducing wildfire risk, while long-term projects seek to improve stormwater management and resilience to future SLR.	Figure I-10

NORTH SHORE

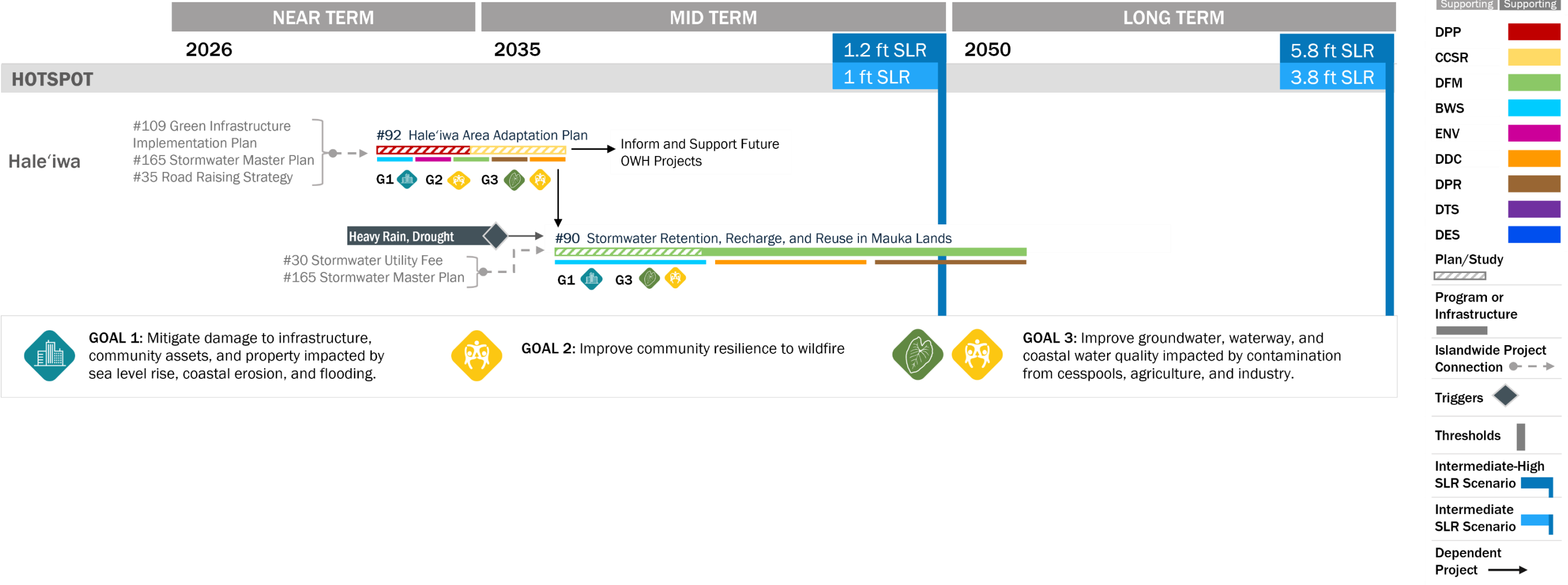
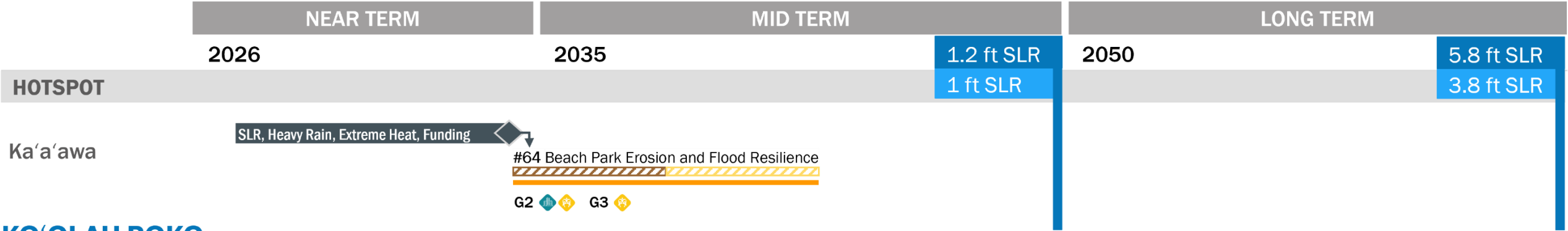


Figure I-4. North Shore Regional Implementation Plan

KO'OLAU LOA



KO'OLAU POKO

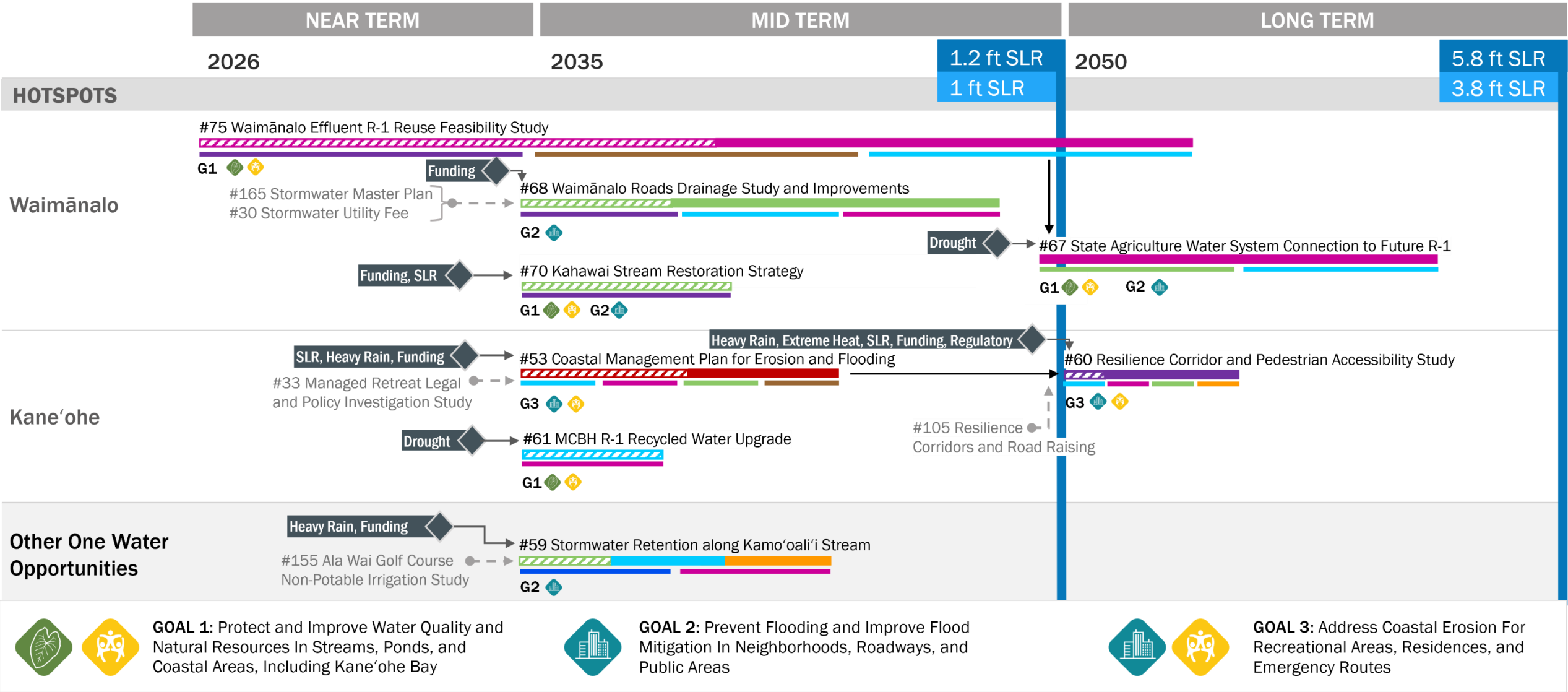


Figure I-5. Ko'olau Loa and Ko'olau Poko Regional Implementation Plan

EAST HONOLULU

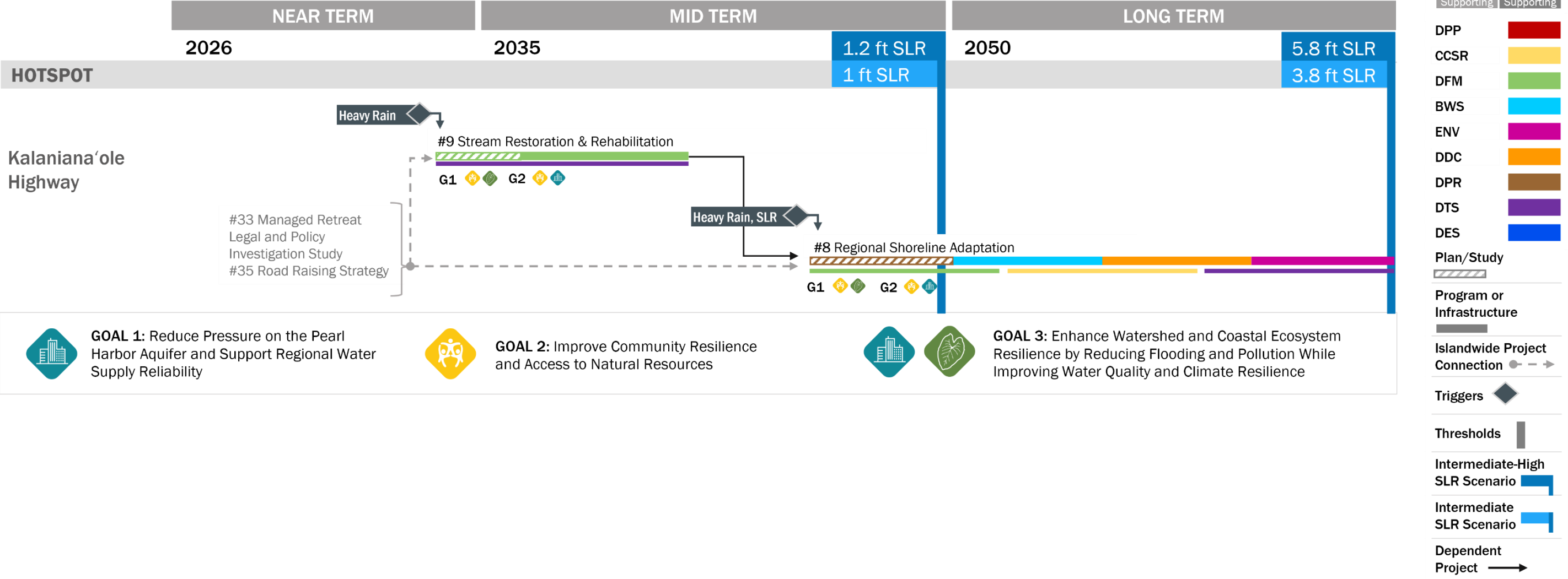


Figure I-6. East Honolulu Regional Implementation Plans

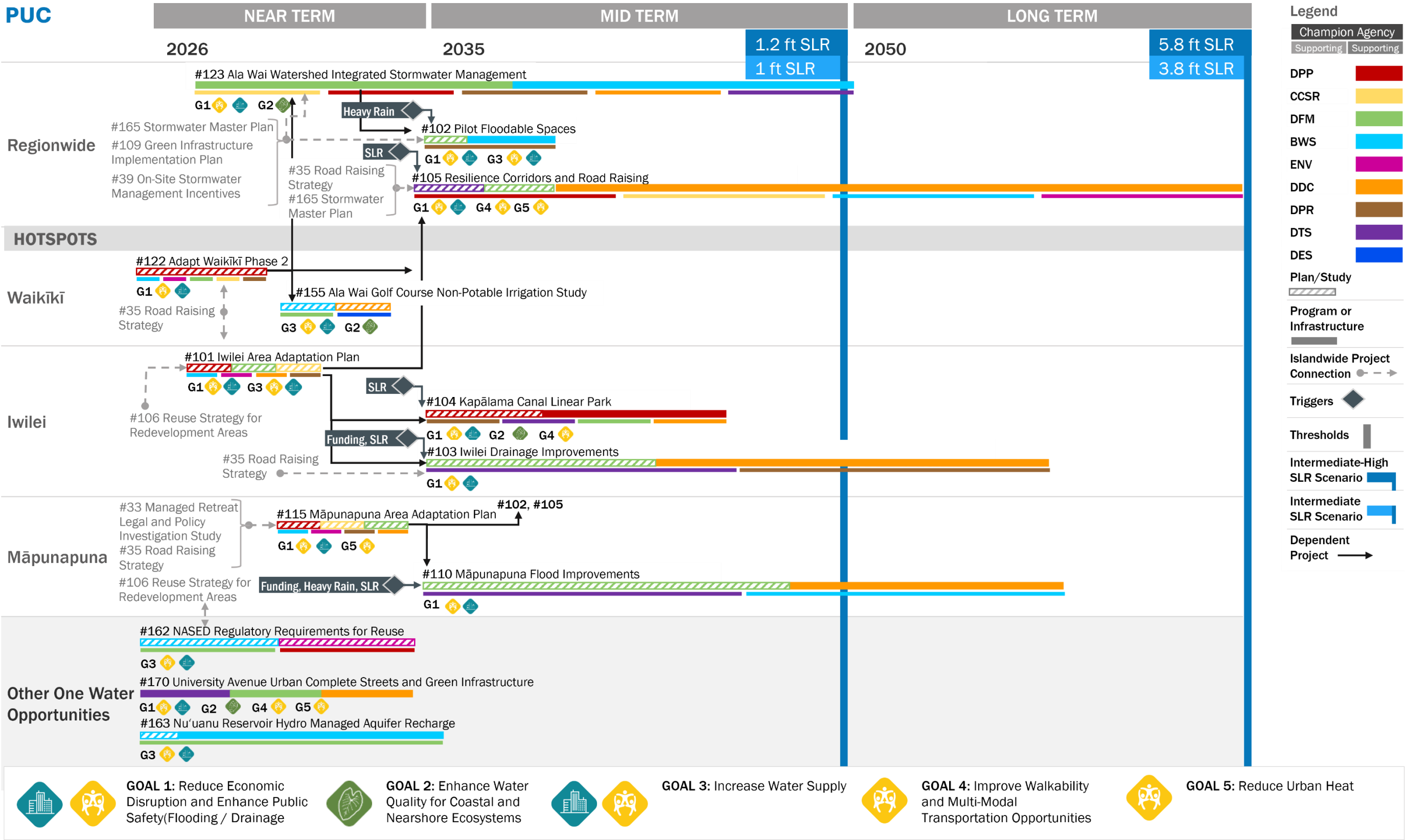


Figure I-7. PUC Regional Implementation Plan

CENTRAL O’AHU

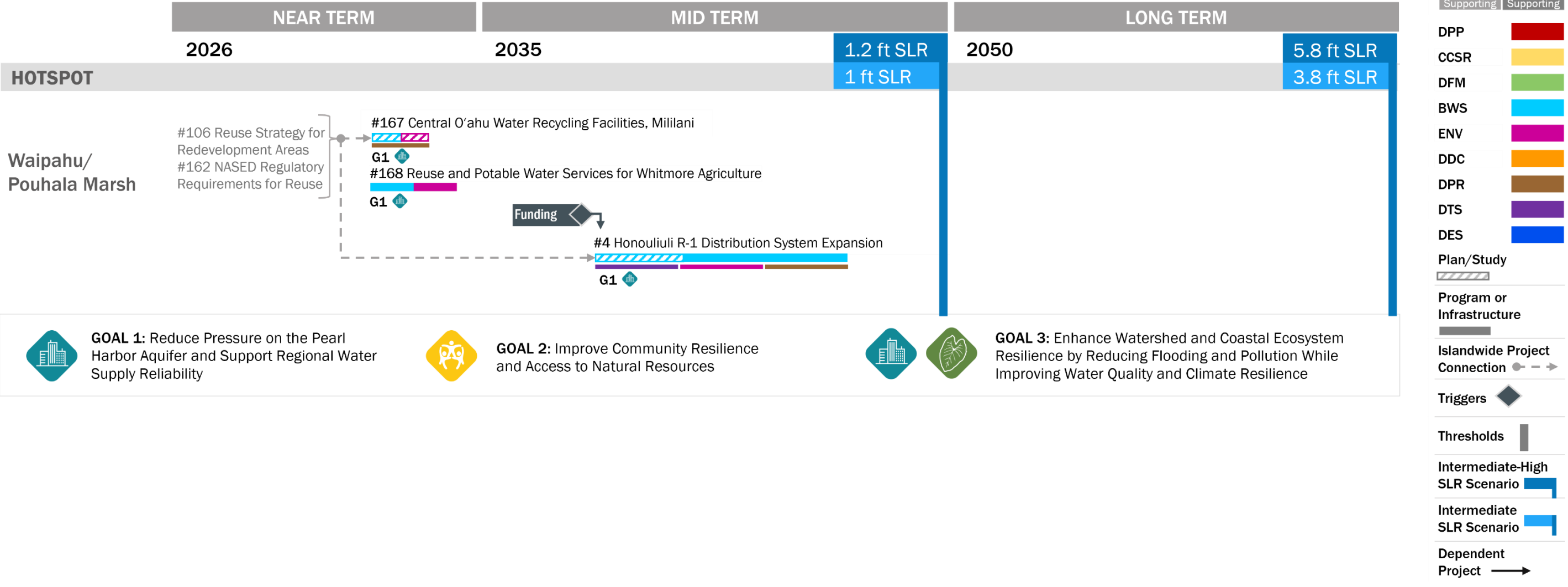


Figure I-8. Central O’ahu Regional Implementation Plans

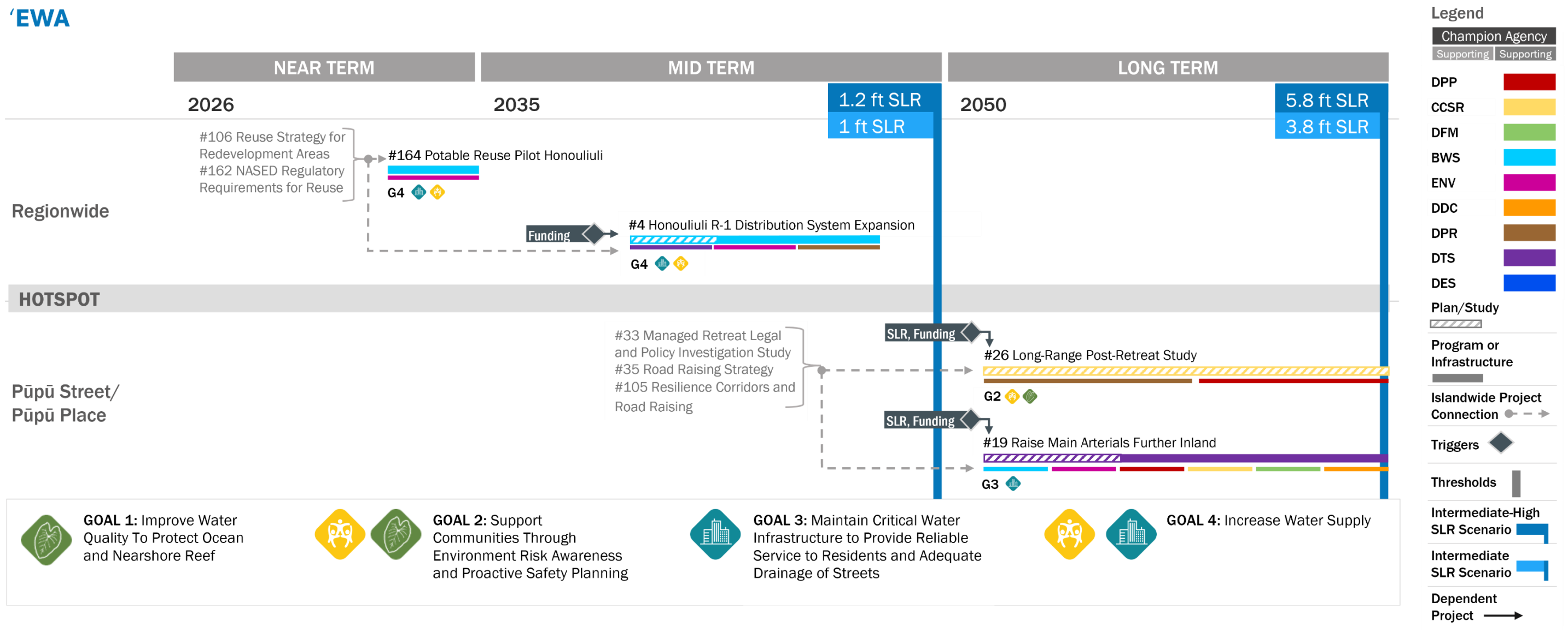


Figure I-9. ‘Ewa Regional Implementation Plan

WAI'ANAE

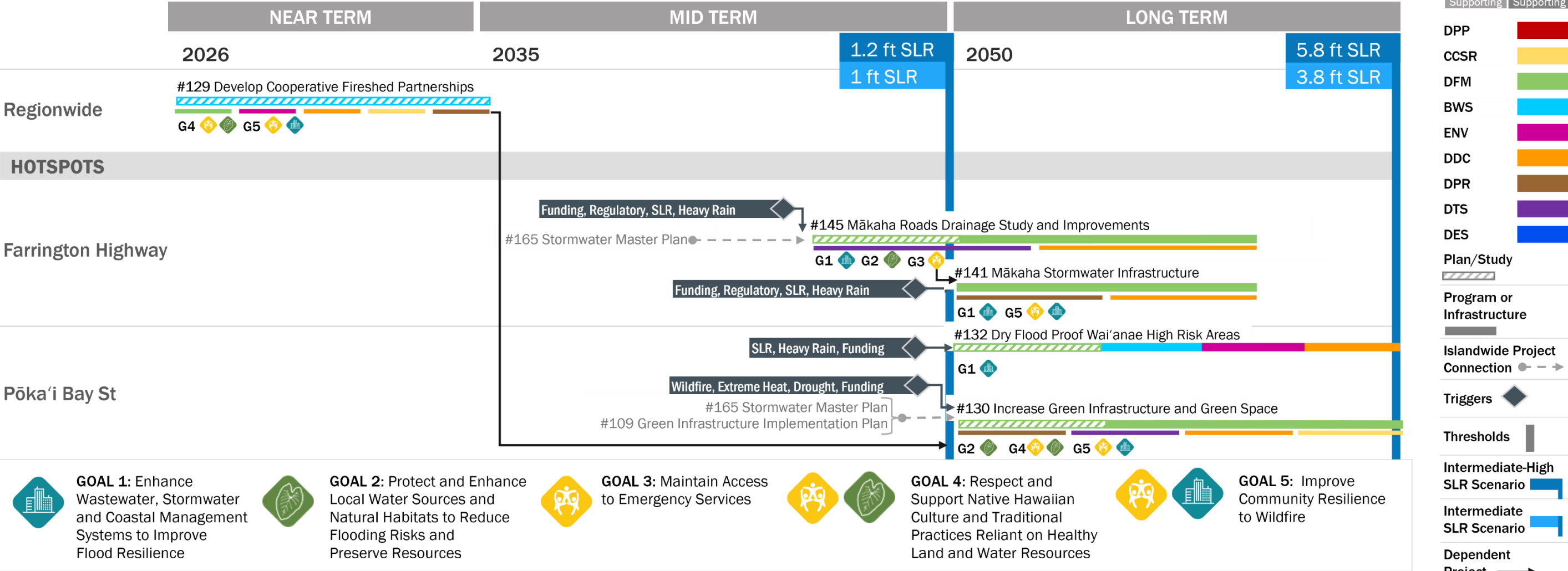


Figure I-10. Wai'anae Regional Implementation Plan