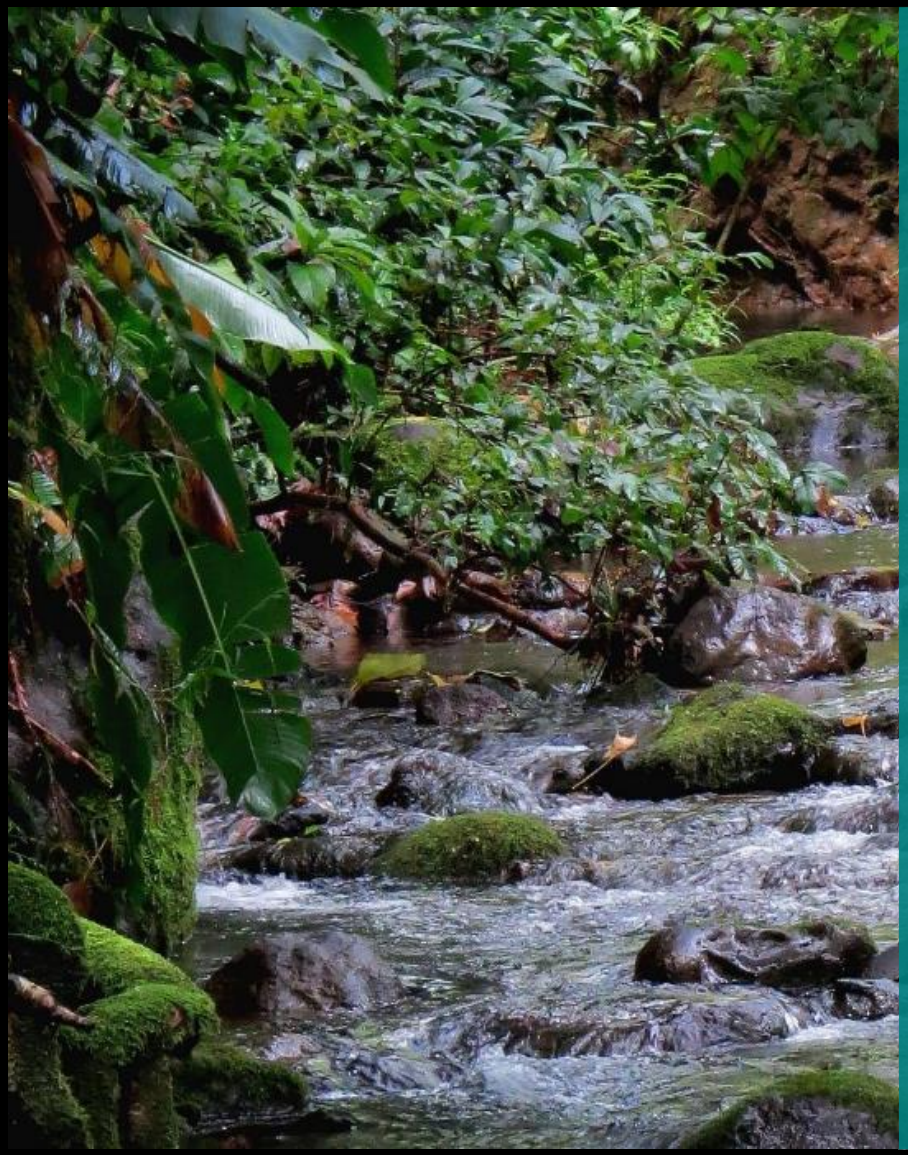


STAKEHOLDER ADVISORY GROUP

Board of Water Supply, City & County of Honolulu
April 16, 2026
Meeting 60

WELCOME & INTRODUCTIONS

DAVE EBERSOLD, FACILITATOR

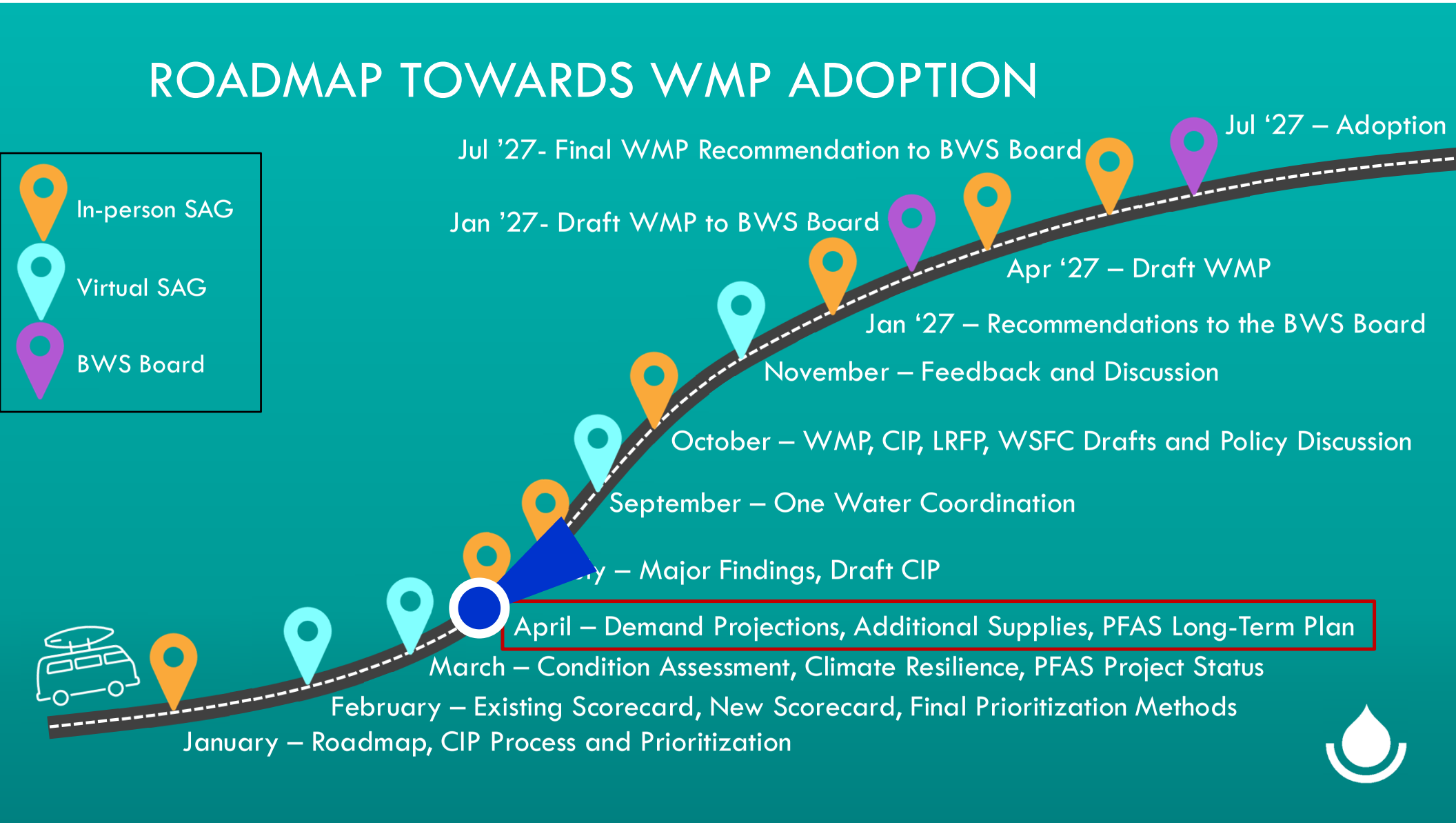
STAKEHOLDER ADVISORY GROUP MEETING 60

APRIL 16, 2026

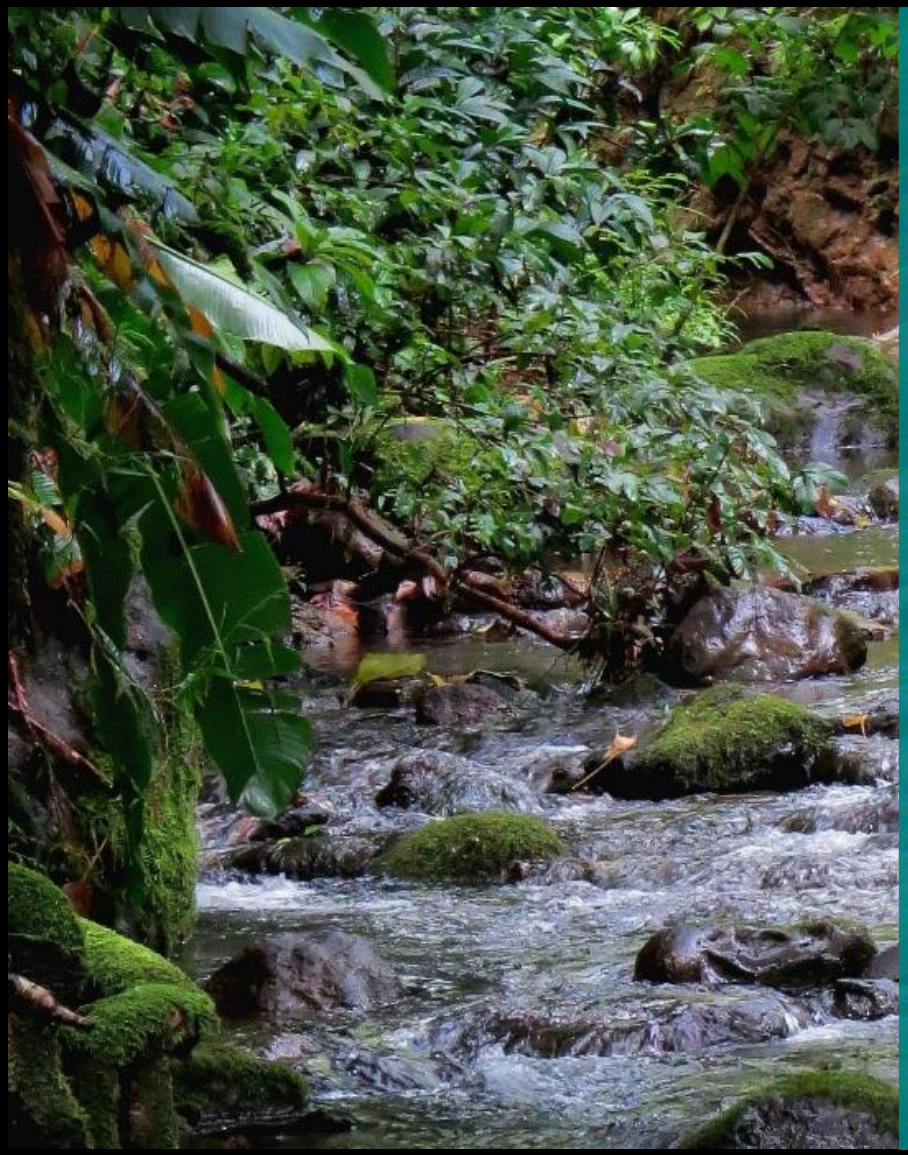
MEETING OBJECTIVES

- Welcome and public comment
- Water demand projections
- Potential future sources
- Accept notes from meetings #58 and 59
- PFAS and emerging contaminants management
- Adjourn

ROADMAP TOWARDS WMP ADOPTION



PUBLIC COMMENT ON AGENDA ITEMS

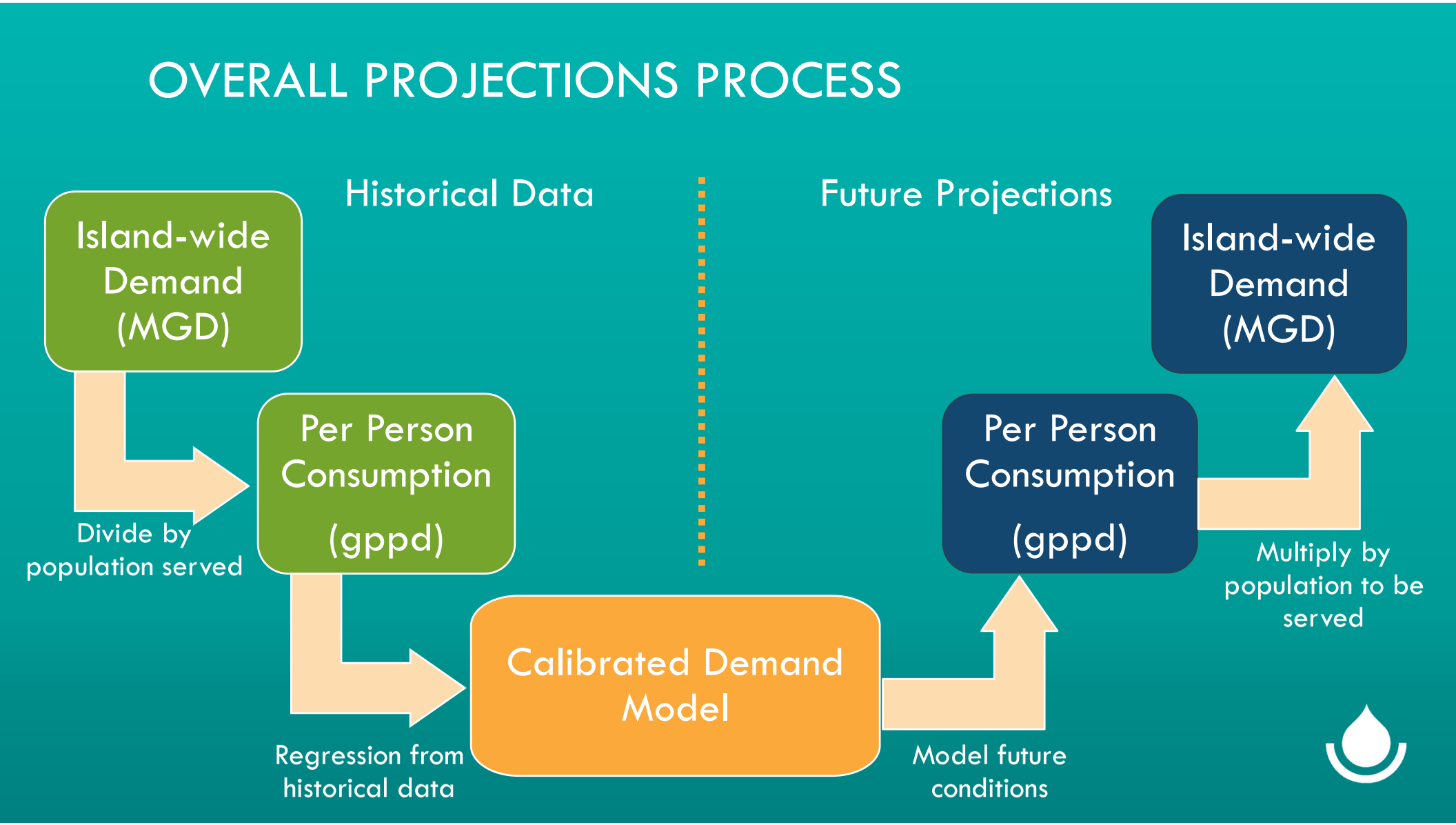


FUTURE WATER DEMAND PROJECTIONS

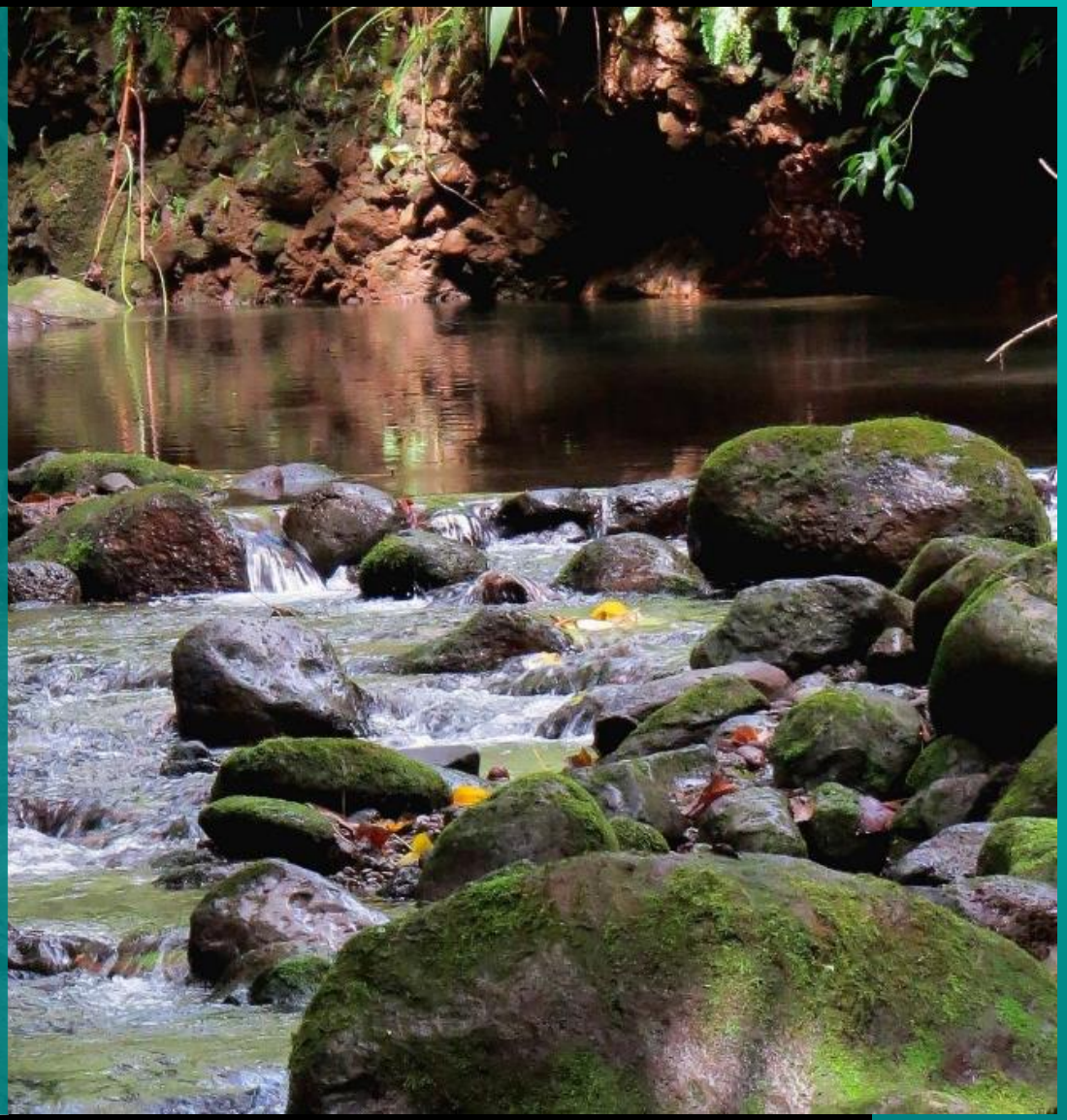
Carl Lundin, PE, PMP

boardofwatersupply.com

OVERALL PROJECTIONS PROCESS



HISTORICAL WATER DEMAND



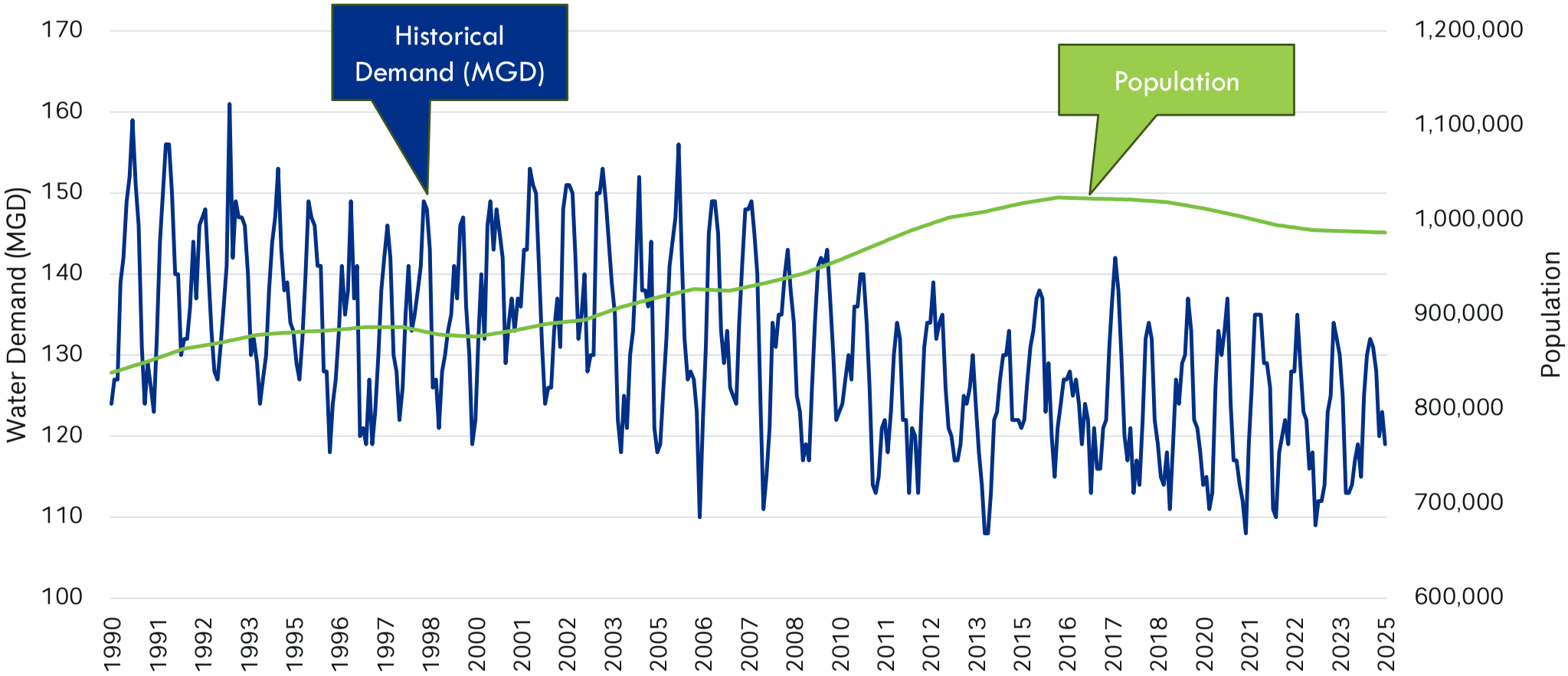
HISTORICAL PER PERSON WATER DEMAND

- BWS provides about 135 million gallons per day (mgd) to 1 million people

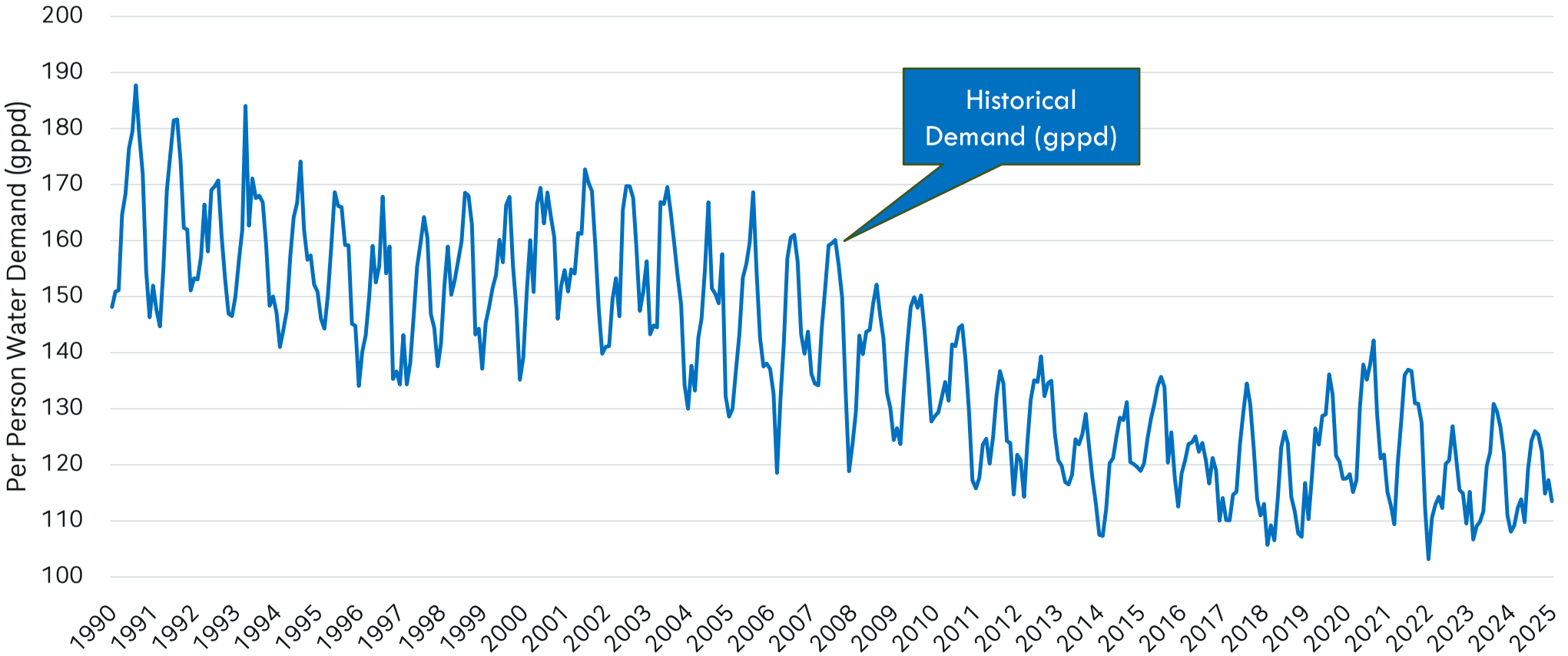
Total BWS Water Production	÷	**O'ahu Population**	=	**Per Person Water Demand**
Gallons		*Number of People*		*Gallons Per Person Per Day (gppd)*

- Seasonal vs Long-Term impacts
  - Seasonal: patterns within a year
  - Long-Term: trends over years or decades

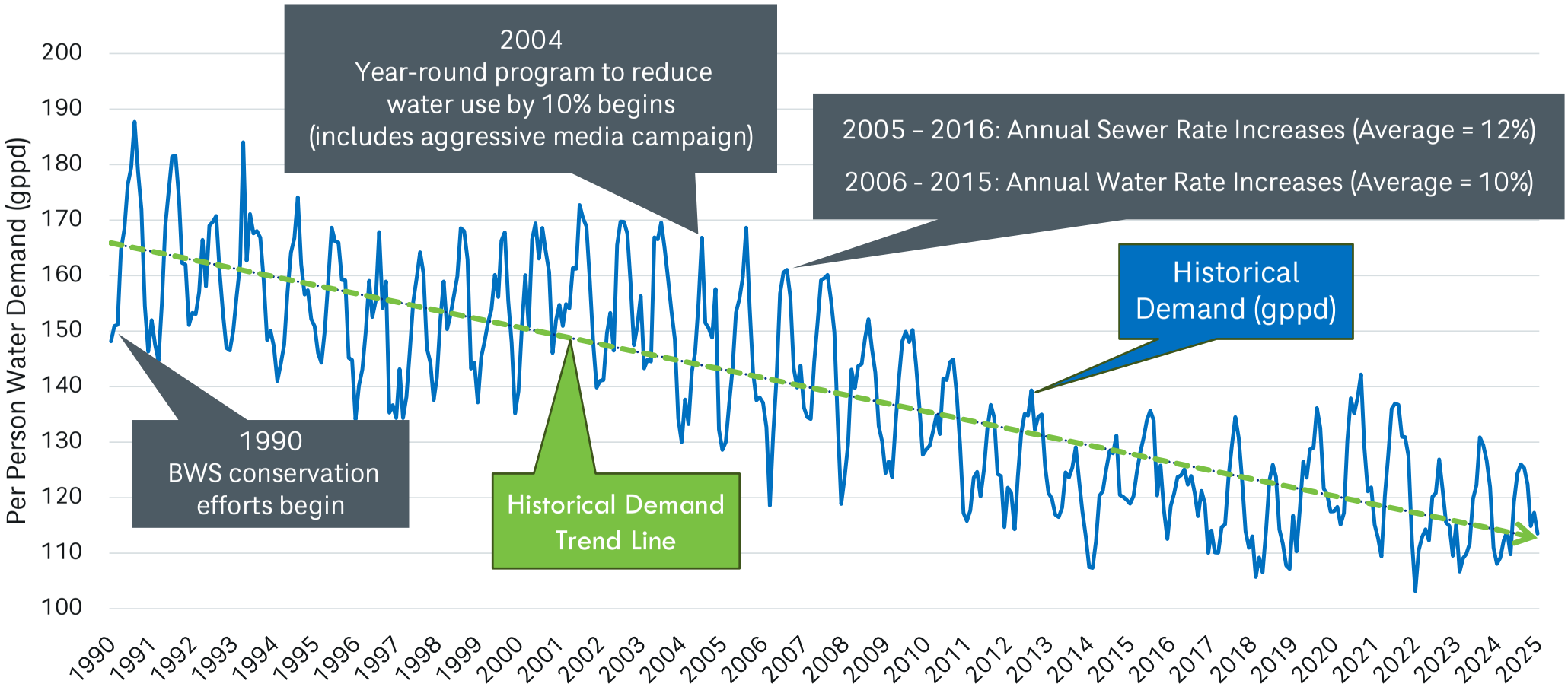
HISTORICAL WATER DEMAND (MGD) AND O‘AHU POPULATION



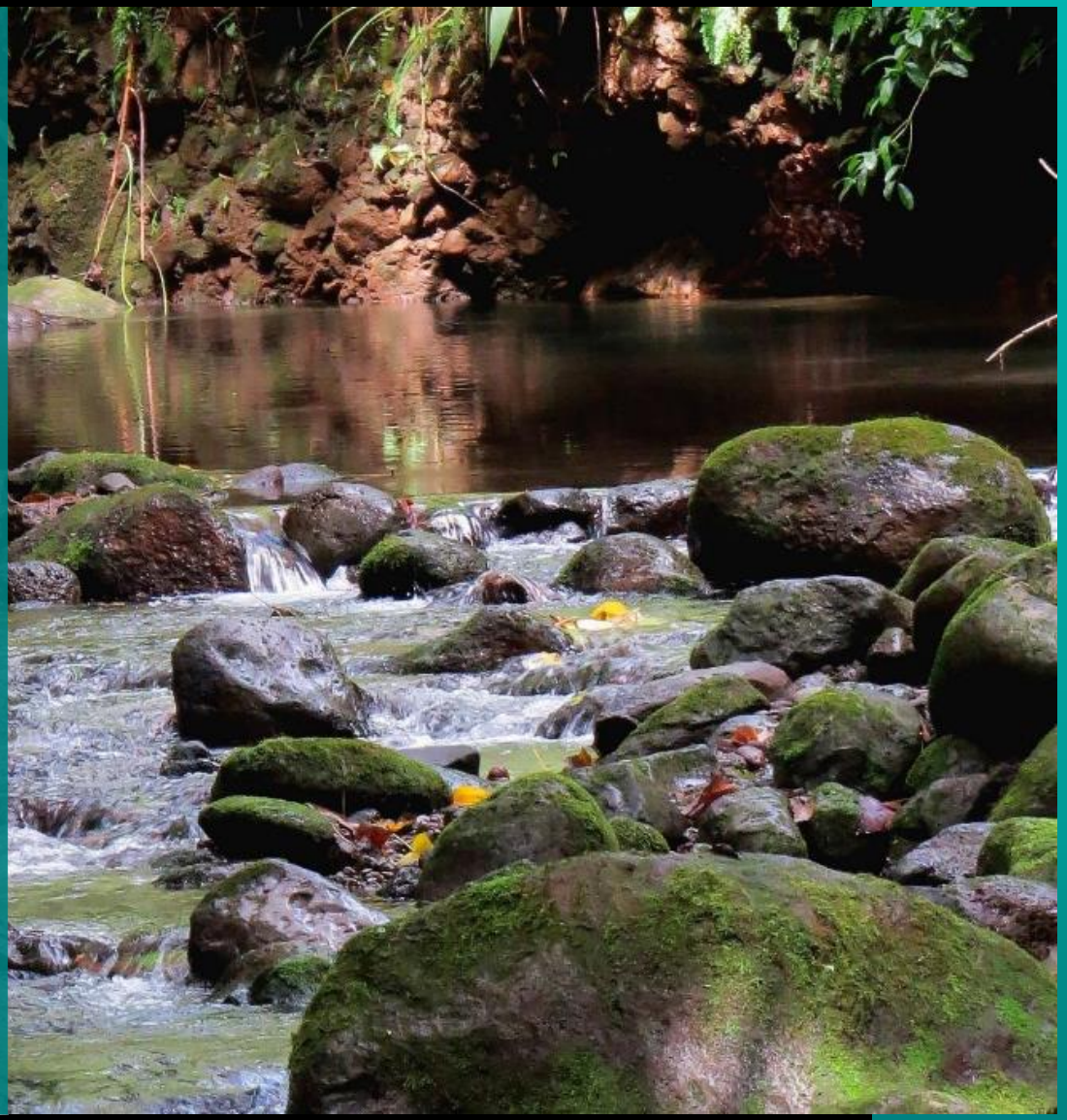
HISTORICAL PER PERSON WATER DEMAND



HISTORICAL PER PERSON WATER DEMAND - LONG-TERM TRENDS



DEMAND MODEL – METHODOLOGY



DEMAND PROJECTIONS METHODOLOGY

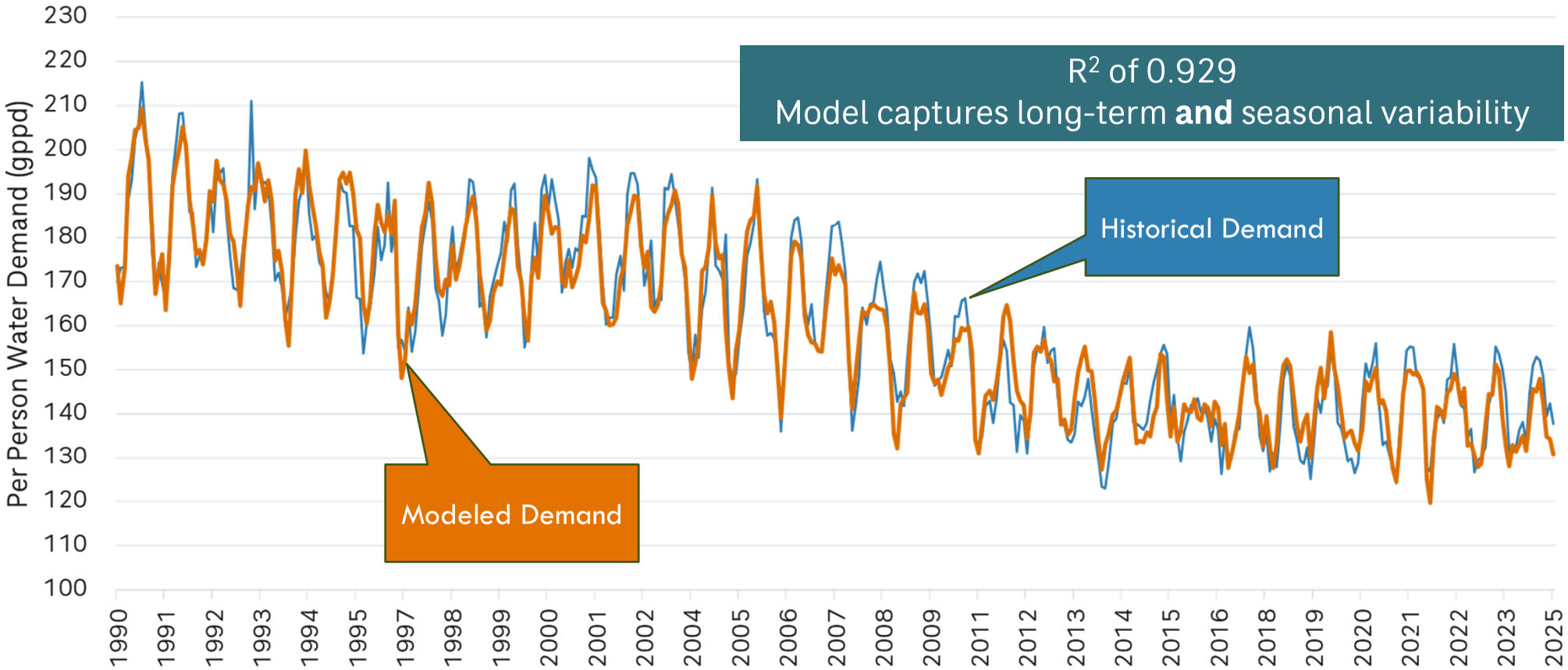
- Econometric Demand Model
  - Statistical analysis that looks at how economics AND weather impact demand
  - ***Recognizes that:***
    - ***Water demand is based on combination of variables***
    - ***Water demand is not random and not set in stone***
- Examine combination of variables to find which one "fits" historical demands
  - Determine how much each variable affects demand

VARIABLES EXPLORED IN MODEL

- **Max monthly temperature**
- Number of days hotter than 90 degrees
- **Monthly precipitation**
- **Previous month's precipitation**
- **Max consecutive days in month with zero precipitation**
- Visitor arrivals
- **Unemployment rate**
- Economic recession indicator (unemployment > ~6%)
- Per capita income
- **Volumetric price for 9,000 gal water**
- Sewer rates
- BWS conservation/education
- Plumbing efficiency
- **Non-revenue water**
- Main breaks
- Nonpotable water

Most impactful variables in **blue**

WATER DEMAND MODEL



HOW MUCH DOES EACH VARIABLE MATTER?

Variable	Coefficient
Monthly Average Daily Max Temperature	1.046
Consecutive Days Without Precipitation	0.020
Total Monthly Precipitation	-0.033
Previous Month's Total Precipitation	-0.033
Unemployment Rate	-0.018
Volumetric Price of Water (per 9 kgal)	-0.180
Nonrevenue Water	0.142

- The coefficient tells us how much water demand would change if a variable was increased by 1%

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- Examples:
  - When the monthly average daily **max temperature** increases by 1%, the demand ***increases*** by 1.05%

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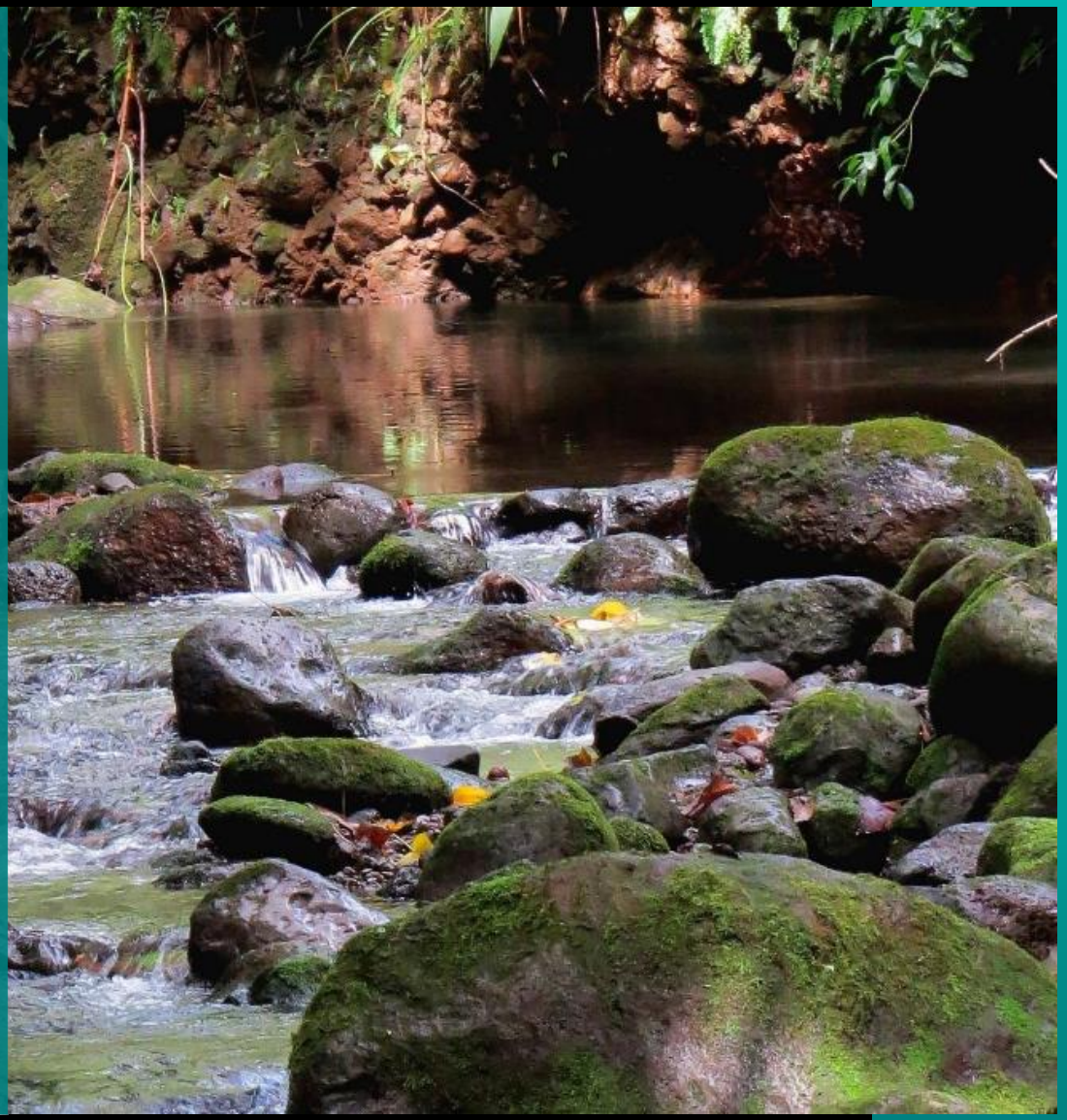
- The coefficient tells us how much water demand would change if a variable was increased by 1%
- Examples:
  - When the monthly average daily **max temperature** increases by 1%, the demand ***increases*** by 1.05%
  - When the **average price of water** increases by 1%, the demand ***decreases*** by 0.18%

PROJECTIONS PROCESS

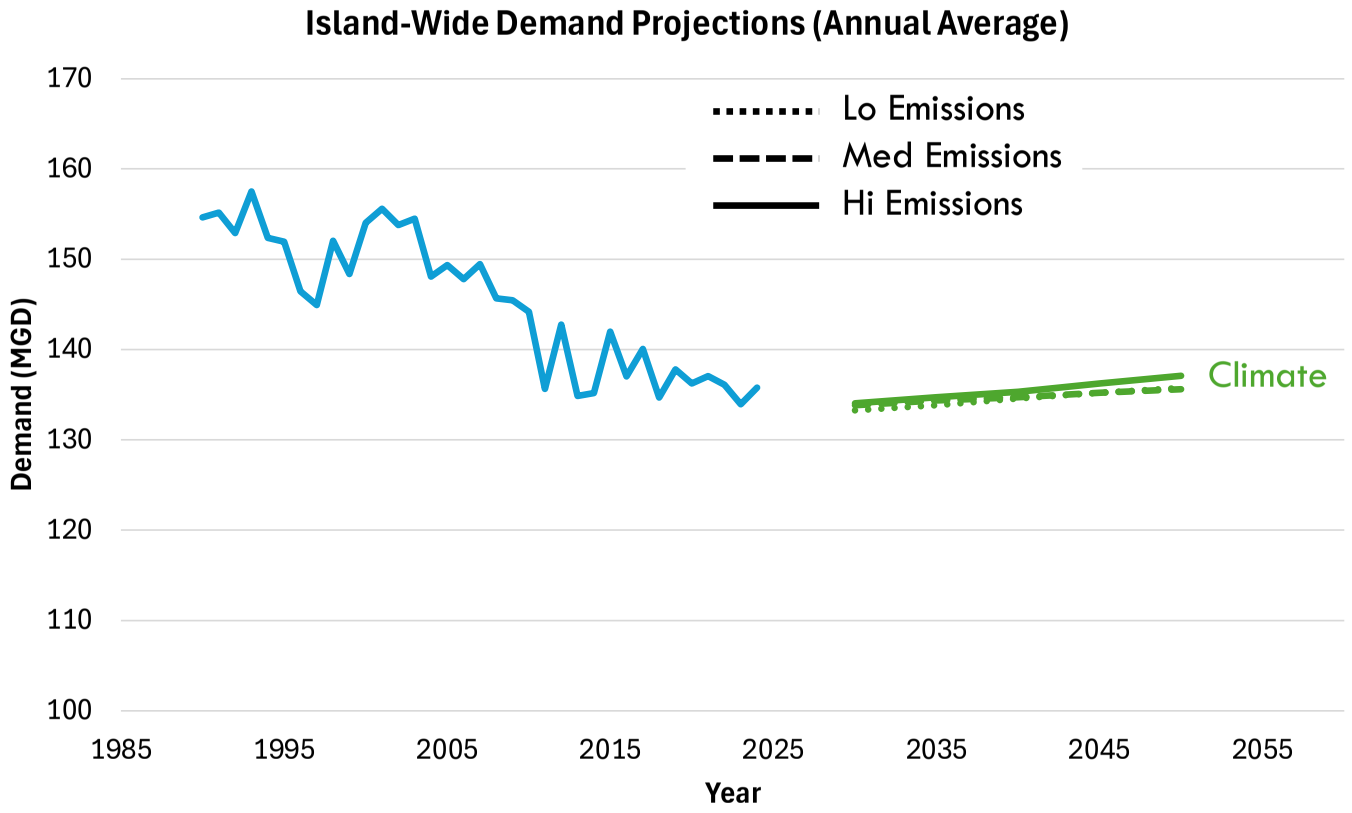


APPLYING THE DEMAND MODEL TO ESTIMATE THE FUTURE

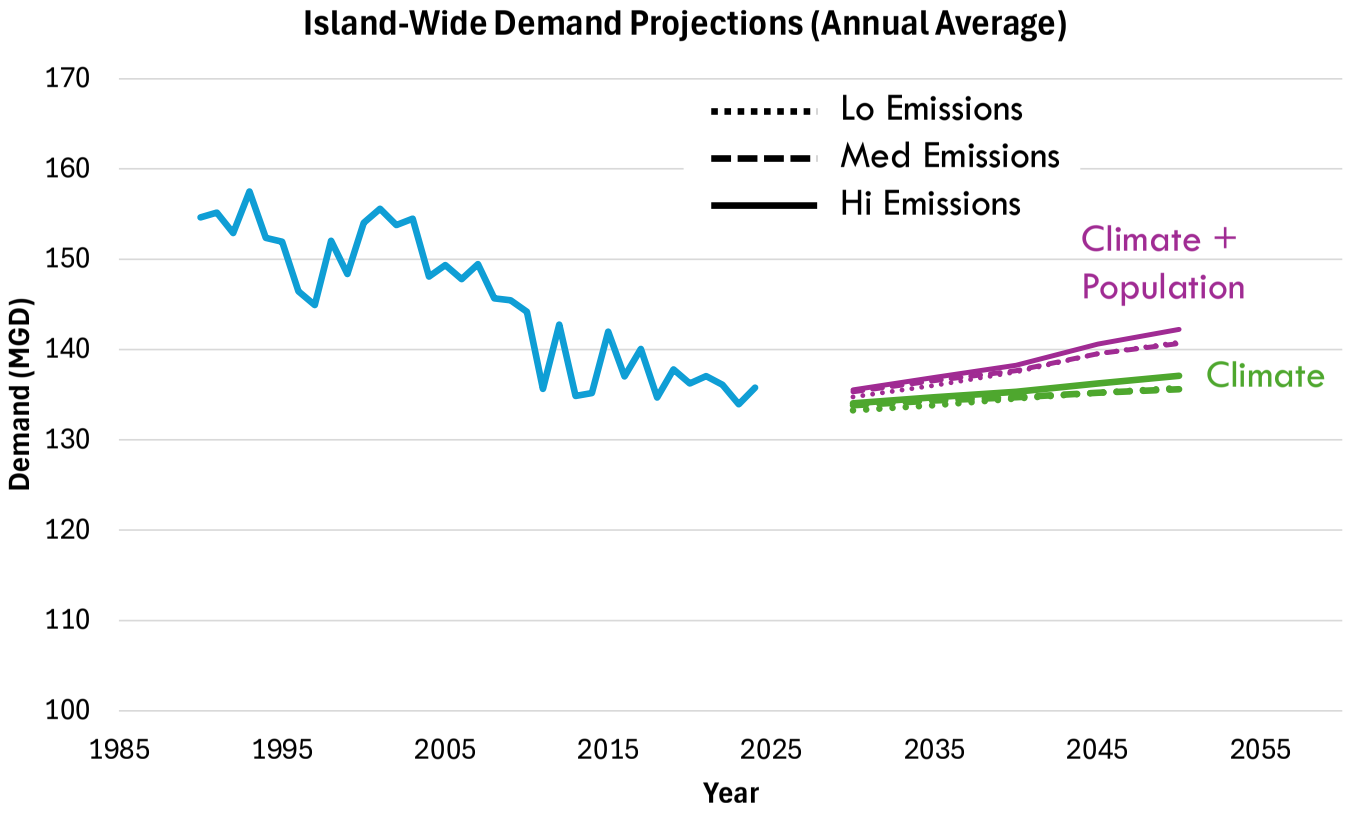
- Project how all the factors will change through 2055
- Consider three climate scenarios
- Base non-climate factors on historical trends

	Variable	Coefficient
Climate	Monthly Average Daily Max Temperature	1.046
	Consecutive Days Without Precipitation	0.020
	Total Monthly Precipitation	-0.033
	Previous Month's Total Precipitation	-0.033
	Unemployment Rate	-0.018
	Volumetric Price of Water (per 9 kgal)	-0.180
	Nonrevenue Water	0.142

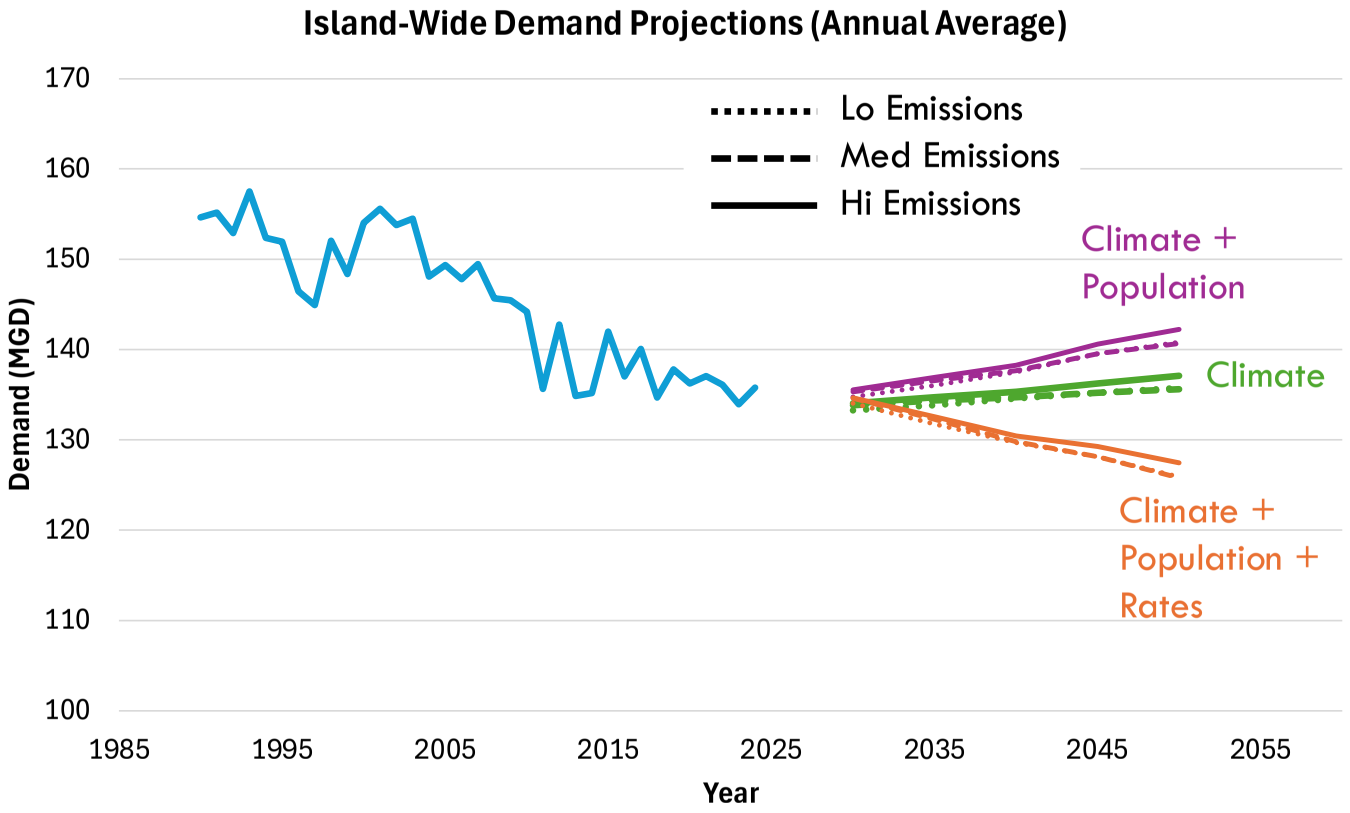
IF WE PROJECT THE CLIMATE, BUT USE TODAY'S POPULATION…

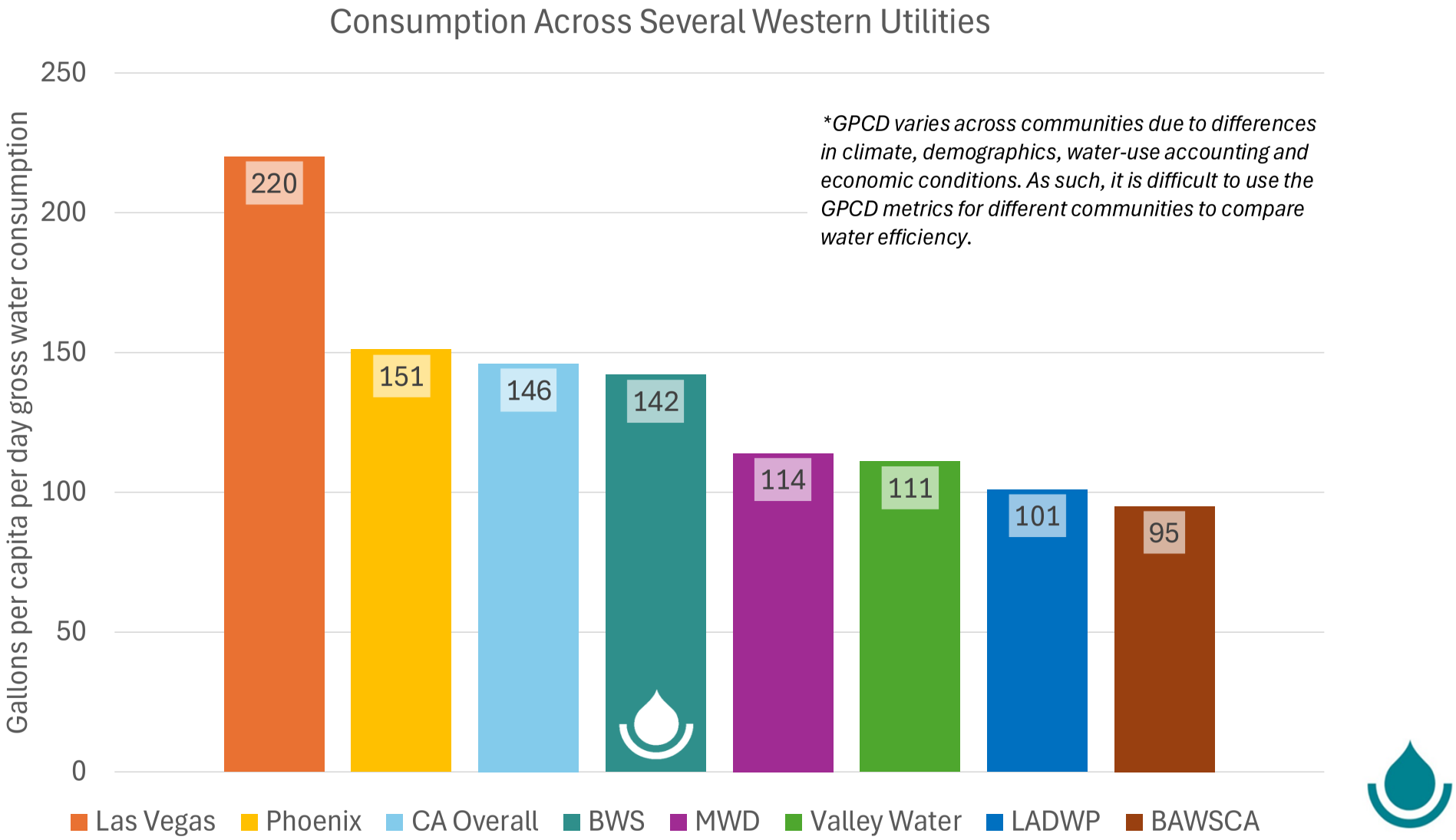


IF WE PROJECT THE CLIMATE AND ADJUST FOR ESTIMATED POPULATION…



IF WE PROJECT THE CLIMATE, ADJUST FOR ESTIMATED POPULATION, AND INCLUDE A 3% ANNUAL RATE INCREASE

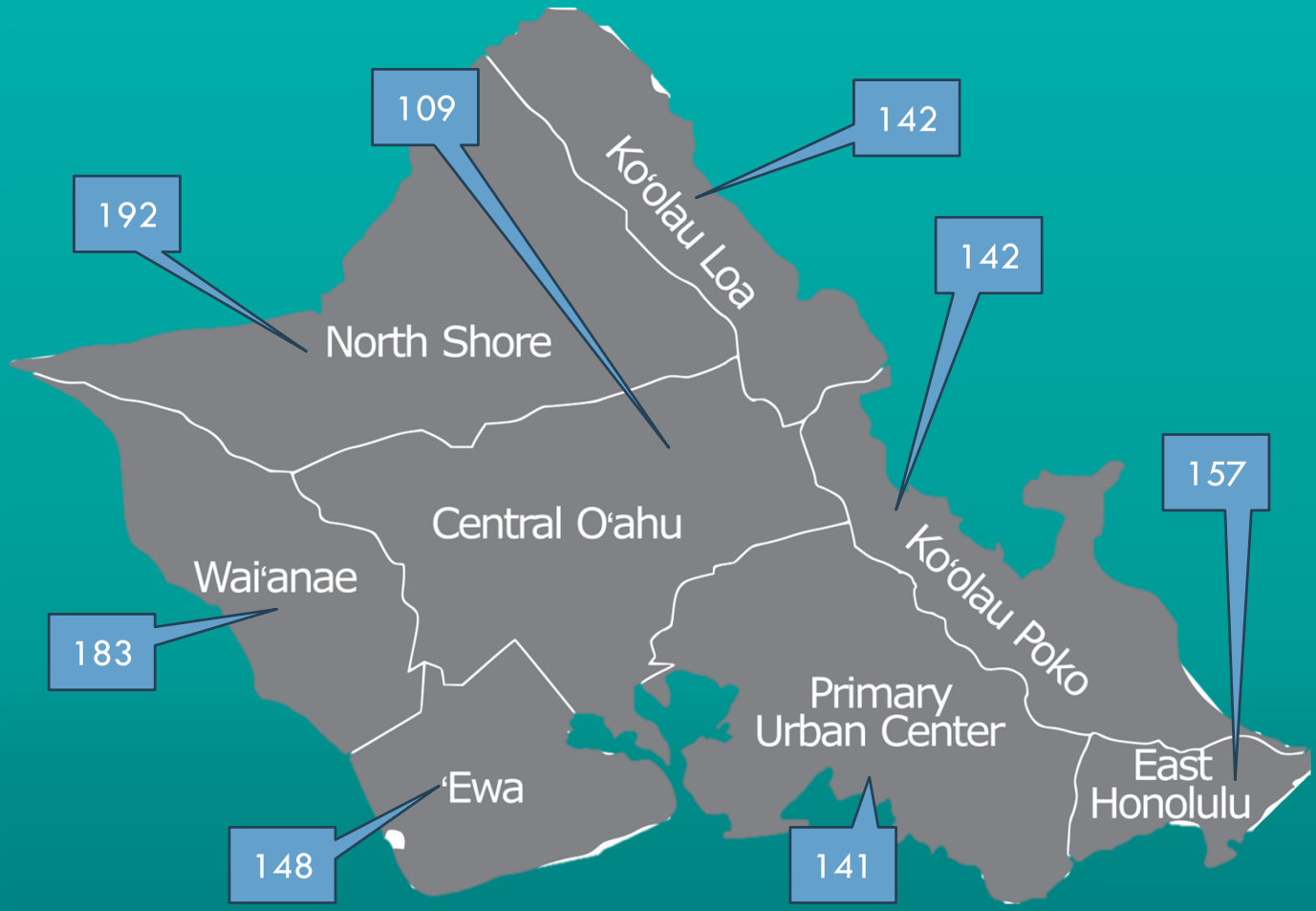



Consumption Across Several Western Utilities
Gallons per capita per day gross water consumption
250
200
150
100
50
0
220
151
146
142
114
111
101
95
*GPCD varies across communities due to differences in climate, demographics, water-use accounting and economic conditions. As such, it is difficult to use the GPCD metrics for different communities to compare water efficiency.
Las Vegas
Phoenix
CA Overall
BWS
MWD
Valley Water
LADWP
BAWSCA

GEOGRAPHICALLY DISPERSED DEMANDS MUST ALSO BE CONSIDERED

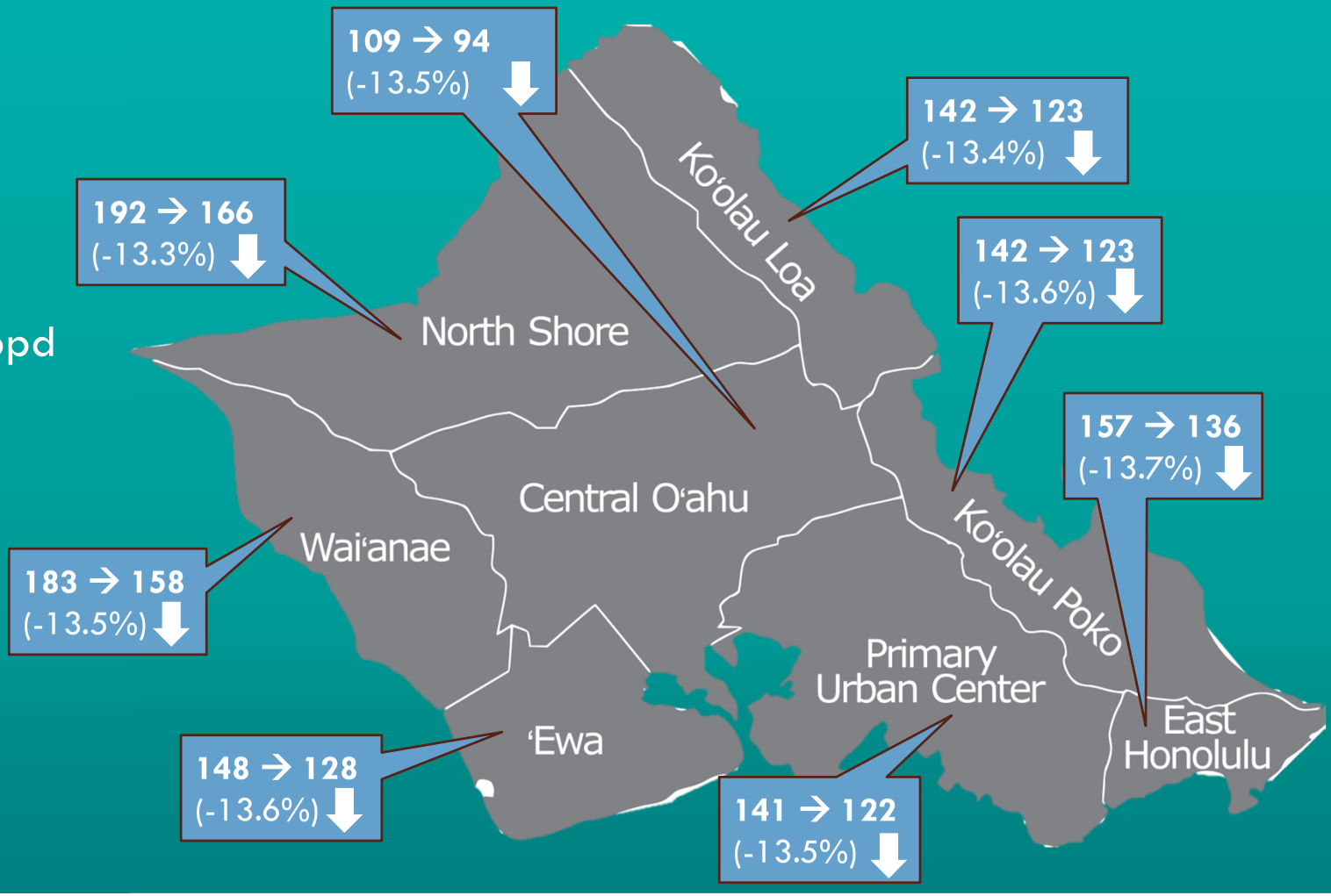
- Demands vary across the island due to:
  - Climate differences
  - Demographic differences
  - Commercial vs industrial vs residential proportion
  - Agricultural potable water use
- Utilized Department of Planning and Permitting's (DPP) Development Plan Areas (DP Area)

2024 AVERAGE ANNUAL DEMAND BY DP AREA (GPPD)



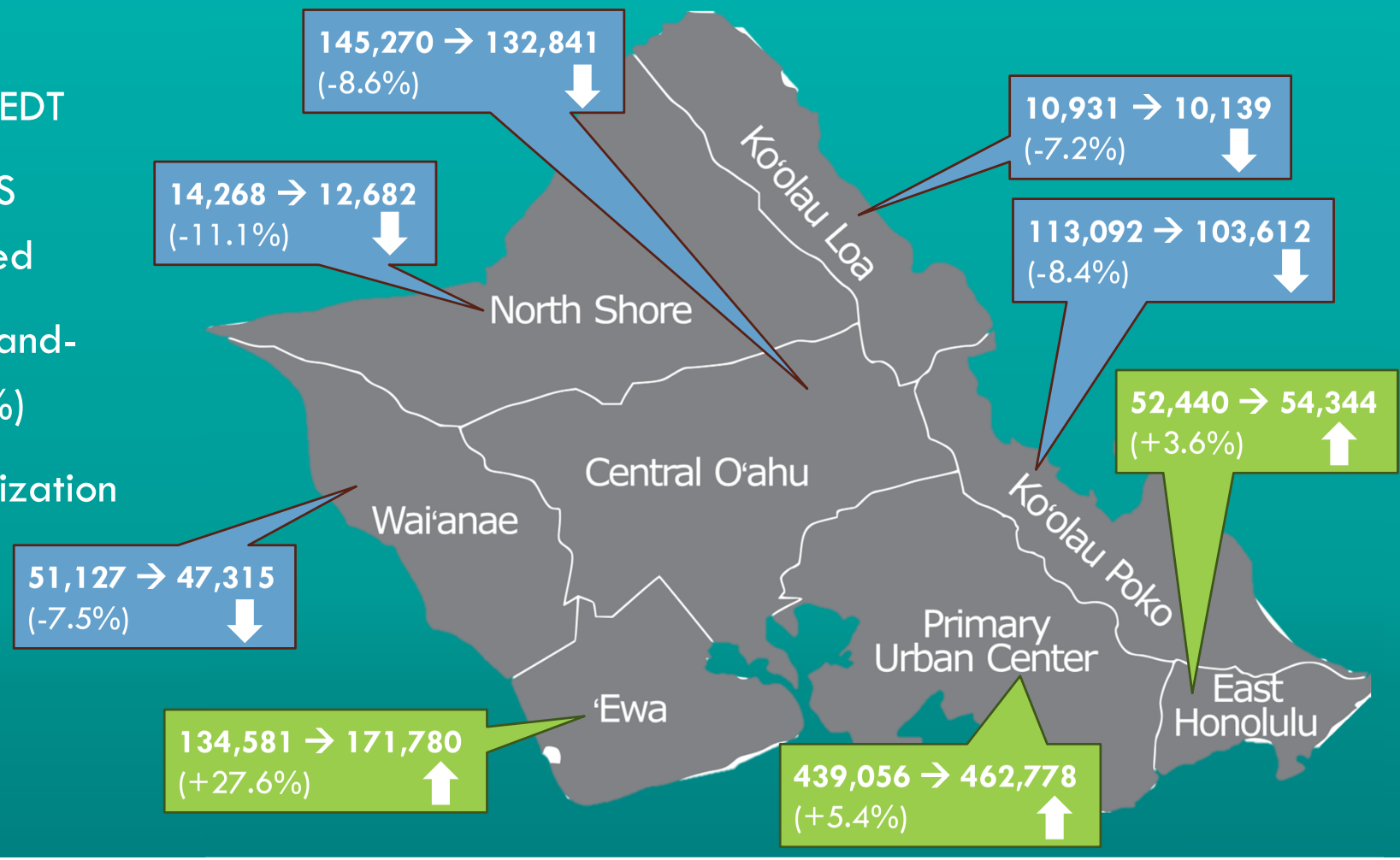
ANNUAL AVERAGE GPPD CHANGES (2024 TO 2055)

- Moderate emissions scenario
- Island-wide changes from 141 → 122 gppd



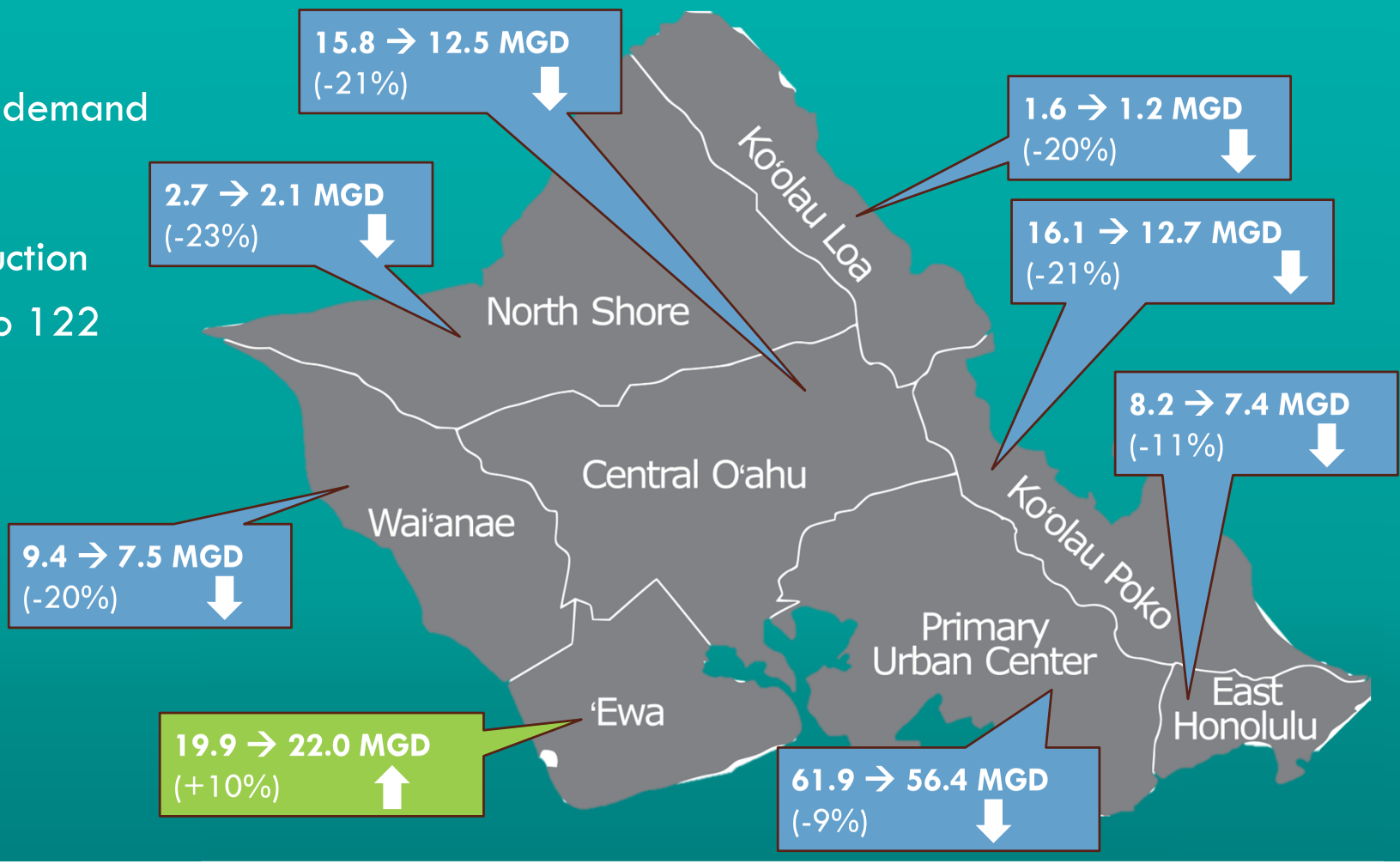
PROJECTED POPULATION CHANGES (2024 TO 2055)

- Projected by DBEDT
- Adjusted to BWS population served
- Minor growth island-wide (total 3.6%)
- Increased urbanization



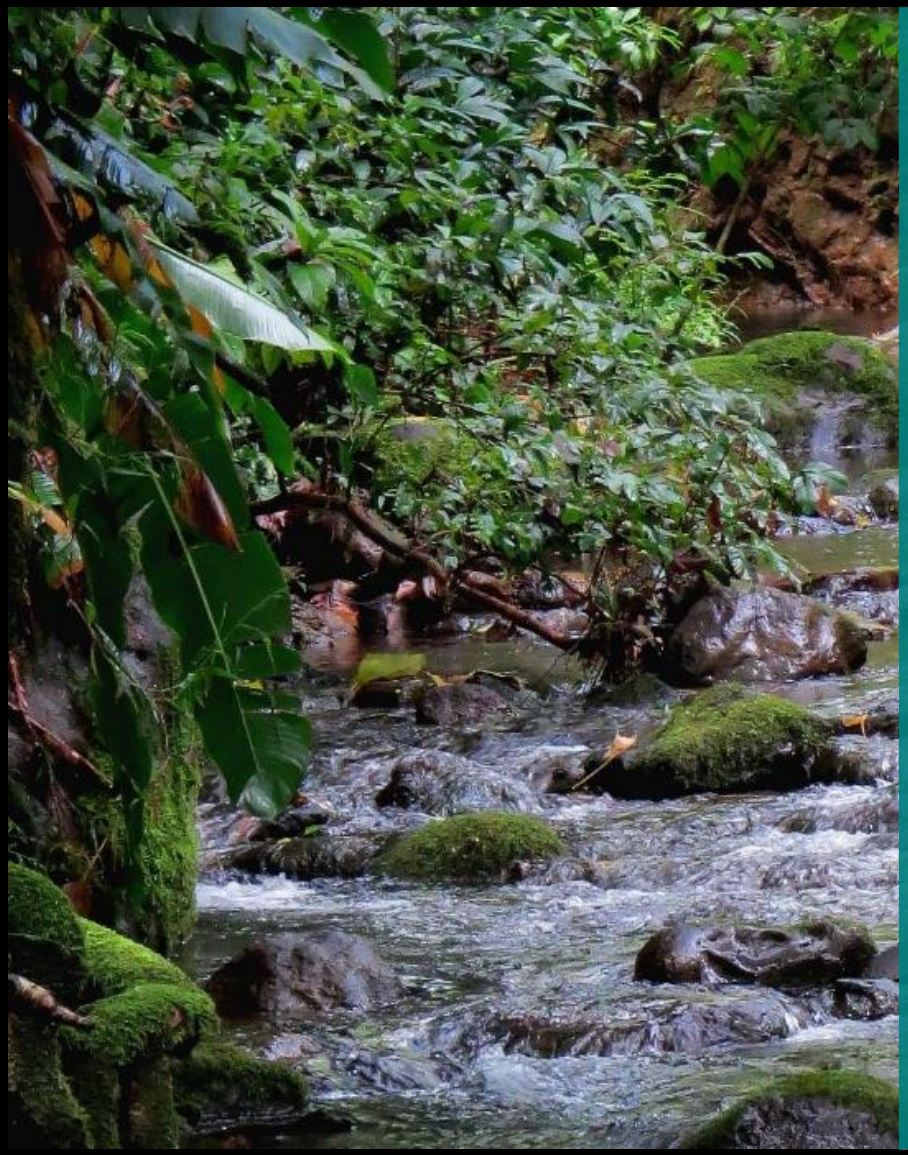
TOTAL DEMAND CHANGES (2024 TO 2055)

- Average annual demand shown
- Island-wide reduction from 136 mgd to 122 mgd



NEXT STEPS

- Incorporate Transit Oriented Development (TOD) Area demands
- Consider Affordable Housing Projects potential impacts
- Utilize projected demands to inform source requirements



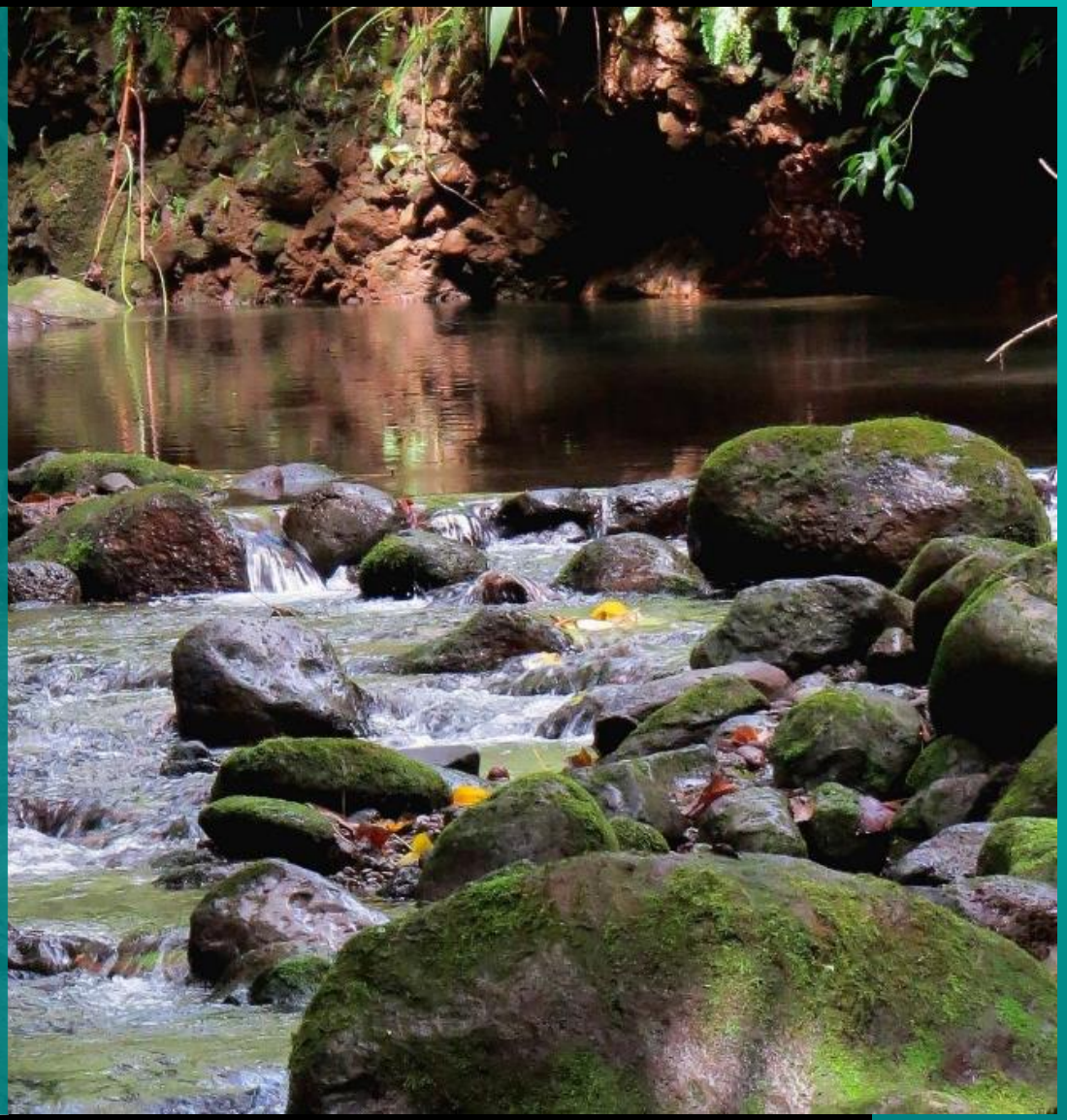
FUTURE WATER SUPPLIES

Bill Fernandez
CDM Smith
April 2026

AGENDA

- Need for New Supplies in the Future
- Pumping Capacity Analysis
- Options for Alternative Supplies
- Public Education Video

NEED FOR NEW SUPPLIES IN THE FUTURE

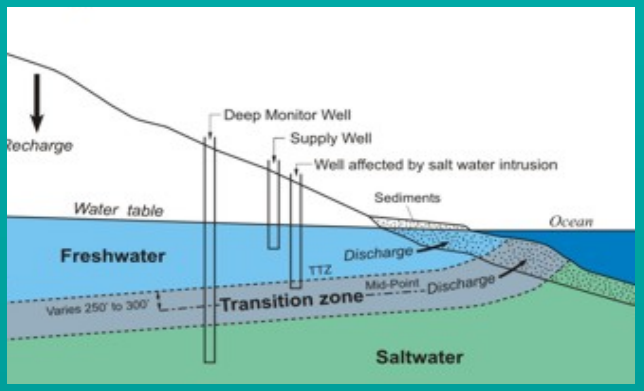


FUTURE SUPPLY NEED

Supply Need =

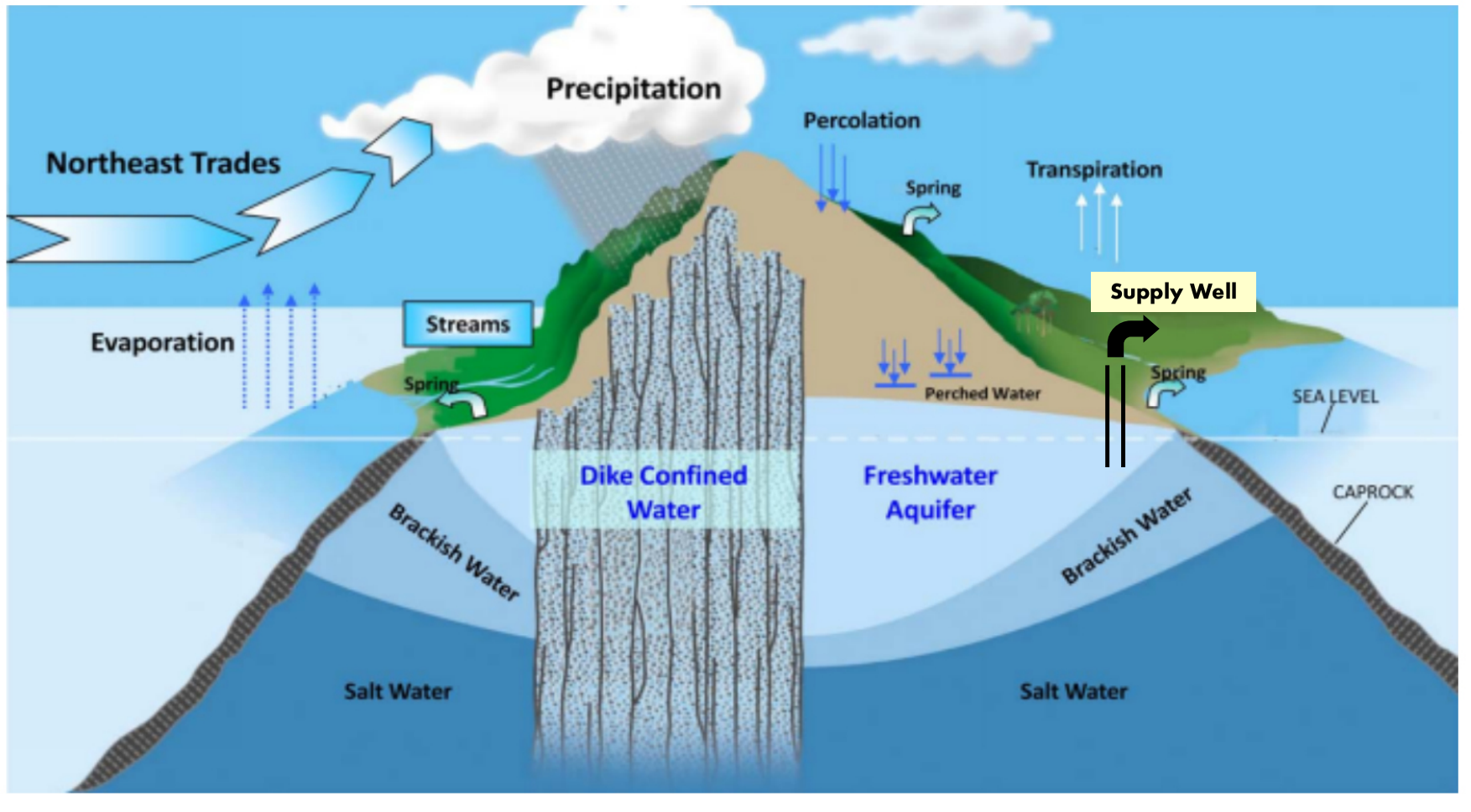
Water Demands

−

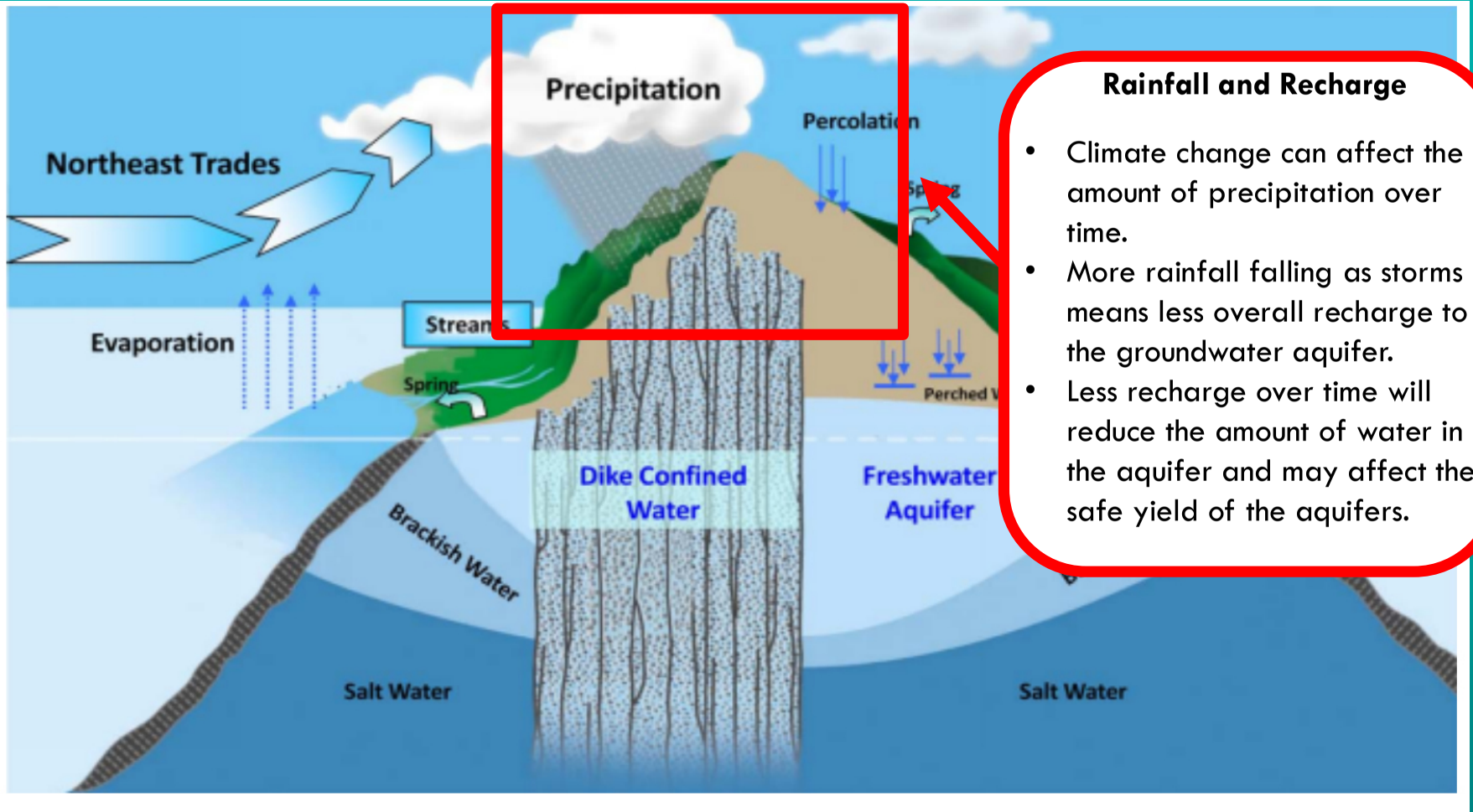


Water Supply

WATER CYCLE


Precipitation
Percolation
Northeast Trades
Spring
Transpiration
Supply Well
Evaporation
Streams
Spring
Perched Water
Spring
SEA LEVEL
Dike Confined Water
Freshwater Aquifer
CAPROCK
Brackish Water
Brackish Water
Salt Water
Salt Water

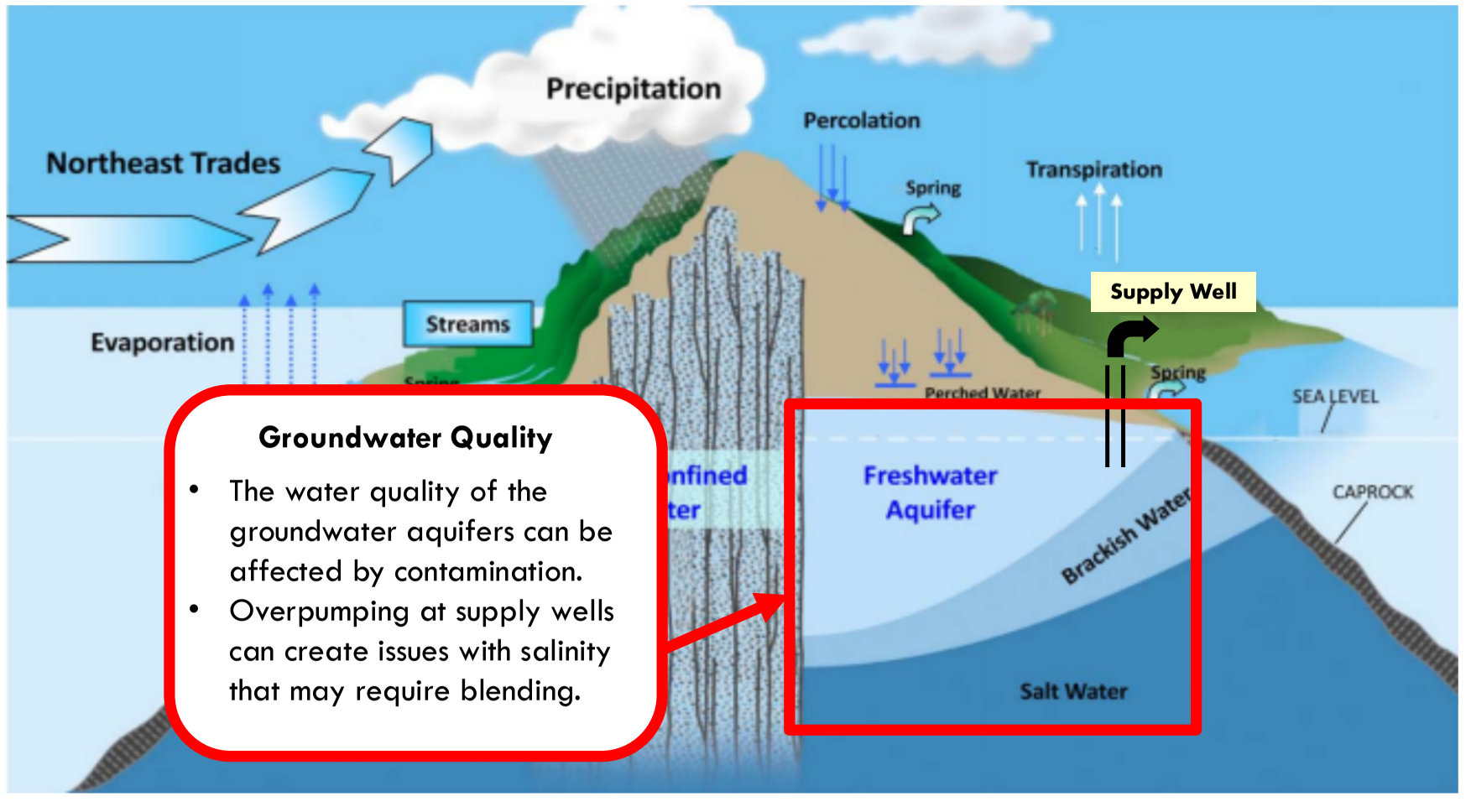
STRESS ON THE WATER CYCLE



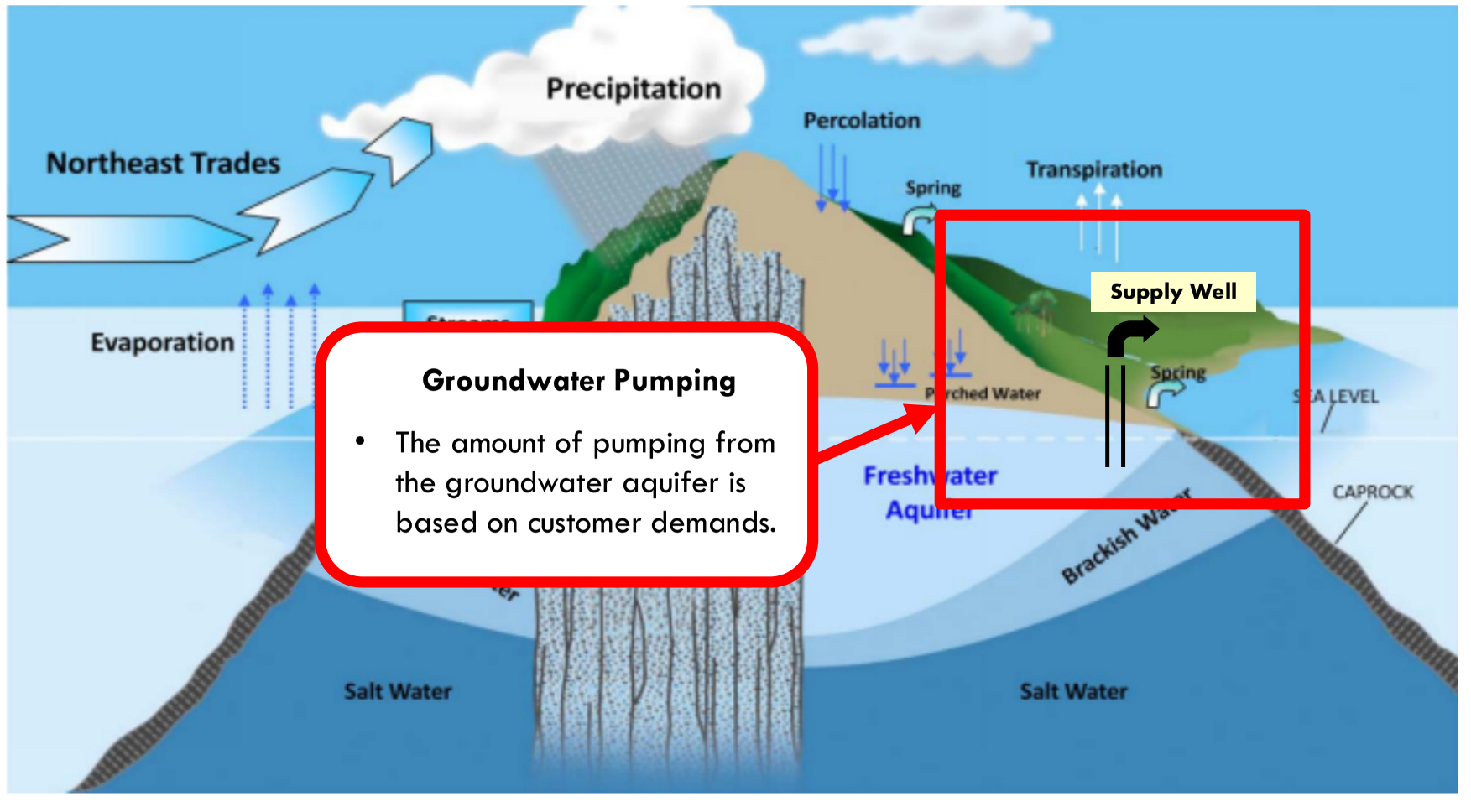
Rainfall and Recharge

- Climate change can affect the amount of precipitation over time.
- More rainfall falling as storms means less overall recharge to the groundwater aquifer.
- Less recharge over time will reduce the amount of water in the aquifer and may affect the safe yield of the aquifers.

STRESS ON THE WATER CYCLE



STRESS ON THE WATER CYCLE



RELATING STRESS ON THE WATER CYCLE TO THE WATER MASTER PLAN

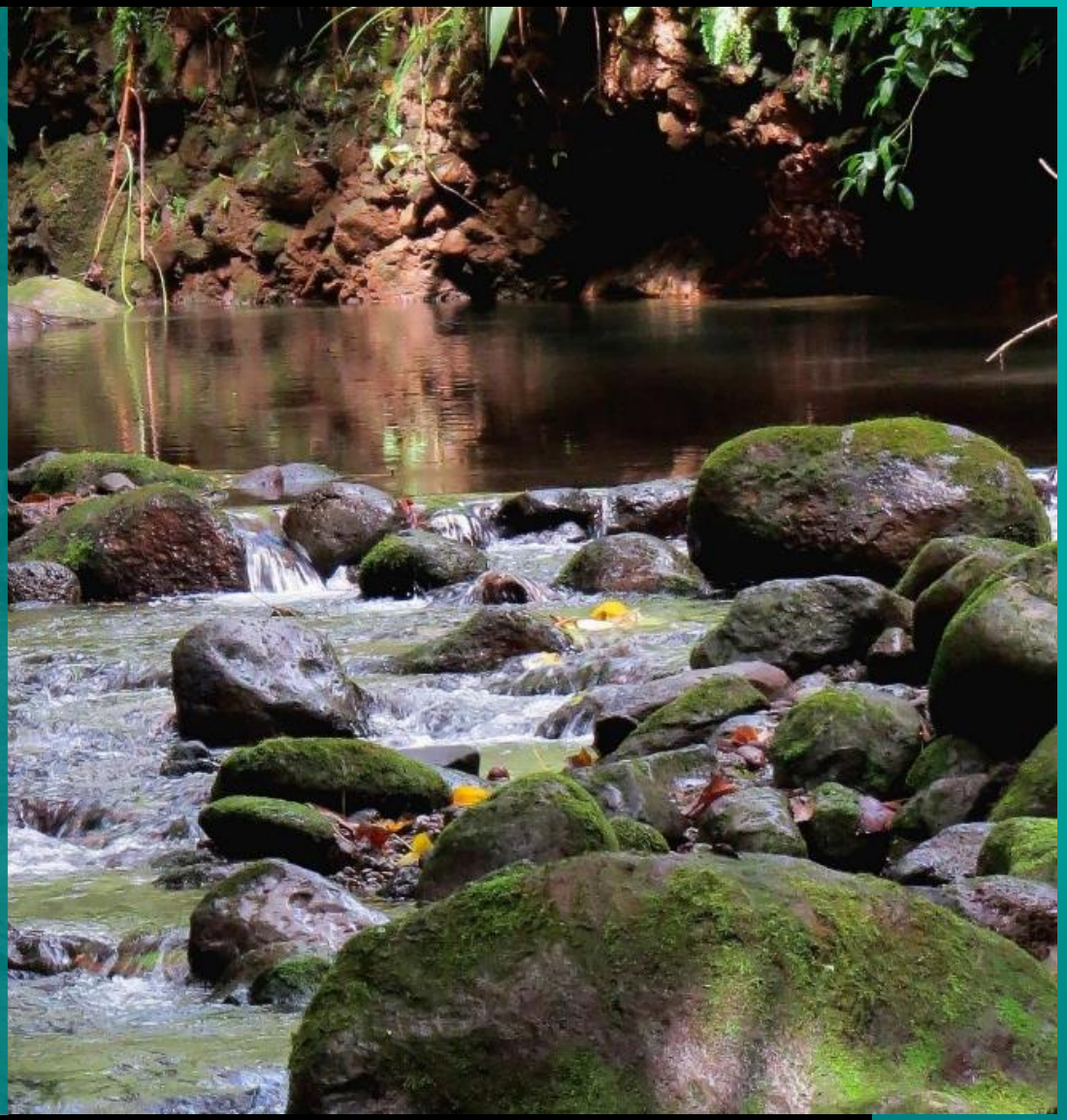
- Is there water supply and water infrastructure available to meet demands?
- Sometimes new infrastructure, or new supplies, are needed to meet demands as they change, either locally or to other parts of the system.

Overall Demands

Supply Yields

Demand Locations

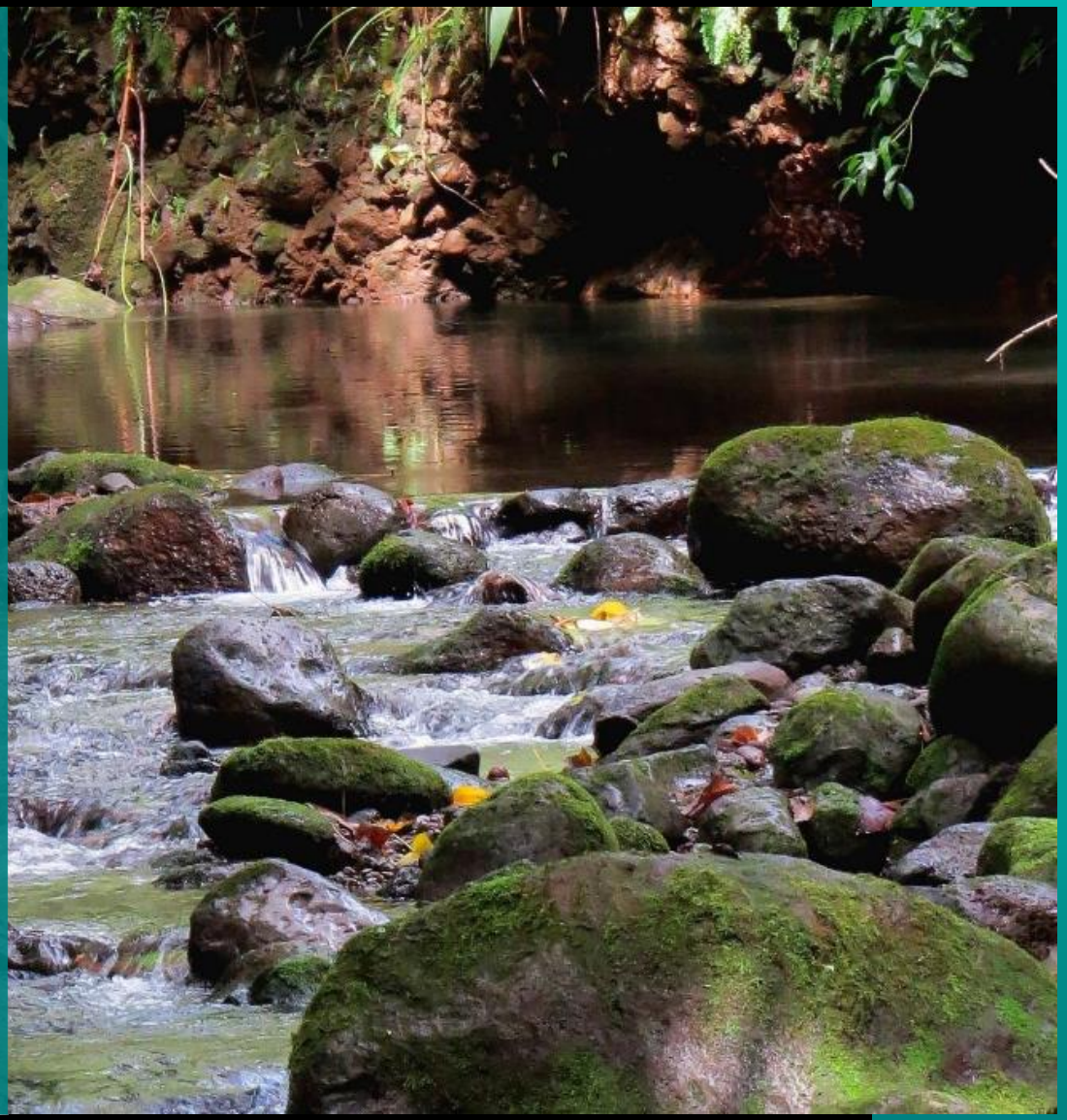
PUMPING CAPACITY ANALYSIS



PUMPING CAPACITY ANALYSIS

- Compare demands to firm pumping capacity within each of BWS' 110 distribution system pressure zones
- Identify where pumping capacity is not sufficient, where infrastructure may need to be updated, augmented
- Potential infrastructure needs found in:
  - METRO 180 WEST, METRO 170, METRO 705
  - WAIANAE 242
  - NUUANU 822
- Solutions could include either new sources or new transfers in

OPTIONS FOR ALTERNATIVE SUPPLIES



ALTERNATIVE SUPPLY OPTIONS

- Continued Investment in Water Conservation
- Seawater Desalination
- Stormwater Capture and Aquifer Recharge
- Centralized Recycled Water/Reuse
- On-site Reuse

CONTINUED INVESTMENT IN WATER CONSERVATION

Core BWS Programs

WaterSense Meets EPA Criteria

Trade Ally Program

WaterWisdom

BWS/ENV Joint Rebate

Low Flow Toilet (1.28 gpf or less)

Rebate: NOW $200

Energy Star Clothes Washer

Rebate: NOW $150

Rebate: NOW $400

Smart Water Monitor

REBATE PROGRAM HIGHLIGHTS (SINCE 2018)

117,334,692
Gallons Saved/Year

21,817
Rebates Issued

$1,613,775
($) Rebates Provided

13,202
Clothes Washers

5,485
Toilets

1,501
Rain Barrels

634
WBICs

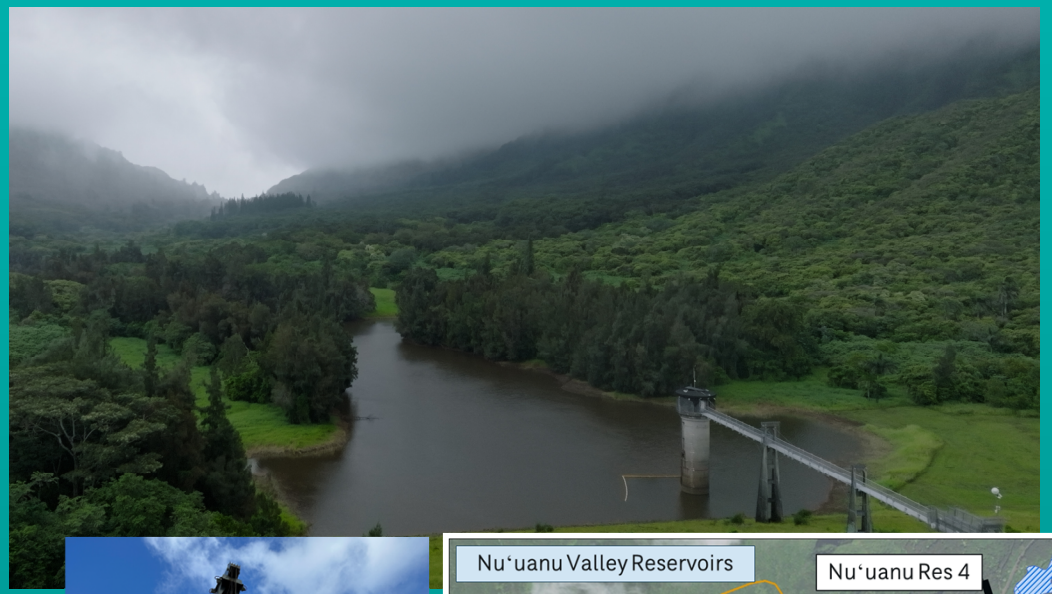
KALAELOA SEAWATER DESALINATION PLANT

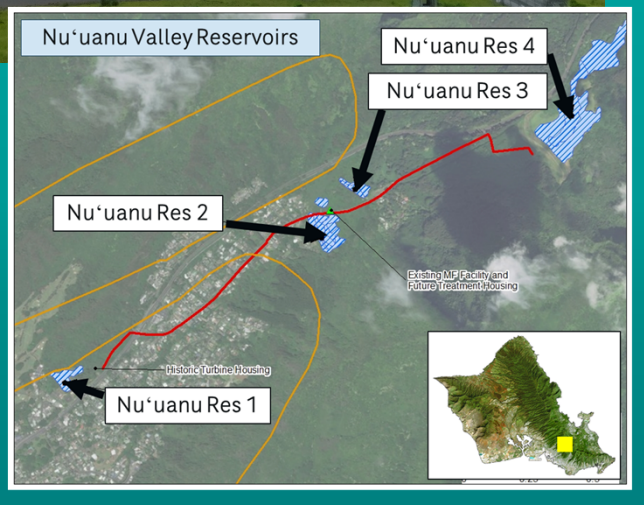
- Reverse osmosis (RO) membranes treat seawater, producing 1.7 to 2.55 million gallons of fresh water per day
- Will serve Campbell Industrial Park, Kapolei Business Park, and the Deep Draft Harbor.
- Treatment evaluation pilot phase was completed in 2025 – product water meets regulatory and WQ standards.

Typical RO treatment facility – Kalaeloa Desalco

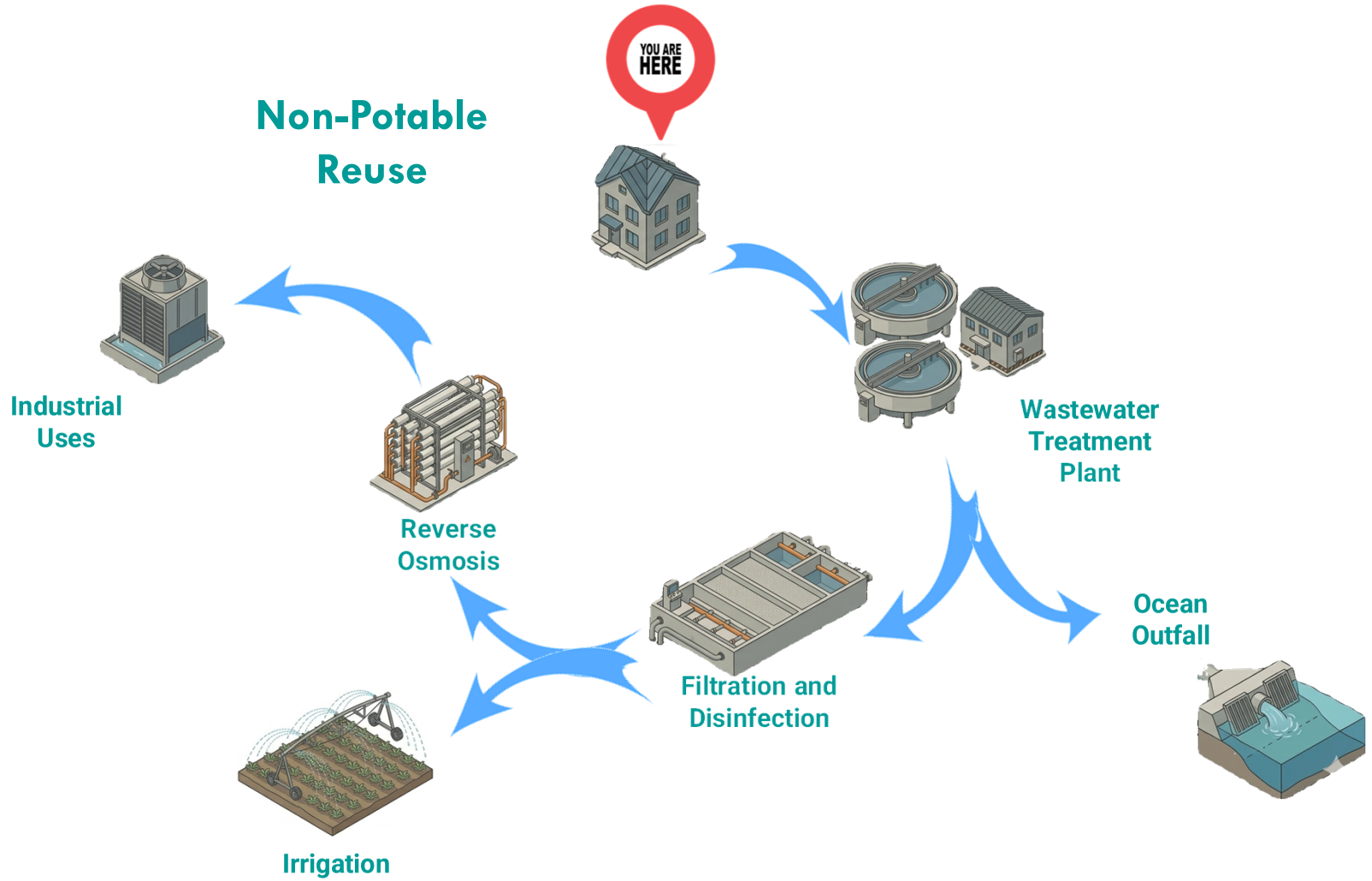
STORMWATER CAPTURE AND AQUIFER RECHARGE IN NUUANU

- Convey excess stormwater captured in Nu‘uanu Reservoir 4
- Pre-treat stormwater at treatment plant near Reservoir 2 & 3
- Generate electricity using elevation difference
- Inject treated water into groundwater aquifer near Reservoir 2/3 or at Reservoir 1, before it makes its way to downgradient BWS Kalihi Wells
- Currently develop preliminary engineering and environmental assessment

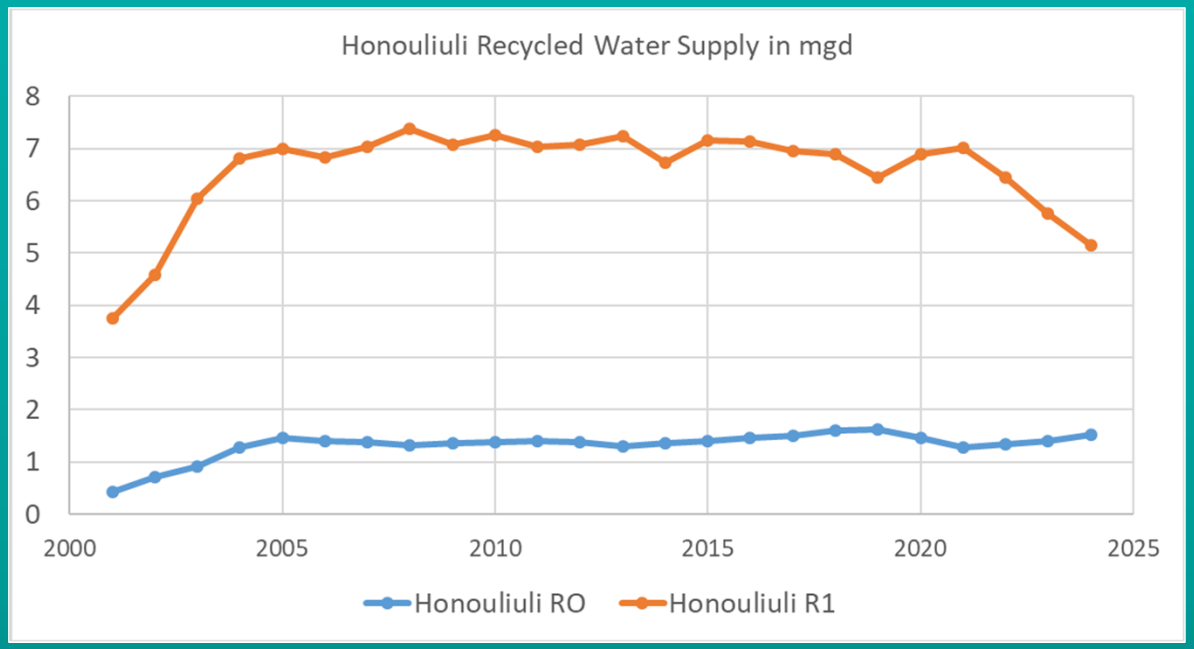




CENTRALIZED RECYCLED WATER/REUSE

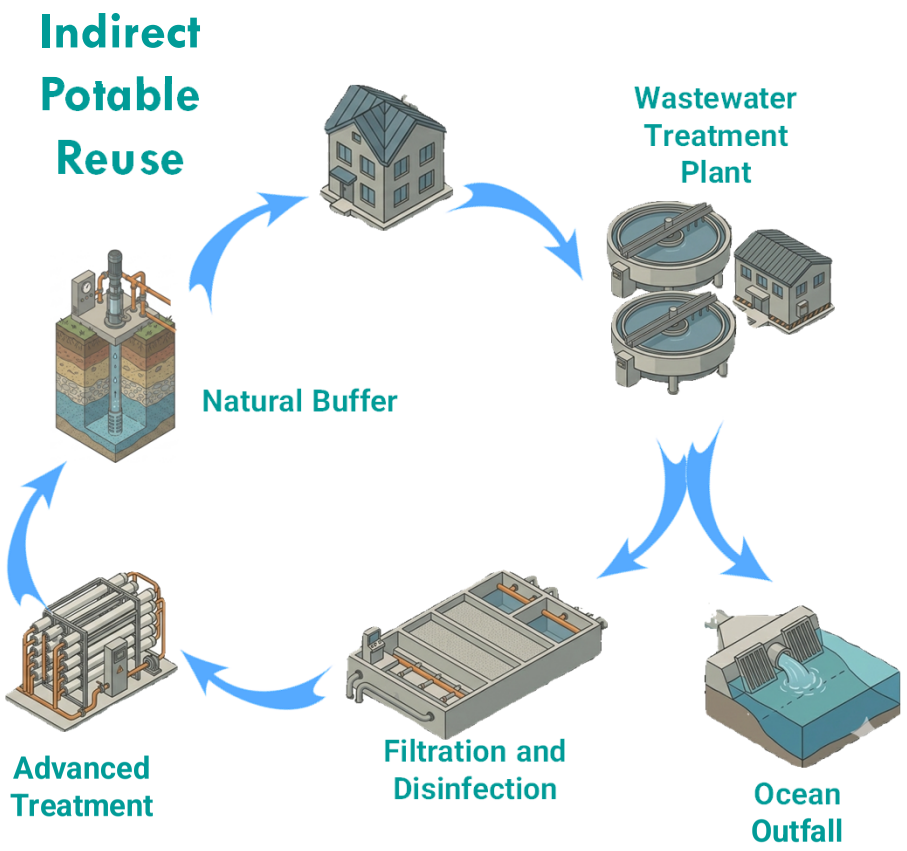


HISTORICAL WATER REUSE AT HONOULIULI



- 12 mgd Honouliuli Water Recycling Facility
- R1 (High Quality, 7 mgd)
  - Irrigation of golf courses, commercial landscaping
- RO (Higher Quality, 1-2 mgd)
  - Industrial uses include process water or cooling towers

CENTRALIZED RECYCLED WATER/REUSE



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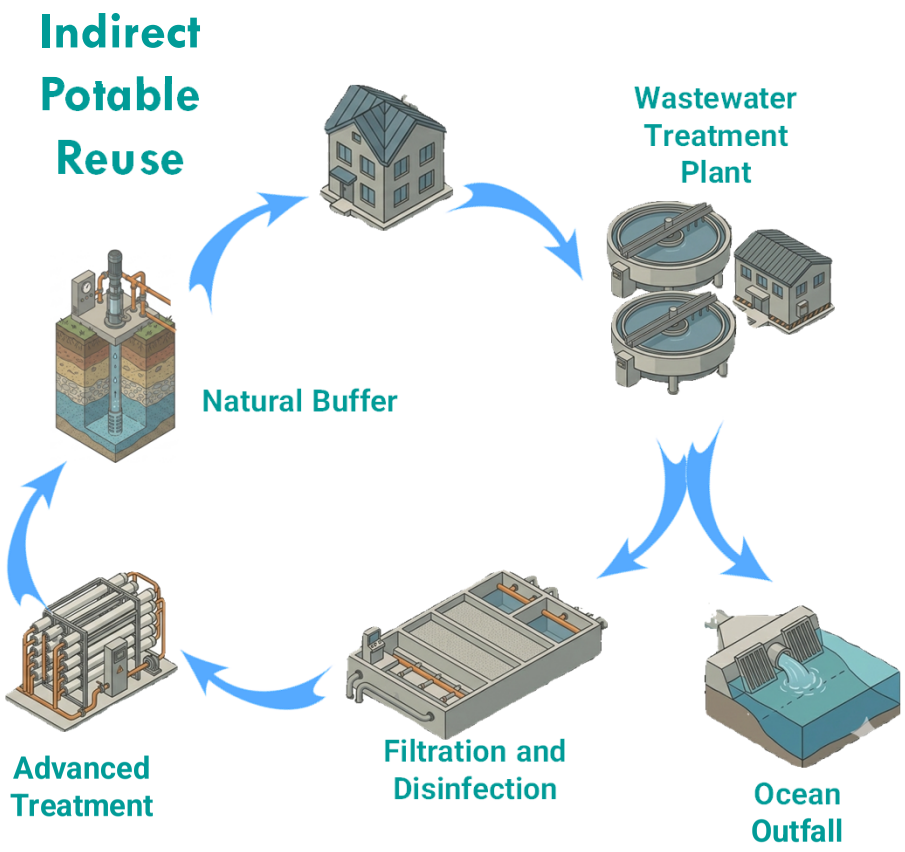
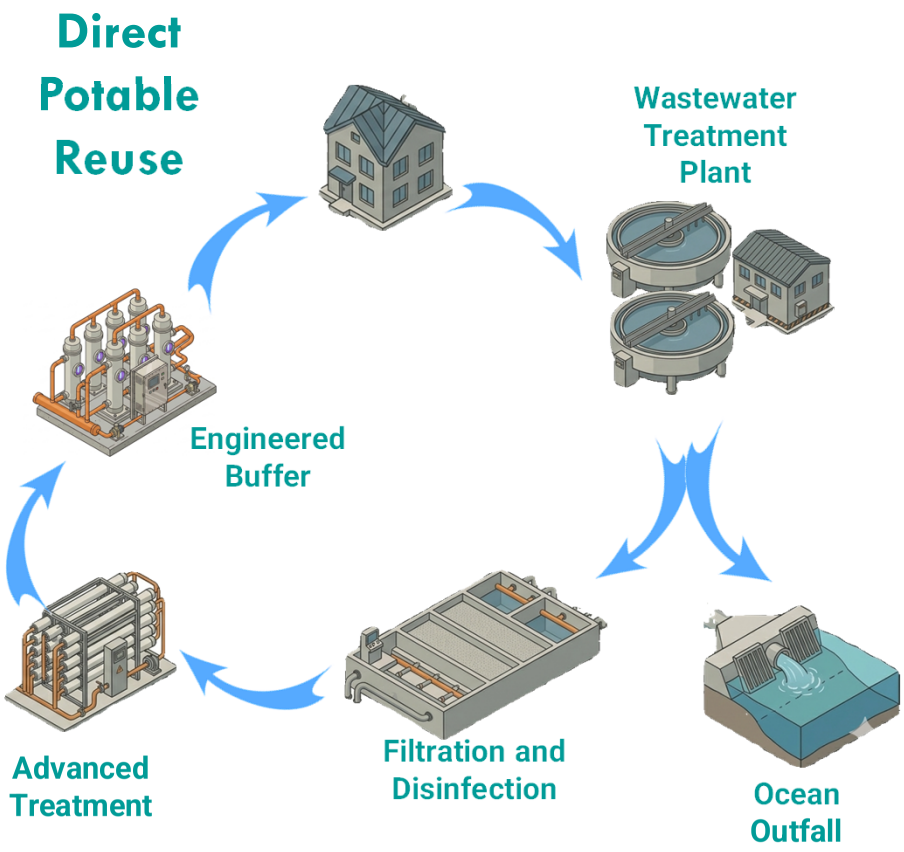




ON-SITE WATER REUSE: GRAY WATER REUSE SYSTEMS

- City Council reviewing Bill 21 - amend Honolulu's Land Use Ordinance related to TOD development
- Adds "gray water reuse systems" as a community benefit
- Department of Health: gray water sourced from sinks, tub and shower drains, and clothes washers — that has not come into contact with toilet waste — are estimated to be 50% to 80% of the total residential wastewater generated.

ON-SITE WATER REUSE: KUILEI PLACE (2027)

- 43-story luxury residential project in Mōiliʻili
- Utilize Epic's OneWater system to reduce the project's total non-potable water demand by nearly 43%.
- Capture gray water from sinks, showers and laundry
- Recycle up to 30,000 gallons of greywater per day and reuse it for toilet flushing and irrigation
- System includes monitoring, UV disinfection and fail-safe diverter valves to meet state safety requirements

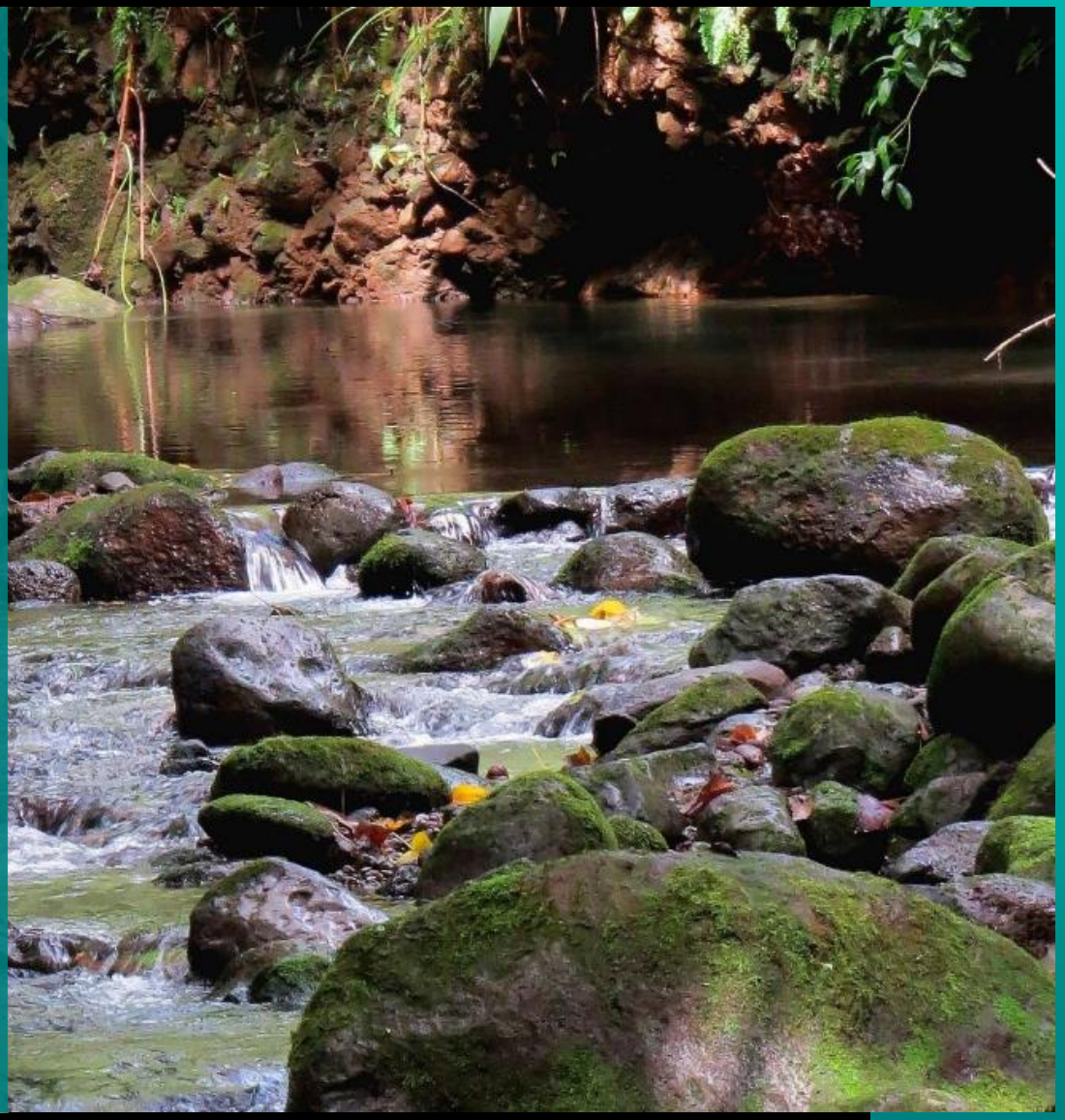
ON-SITE WATER REUSE: SALESFORCE BUILDING IN SAN FRANCISCO, CA

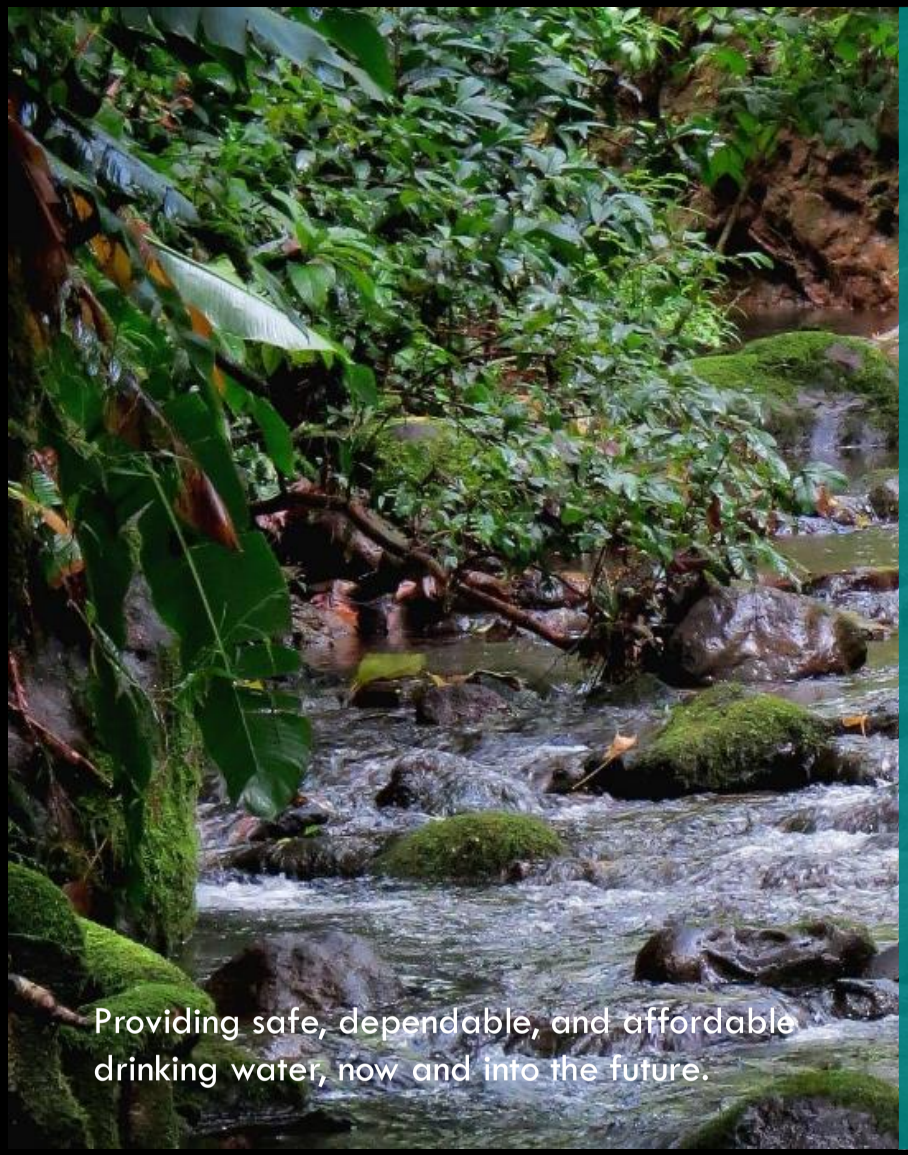
- Largest onsite blackwater system in a commercial high-rise in the U.S., designed to recycle up to 30,000 gallons of wastewater per day - reducing the building's freshwater consumption by up to 76%
- Water from the building's rooftop rainwater collection, cooling towers, sinks, toilets, and urinals is collected and treated onsite, then circulated for reuse in the HVAC system and for all toilet flushing.




EDUCATIONAL VIDEO: "RENEWED: THE JOURNEY TO SAFE DRINKING WATER"

Southern California Water Coalition





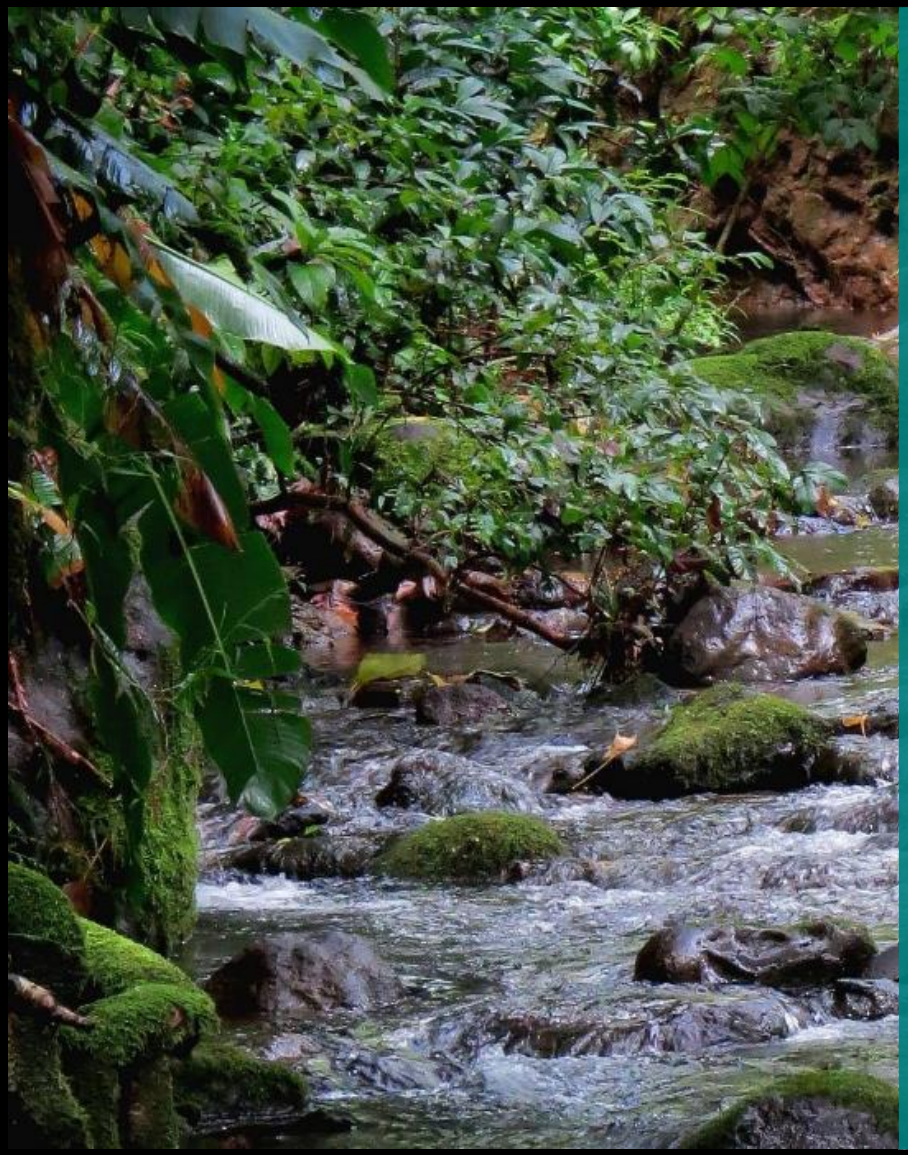
Providing safe, dependable, and affordable drinking water, now and into the future.

Mahalo!

ACCEPT MEETING NOTES FROM MEETING 58 AND 59

David Ebersold
Facilitator

www.boardofwatersupply.com



PFAS AND EMERGING CONTAMINANTS MANAGEMENT

Michelle Sorensen, PE
Sierra Johnson, PE

boardofwatersupply.com

PFAS and Emerging Contaminants Management

Proactively protecting public health, water quality and reliability

Stakeholder Advisory Group | April 2026

Agenda

PFAS and Emerging Contaminants Management

1. PFAS Q&A from March meeting
2. Long-Term PFAS Management

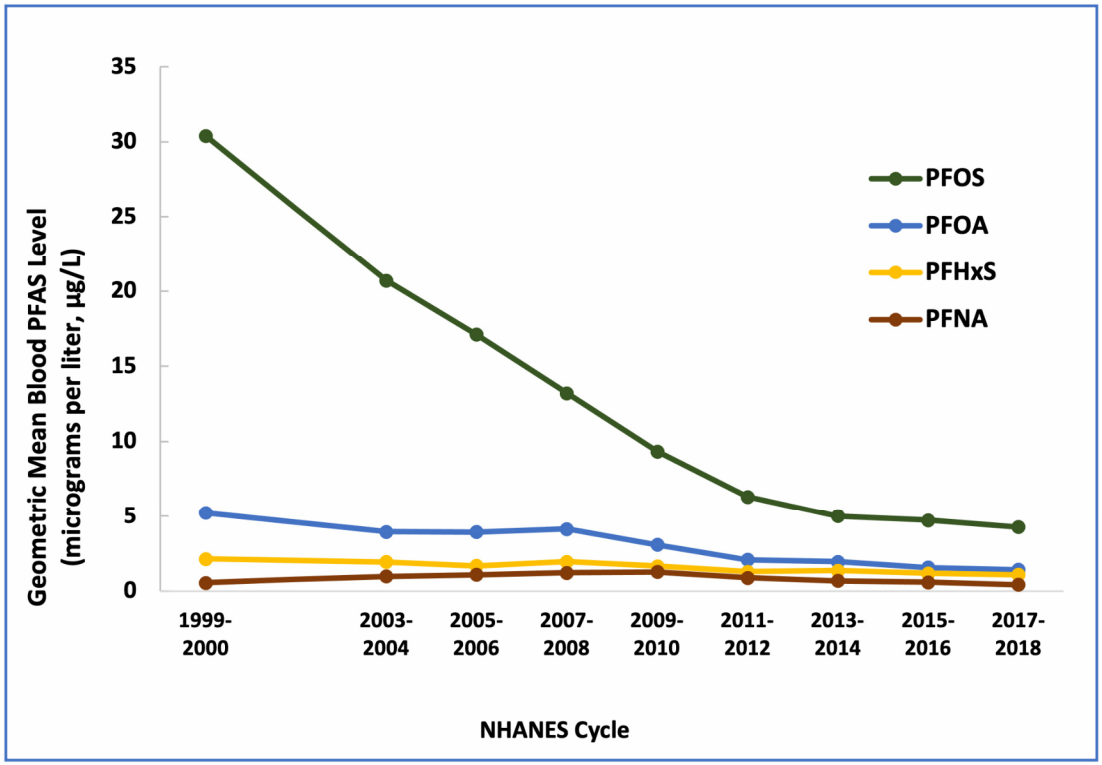
PFAS

March SAG Meeting

Questions & Responses

1. Does data demonstrate that PFAS concentration in human blood is decreasing due to product regulations?
2. What has HI done to protect people from PFAS?
3. How does PFAS level in the groundwater on O‘ahu compare to other areas across the country and world?
4. How do industrial processes and military operations (past & present) impact PFAS levels?

Have PFAS concentrations in people been decreasing in the US?



https://www.atsdr.cdc.gov/pfas/data-research/facts-stats/index.html

Since 2002, production and use of PFOS and PFOA in the U.S. have declined.

As a result, some blood PFAS levels have also gone down. From 1999-2000 to 2018-2019:

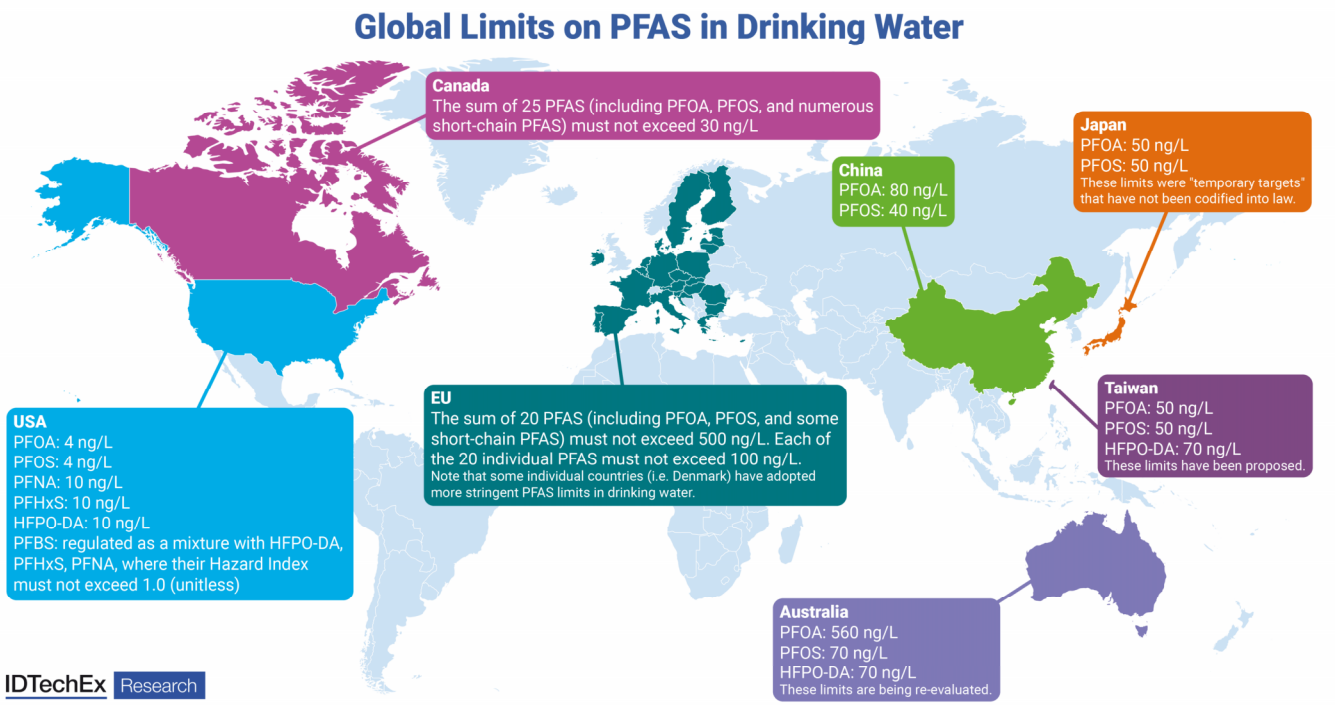
- Blood PFOS levels declined by more than 85%
- Blood PFOA levels declined by more than 70%

National Health and Nutrition Examination Survey (NHANES) the Centers for Disease Control and Prevention (CDC)

What has Hawai‘i been doing to protect people from PFAS?

- Banned PFAS-containing firefighting foam (Act 152, 2022)
- Banned PFAS in food packaging to reduce inputs to landfills, wastewater, and groundwater (Act 152, 2022)
- Expanding PFAS bans to additional consumer products such as cosmetics and personal care products (SB 683).
- DOH has established PFAS Environmental Action Levels (EALs) to guide response for detection in water
- DOH is requiring monitoring of PFAS in drinking water statewide

How does PFAS level in the groundwater on Oahu compare to other areas across world and country?



The US has some of the most stringent regulations for PFAS levels in the world

How does PFAS level in the groundwater on Oahu compare to other areas across world and country?

Among 10,300 US public water systems sampled

approximately 2,400 have detected regulated PFAS

With more than half of these water systems with levels above BWS's highest detection

“How do industrial processes and military operation – past and present – affect PFAS levels in groundwater?”

▶ BWS’S APPROACH TO MANAGING PFAS

Brown AND Caldwell

BWS Approach to Managing PFAS

Immediate Priorities

- Installing treatment at 3 sites where:
  - Regulated PFAS detection
  - No treatment in place
  - Wells are needed to support system demand

Temporary treatment system at Kaʻamilo Wells

Long-term Strategy

BWS' Long-term Approach to Managing PFAS

1. Prioritize sites by risk of PFAS contamination
2. Develop feasible solutions
3. Implement and monitor

CALCULATING RISK

COMPLETE

IN-PROGRESS

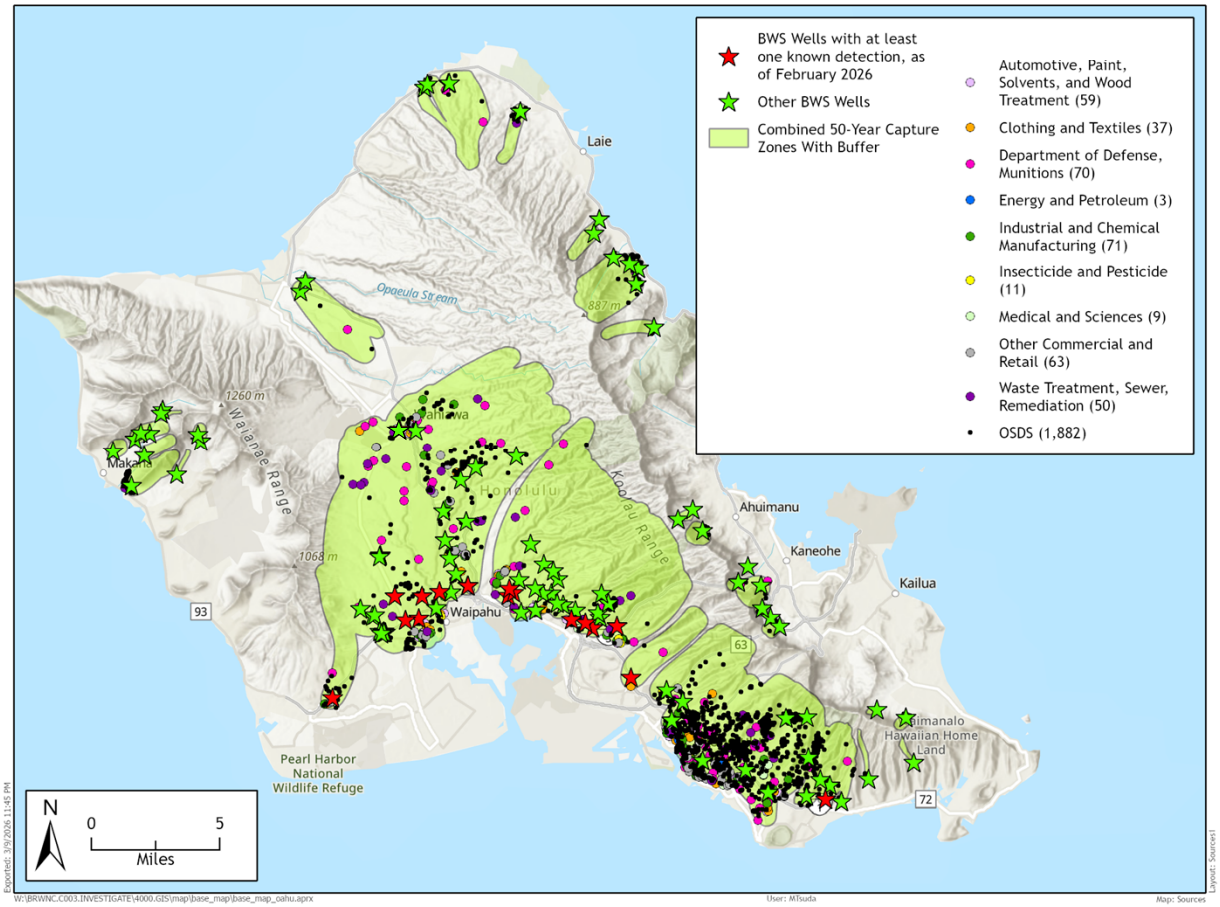
LONG-TERM PRIORITY SITES

STEP 1

Identify and map potential sources of PFAS

EXAMPLES

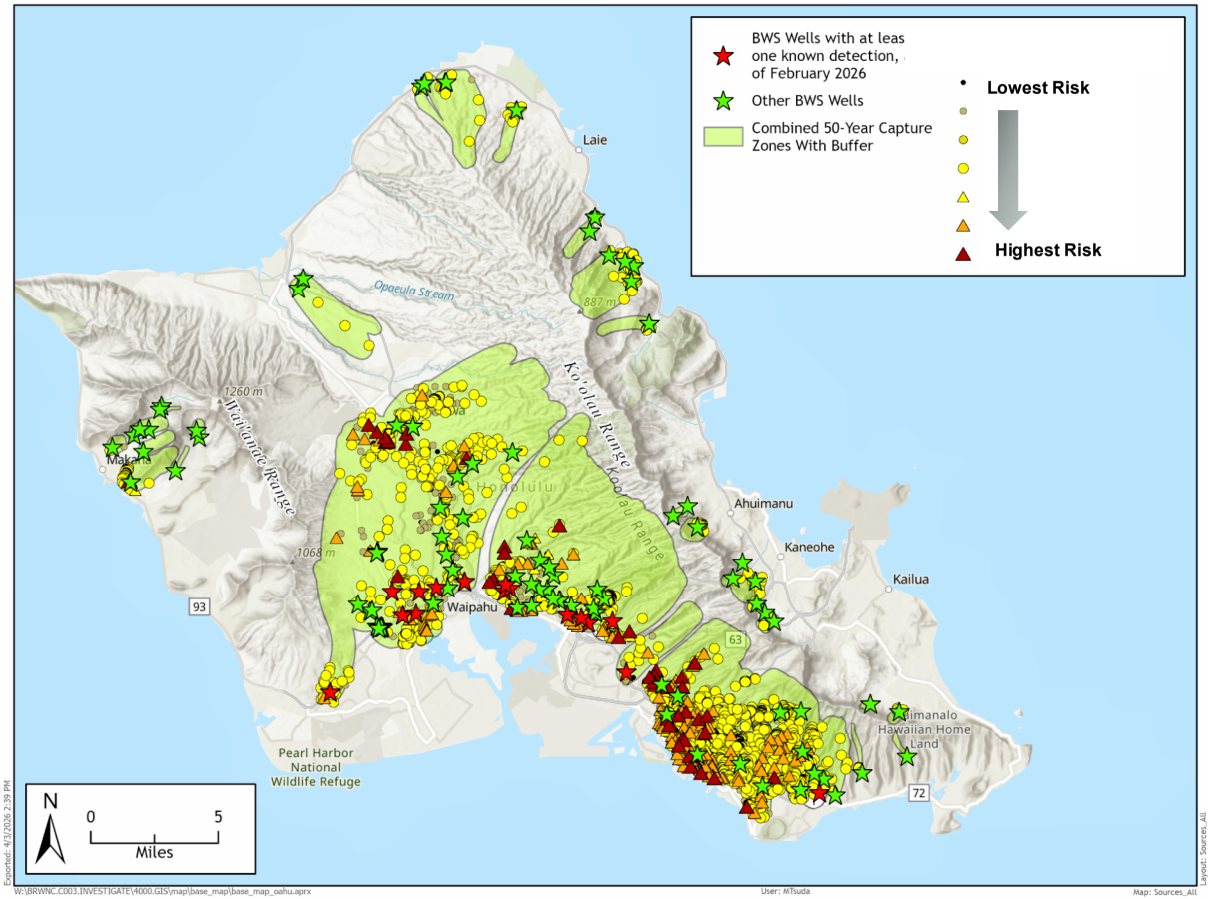
- Automotive, paint, solvents & wood treatment (59)
- Clothing & textiles (37)
- DoD & munitions (70)
- Energy & Petroleum (3)
- Industrial & chemical manufacturing (71)
- Insecticide & pesticides (11)
- Medical & sciences (9)
- Other commercial & retail (63)
- Wastewater treatment, sewer (50)
- Onsite Sewage Disposal System OSDS (1,882)



STEP 2

Assess source risk

- Preliminary risk scores for potential PFAS sources within BWS well capture zones.
- Additional data required to further refine risk factors



Risk assessment is in-progress with additional groundwater modeling

Data Sources

** Additional data sets referenced in report*

Source	Description
ERIS Report	Environmental Risk Information Services (ERIS) is collection of hundreds of federal, state, local, and private databases, capturing both known contamination sites (e.g., CERCLIS, LUST) and facilities that handle, store, or transport hazardous materials
AFFF Spills Registry	Aqueous film forming foam (AFFF) spills
Formerly Used Defense Sites (FUDS)	Formerly Used Defense Sites (FUDS) are known to use AFFF
iHEER	Hawai‘i Interactive Hazard Evaluation and Emergency Response portal reported emergency releases and of potentially contaminated sites
O‘ahu OSDS	Maintained by the Hawai‘i Department of Health and the Hawai‘i Statewide GIS Program. OSDS includes cesspools, septic systems, and other on-property wastewater systems
WWTP Index	Statewide all public and private wastewater treatment plants.
ECHO Database	The Enforcement and Compliance History Online (ECHO) database is an EPA system that provides public access to environmental compliance, violation, and enforcement information for regulated facilities
DOH	Safe Drinking Water Branch Contamination (DOH), Safe Drinking Water Branch Underground Injection Control Wells , Groundwater Contamination Viewer
Fire Stations	Active fire stations on O‘ahu
OSWM Redemption Center	Office of Solid Waste Management System (OSWM) database of redemption centers in the state of O‘ahu
SWPP	BWS 2024 Stormwater Protection Plan

Current Status & Next Steps

In-progress

✓PFAS source identification

- High-level groundwater modeling & risk evaluation
- Treatment cost evaluation

Next Steps

- Prioritize well sites by likelihood of PFAS impact
- Develop capital improvement projects

How do you remove PFAS from groundwater?

Treatment media that must be periodically replaced

- **Granular Activated Carbon (GAC)**
  - One of Best Available Technology (BAT) for PFAS per EPA
  - Cost-effective
  - Removes PFAS & other contaminants
  - Spent media landfilled or reactivated
- **Ion Exchange**
  - BAT for PFAS
  - Smaller footprint
  - Selective PFAS removal
  - Spent media landfilled

How much does it cost to treat for PFAS?

PFAS Capital and O&M Costs

- Capital cost for each new PFAS granular activated carbon (GAC) treatment system
  - **$6 - $20 million (based on 3 cost estimates, varying size)**

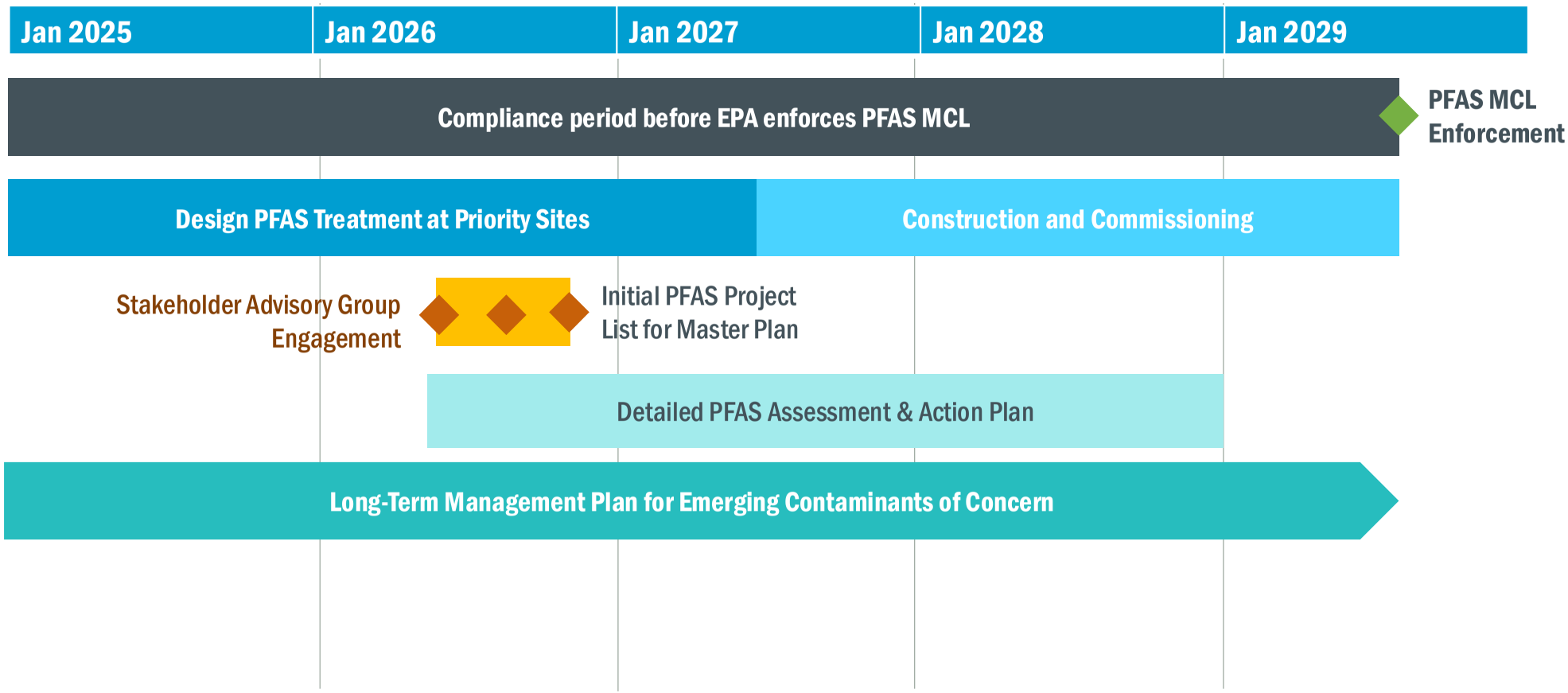
- Operations and maintenance for each
  - **30-yr O&M cost (for a 2 mgd facility): ~$300,000 per year or $9M for 30 years**

Long-term PFAS Management

Next Steps

- Prioritize well sites by likelihood of PFAS impact
- Develop capital improvement projects to reduce risk
- Assess cost, feasibility and implementation considerations

Next Steps


Jan 2025
Jan 2026
Jan 2027
Jan 2028
Jan 2029
Compliance period before EPA enforces PFAS MCL
PFAS MCL Enforcement
Design PFAS Treatment at Priority Sites
Construction and Commissioning
Stakeholder Advisory Group Engagement
Initial PFAS Project List for Master Plan
Detailed PFAS Assessment & Action Plan
Long-Term Management Plan for Emerging Contaminants of Concern

PFAS Information & Resources

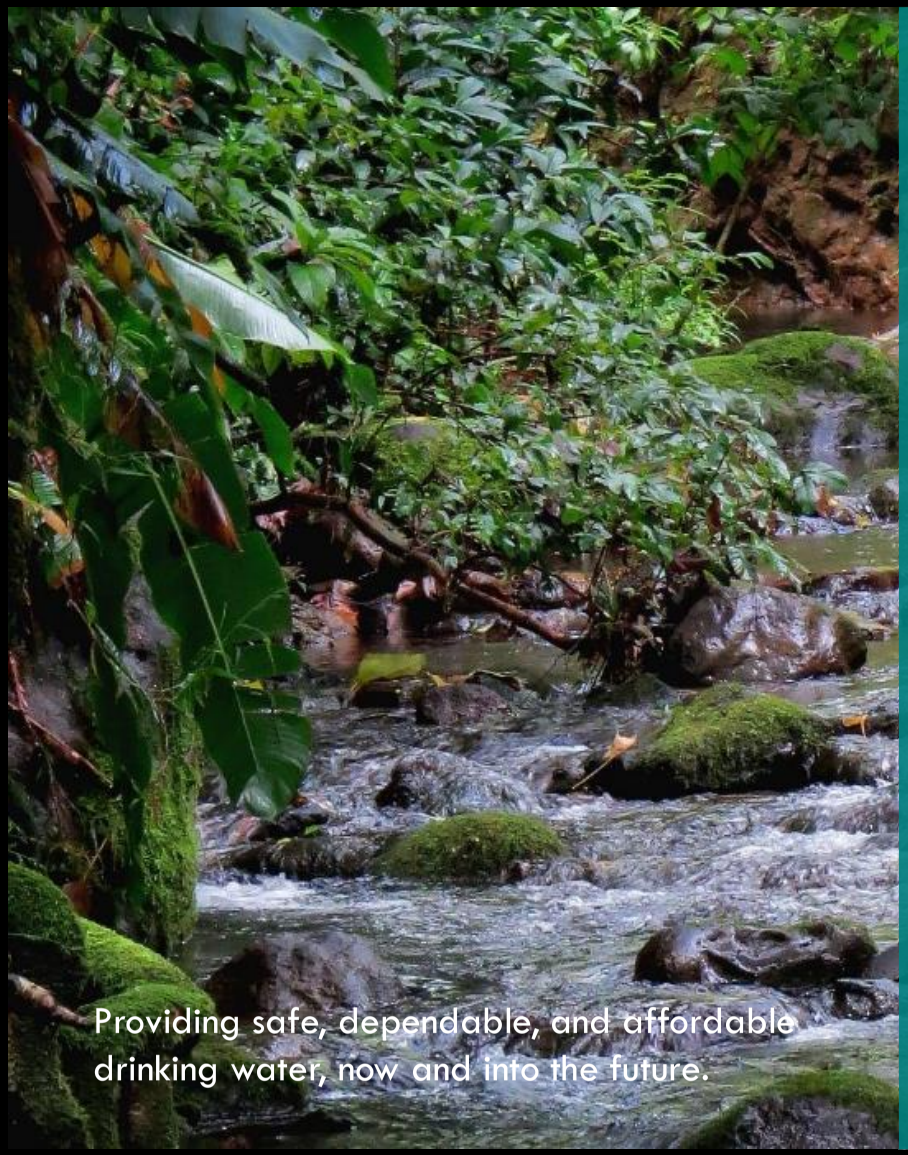
- Interstate Technology & Regulatory Council (ITRC) on PFAS pfas-1.itrcweb.org/
- Hawai‘i State, Department of Health health.hawaii.gov/heer/environmental-health/highlighted-projects/pfas/
- U.S. Environmental Protection Agency (EPA) epa.gov/pfas
- CDC’s Agency for Toxic Substances and Disease Registry (ATSDR) atsdr.cdc.gov/pfas/index.html
- National Institute of Environmental Health Services (NIEHS) niehs.nih.gov/health/topics/agents/pfc/index.cfm
- Food and Drug Administration (FDA) fda.gov/food/chemicals/and-polyfluoroalkyl-substances-pfas
- Department of Defense defense.gov/Explore/Spotlight/pfas/

- How do we explain PFAS risks and priorities across the island in a way that informs without creating alarm or dismissing concerns?
- Are there any information gaps (so far) that could affect community trust?

Questions?

STAKEHOLDER MEETINGS THROUGH 2026

Type	Date	Topic	Stakeholder Input
In-Person	15-Jan-26	2026 WMP Roadmap CIP Process and Prioritization	WMP Input Milestones CIP Priorities
Virtual	26-Feb-26	Existing scorecard update New Scorecard Objectives CIP Prioritization Methodology	New Scorecard Priorities
Virtual	19-Mar-26	Condition Assessment Results Preliminary Climate Resilience Options	Preferences for level of climate facility mitigation
In-Person	16-Apr-26	Demand Projections Potential Additional Supplies	Preferences for supply hardening and diversification
In-Person	16-Jul-26	Major Findings Draft CIP	Input on CIP Priorities and Funding Levels
Virtual	17-Sep-26	One Water Coordination	Feedback on One Water CIP Integration
In-Person	15-Oct-26	Draft Reports and Policy Feedback: WMP, CIP, LRFP, WSFC	Feedback on overall plan and policy recommendations to BWS Board
Virtual	19-Nov-26	Feedback and Discussion	Feedback on overall plan and policy recommendations to BWS Board
In-Person	15-Jan-27	Recommendations to the Board: WMP, CIP, LRFP, WSFC	Feedback on overall plan and policy recommendations to BWS Board
In-Person	15-Apr-27	Draft WMP Final Review	Concurrence with Board-approved Draft WMP
In-Person	15-Jul-27	Final WMP and Summaries (pending Board Adoption)	Recommendation for Board adoption of Final WMP



Providing safe, dependable, and affordable drinking water, now and into the future.

Mahalo!