

MINUTES

REGULAR MEETING OF THE BOARD OF WATER SUPPLY

January 27, 2020

At 2:00 PM on January 27, 2020, in the Board Room of the Public Service Building at 630 South Beretania Street, Honolulu, Hawaii, Vice Chair Sproat called to order the Regular Meeting.

Present: Kapua Sproat, Vice Chair
Kay C. Matsui
Ray C. Soon
Max J. Sword
Ross S. Sasamura
Jade T. Butay

Also Present: Ernest Lau, Manager and Chief Engineer
Ellen Kitamura, Deputy Manager and Chief Engineer
Erwin Kawata
Mike Fuke
Jadine Urasaki
Joe Cooper
Kathy Mitchell
Kathleen Pahinui
Henderson Nuuhiwa
Trudy Okazaki
Michele Thomas
Mike Matsuo
Barry Usagawa
Keoni Mattos
Tracy Burgo
Jamna Usman

Others Present: Jeff Lau, Deputy Corporation Counsel
Moana A. Yost, Deputy Corporation Counsel
Dean Nakano, Brown & Caldwell
Susan Mukai, Brown & Caldwell
Tom Myers, Brown & Caldwell

Absent: Bryan P. Andaya, Chair

APPROVAL OF
MINUTES

Approval of the Minutes of the Regular Meeting held on December 12, 2019.

MOTION
TO APPROVE

Ross S. Sasamura and Max J. Sword motioned and seconded, respectively, to approve the Minutes of the Regular Meeting of December 12, 2019. The motion was unanimously carried.

THE MINUTES OF THE REGULAR MEETING HELD ON DECEMBER 12, 2019 WERE APPROVED AT THE JANUARY 27, 2020 BOARD MEETING			
	AYE	NO	COMMENT
BRYAN P. ANDAYA			ABSENT
KAPUA SPROAT	X		
KAY C. MATSUI	X		
RAY C. SOON	X		
MAX J. SWORD	X		
ROSS S. SASAMURA	X		
JADE T. BUTAY	X		

"January 27, 2020

ADOPTION OF
RESOLUTION
NO. 906, 2020

Chairman and Members
Board of Water Supply
City and County of Honolulu
Honolulu, Hawaii 96843

Chair and Members:

Subject: Adoption of Resolution No. 906, 2020, Authorizing the Submittal of a Financial Assistance Application to the United States Bureau of Reclamation for the Planning, Design, and Construction of the Proposed Kalaeloa Seawater Desalination Facility, and Authorizing the Manager and Chief Engineer, Board of Water Supply to Enter into an Agreement with the Bureau of Reclamation to Accept Funds for the Project

We recommend approval of Resolution No. 906, 2020, authorizing the submittal of a financial assistance application to the United States Bureau of Reclamation (USBR) for the planning, design, and construction of the proposed Kalaeloa Seawater Desalination Facility and authorizing the Manager and Chief Engineer to enter into an agreement to accept those funds. An official resolution is required to be submitted as part of the USBR grant application process.

The Kalaeloa Seawater Desalination project is a congressionally authorized Title XVI Water Reclamation and Reuse Project under the Hawaii Water Resources Act of 2005. The USBR grant program may award up to 25% of the total cost and requires a cost-share of 75% or more.

BWS intends to build the 1.7 mgd Kalaeloa seawater reverse osmosis desalination facility in Campbell Industrial Park to provide high-quality potable water to meet the growing water needs of the 'Ewa District, the secondary urban center. Seawater desalination will supplement existing groundwater supplies and increase system resilience during periods of intense drought from climate change.

Obtaining Federal funding for this beneficial project will allow BWS to continue to provide a safe, dependable and affordable water supply for Oahu.

Respectfully submitted,

/s/ ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

Attachment"

DISCUSSION:

Barry Usagawa, Program Administrator, Water Resources Division gave the report. The resolution is a requirement of a grant application to the U.S. Bureau of Reclamation (USBR) under its Title XVI reclamation program for up to 25% of the project costs and requires a cost-share for the remaining 75% or more. The Kalaeloa Seawater Desalination project was congressionally authorized in 2005, which provides a higher level of funding priority. The purpose of this project is for climate resilience and additional water supply for Ewa. Ewa is the second urban center of Oahu and water demands are approaching our regional system capacity.

Member Jade Butay asked how much does the facility cost?

Mr. Barry Usagawa responded currently it's approximately \$30 million for construction and it includes some over-sizing. Board of Water Supply (BWS) has 20 acres in Campbell Industrial Park acquired from the Federal government for the expressed use as a desalination plant. There are some challenges that BWS is resolving involving archaeological sites, brine injection and distribution system impacts.

Member Butay asked if BWS was to produce 1.7 million gallons the regular way through groundwater wells, what would the cost be?

Manager Ernest Lau responded desalination is more expensive than groundwater wells but it has the ability to be scaled up to a larger capacity in the future when we need it. Currently, BWS development costs range about five to seven dollars per gallon for Pearl Harbor wells. If we divide \$30 million by 2 mgd, the capital costs would roughly be about \$15 per gallon for desalination.

Mr. Usagawa added that the Windward aquifers and other remote regions are over ten dollars a gallon. With the USBR grant, the capital costs to BWS would be in the same source development cost range.

We are fortunate that this project is actually covered under USBR's Title 16 grant program.

Manager Lau expressed his appreciation to Congressman Abercrombie and Congressman Case for helping to pass the Hawaii Water Resources Act of 2005.

Vice Chair Kapua Sproat asked what the total plant capacity could be sized up to?

Mr. Usagawa responded 5 mgd. BWS has previously constructed two 10 mgd deep seawater wells and one shallow caprock injection well. Approximately 40% of the seawater source can be filtered into freshwater using reverse osmosis membrane technology. Should BWS increase freshwater production beyond 5 mgd, additional wells would need to be drilled.

Manager Lau addressed a question that was asked by Member Butay. If BWS was to develop five mgd, the cost per gallon would decrease because of oversizing. The operational cost of the desalination project is expensive due to the amount of energy needed to produce fresh water from seawater.

Mr. Usagawa added that is why BWS is planning for photovoltaics on the site in a future phase to offset the high energy costs.

Vice Chair Sproat stated that this project is still in the planning stage but do we know how BWS will deal with the brine or salt by-product?

Mr. Usagawa shared that it was thoroughly evaluated and mitigated in Chapter 343 EIS filed in 2008. Campbell Industrial Park is already designated as an underground injection control area. Brine will be injected into shallow caprock wells. The source is deep basalt wells. There are two saltwater aquifers in this area, the caprock consisting of marine sediments and corals about 1,000 feet thick overlying the basal seawater aquifer. The deep basal wells are between 1,600 and 2,000 feet deep. The brine will stay in the caprock and not mix with the seawater basal wells or leach out into the ocean due to density. Brine is denser than seawater and will therefore sink. BWS is developing a groundwater model to verify no mixing impacts.

Mr. Usagawa mentioned BWS is working on the conceptual design and a request for proposals for a design-build-operate-maintain contract. The contractor will need to conduct a number of pilot tests to prevent distribution system impacts from blending RO product water in a groundwater source water system.

Member Ray Soon asked if the project was on the capital projects list?

Manager Lau responded that it is in our Water Master Plan. Desalination diversifies our sources of supply for future needs and provides a more climate-resilient, drought-proof water supply alternative.

Member Soon inquired why do we want to do this? The project is \$22,500,000 and will increase operating costs.

Manager Lau explained a few reasons for the high costs. One reason is that a desalination project is an option for communities that are challenged with long-term drought issues, such as California. From this small scale project, BWS would gain the operational experience to determine if the project could be scaled larger in the future as a hedge against climate change impacts. The other reason is the 20 acres of coastal property was acquired at no cost from the federal government with the condition that a desalination facility would be built. To retain the land, we need to use it for desalination. An updated report was provided to the Federal Department of Health and Human Services, they currently control the parcel and are inquiring what plans BWS has for desalination on the property.

Mr. Usagawa mentioned from the University of Hawaii (UH) rainfall forecast predicts that Leeward, Oahu could be 65% drier by the year 2100. If the rainfall decreases that much, the sustainable yield of the Ewa-Kunia aquifer could drop from 16 to 7 MGD, significantly impacting existing BWS source wells. The water master plan pursues reuse, advanced conservation, stormwater capture, and desalination. We have been able to defer desalination for 15 years due to reuse and conservation efforts, but water demand is increasing toward our system capacity.

Member Soon asked if the application is requesting money to plan, design and construction?

Mr. Usagawa replied that there are several phases to the application process. The first phase is a grant application for planning and preliminary engineering and once that is approved the second phase would be for the design and construction. The resolution, however, covers the entire project including design and construction.

Member Soon commented that it is the responsibility of the board not to approve until the results from the planning and design have been reviewed.

Manager Lau stated BWS will budget for design and construction once the project gets closer to construction and will provide additional planning and engineering information then.

Member Soon commented that BWS is asking for the Board's support to plan, design and the construction in order to receive federal funding.

Manager Lau agreed that is correct. The resolution needs to be approved by the Board and then the application can be submitted by the deadline.

Mr. Usagawa confirmed the deadline is February 19, 2020.

Vice Chair Sproat clarified the resolution needs to include construction in order to meet the application's requirements.

Mr. Usagawa stated that without the construction commitment the project may not receive money for planning.

Manager Lau mentioned that the delivery approach for the project would be designed, build, operate and maintain.

**MOTION TO
ADOPT
RESOLUTION
No. 906, 2020**

Ross S. Sasamura motioned to adopt Resolution No. 906, 2020, Authorizing the Submittal of a Financial Assistance Application to the United States Bureau of Reclamation for the Planning, Design, and Construction of the Proposed Kalaeloa Seawater Desalination Facility, and Authorizing the Manager and Chief Engineer, Board of Water Supply to Enter into an Agreement with the Bureau of Reclamation to Accept Funds for the Project

The motion was seconded by Jade T. Butay and passed with 5 AYES and 1 NO.

RESOLUTION NO. 906, 2020 ADOPTED THE SUBMITTAL OF A FINANCIAL ASSISTANCE APPLICATION TO THE UNITED STATES BUREAU OF RECLAMATION FOR THE PLANNING, DESIGN, AND CONSTRUCTION OF THE PROPOSED KALAELOA SEAWATER DESALINATION FACILITY, AND AUTHORIZING THE MANAGER AND CHIEF ENGINEER, BOARD OF WATER SUPPLY TO ENTER INTO AN AGREEMENT WITH THE BUREAU OF RECLAMATION TO ACCEPT FUNDS FOR THE PROJECT ON JANUARY 27, 2020			
	AYE	NO	COMMENT
BRYAN P. ANDAYA			ABSENT
KAPUA SPROAT	X		
KAY C. MATSUI	X		
RAY C. SOON		X	
MAX J. SWORD	X		
ROSS S. SASAMURA	X		
JADE T. BUTAY	X		

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

RESOLUTION NO. 906, 2020

AUTHORIZING THE SUBMITTAL OF A FINANCIAL ASSISTANCE APPLICATION TO THE UNITED STATES BUREAU OF RECLAMATION FOR THE PLANNING, DESIGN, AND CONSTRUCTION OF THE PROPOSED KALAELOA SEAWATER DESALINATION FACILITY, AND AUTHORIZING THE MANAGER AND CHIEF ENGINEER, BOARD OF WATER SUPPLY TO ENTER INTO AN AGREEMENT WITH THE BUREAU OF RECLAMATION TO ACCEPT FUNDS FOR THE PROJECT

WHEREAS, the Board of Water Supply, City and County of Honolulu, desires to construct the Kalaeloa Seawater Desalination Facility in Campbell Industrial Park to supplement Ewa's potable groundwater supply (the "Project"); and

WHEREAS, seawater desalination will provide a resilient freshwater supply to mitigate more intense drought from climate change; and

WHEREAS, the U.S. Department of Interior, Bureau of Reclamation (USBR) has announced the availability of funds for congressionally authorized water reclamation and reuse projects through Title XVI of Public Law 102-575, as amended; and

WHEREAS, the Project is a congressionally authorized Title XVI project under the Hawaii Water Resources Act of 2005; and

WHEREAS, said Federal funding share of the cost of a project shall not exceed 25 percent of the total cost of the project; and

WHEREAS, the Board of Water Supply wishes to apply to the USBR for financial assistance towards the planning, design, and construction of the Project; and

WHEREAS, an official resolution is required to be adopted by the applicant's board of directors or governing body to authorize that the applicant commit to the financial and legal obligations associated with receipt of a financial assistance award as a condition set by the grantor to receive funding for the above project; and

WHEREAS, the Chair of the Board of Water Supply and the Manager and Chief Engineer has reviewed and supported the application for financial assistance indicated above; and

WHEREAS, the Board of Water Supply has the legal authority and financial capability to provide the matching funds for the project pursuant to Chapter 54 Water Systems, Hawaii Revised Statutes, and Article VII, Revised Charter of the City and County of Honolulu which establishes powers and duties of the Board of Water Supply to manage, control, and operate the waterworks of the county and all property thereof, for the purpose of supplying water to the public in the county, and shall collect, receive, expend, and account for all sums of money derived from the operation thereof and all other moneys provided for the use or benefit of the waterworks and all property used for or held in connection therewith; and

WHEREAS, the Board of Water Supply will work with the USBR to meet the established deadlines for entering into a cooperative agreement; now, therefore,

BE IT RESOLVED by the Members of the Board Of Water Supply, City and County of Honolulu, in accordance with Hawaii Revised Statutes and Revised Charter of the City and County of Honolulu, that the Manager and Chief Engineer is authorized to execute, on behalf of the Board, an agreement and related documents with the U.S. Bureau of Reclamation to provide aid to the Board as described above.

ADOPTED:

A handwritten signature in black ink, consisting of a series of loops and a long horizontal stroke extending to the right.

Kapua Sproat
Vice Chair

Honolulu, Hawaii
January 27, 2020

ITEM FOR INFORMATION NO. 1

"January 27, 2020

PRESENTATION ON IMPACTS OF CLIMATE CHANGE ON HONOLULU WATER SUPPLIES AND PLANNING STRATEGIES FOR MITIGATION Chair and Members
Board of Water Supply
City and County of Honolulu
Honolulu, Hawaii 96843

Chair and Members:

Subject: Presentation on Impacts of Climate Change on Honolulu Water Supplies and Planning Strategies for Mitigation, Collaborative Project with BWS and Water Research Foundation.

The Honolulu Board of Water Supply and the Water Research Foundation co-funded a vulnerability assessment to identify and adapt to climate change risks to: (1) freshwater supply from forecasted temperature increases and reduction in precipitation, (2) groundwater quality from saltwater intrusion, and (3) coastal water system infrastructure from projected sea-level rise. The project evaluated potential climate change impacts for a 2100 timescale, on estimates of a range of groundwater sustainable yields utilizing the University of Hawaii's statistical and dynamical downscaled climate models of rainfall; and coastal pipeline infrastructure assets for 3 feet of sea-level rise utilizing UH's sea-level rise models for marine and groundwater inundation; and then identified a suite of adaptive strategies to address the range of anticipated changes.

Water Resources staff will present the findings of the climate change study.

Respectfully submitted,

/s/ ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

Attachment"

The foregoing was for information only.

DISCUSSION : Mr. Usagawa pointed out the website where you can view the study as well as other climate change reports.

Member Soon asked what is BWS's next step?

Mr. Usagawa responded the next step would be to submit our One Water white paper to the City Climate Change Commission for their consideration of a recommendation to the City administration.

Member Soon commented that this would enforce the collaboration.

Mr. Usagawa stated that agency collaboration needs to be formalized. BWS is concentrating on how the City will elevate streets so that we don't have to wait for low tide to fix main breaks which lengthen the disruption of water service. When the water has no place to go, private properties will be flooded and we will experience more water damage claims.

Member Sword asked as a long term plan, will the pipes be replaced by BWS be impervious to corrosion.

Manager Lau responded to the question, yes.

Mr. Usagawa responded that BWS is replacing the pipes with PVC and bonded coated ductile iron which is more resistant to corrosion. We would like the street to be elevated before we replace the pipes otherwise it would be too deep to reach and repair the main breaks.

Member Sword commented that sea-level rise causes havoc on the pipes. When they are replaced with corrosion-resistant materials, we will be addressing the issue.

Manager Lau mentioned that there is a schedule in the Water Master Plan that requires BWS to carefully make a decision when to replace the pipes. BWS works closely with the Department of Transportation Services and the Department of Facilities Maintenance. BWS needs to take into consideration that in some areas we have to replace the pipes sooner rather than later because of conditions. BWS encourages collaboration with other city and state agencies and looks at different pipe materials. The main concern is preventing the pipes from corrosion since they will be in seawater most of the time.

Member Butay mentioned the Department of Transportation did a study on coastal highways and that 15% will be affected by sea-level rise and cost 15 billion dollars to relocate.

Manager Lau stated with the severity of storms that we are experiencing it is putting a hardship on our systems. BWS needs to be prepared and strengthen the system so that we have a faster recovery.

Mr. Usagawa pointed from the DOT study that 6 of the top 10 most critical coastal roads are on the windward side of Oahu. A recent highway collapse from wave erosion in Hauula also exposed our 16" pipeline. Coastal erosion from storms is a big issue.

Member Butay mentioned that it costs about \$7.5 to \$15 million dollars per mile to move a bridge.

Manager Lau commented we have to work together as a whole and come up with a strategy and solutions.

Vice Chair Sproat asked if the range of sea-level rise is at 1, 3 to 4 feet and why didn't it settle at 3.2 feet?

Mr. Usagawa responded that the sea level rise projections are a range and 3.2 feet is in the middle, but the upper range was recently revised to 8 feet. The lower range of projections has dropped out.

Vice Chair Sproat commented that some would say that 3.2 feet is conservative.

Mr. Usagawa responded that even when a number is selected there is a possibility that it could be raised.



February 20, 2019

Impacts of Climate Change on Honolulu Water Supplies and Planning Strategies for Mitigation

Robert C. Renner, P.E., Water Research Foundation

Barry Usagawa, P.E., Board of Water Supply



Objectives

- Evaluate climate change impacts on Honolulu Board of Water Supply (BWS) infrastructure and water supply
- Develop a suite of strategies to address the anticipated changes

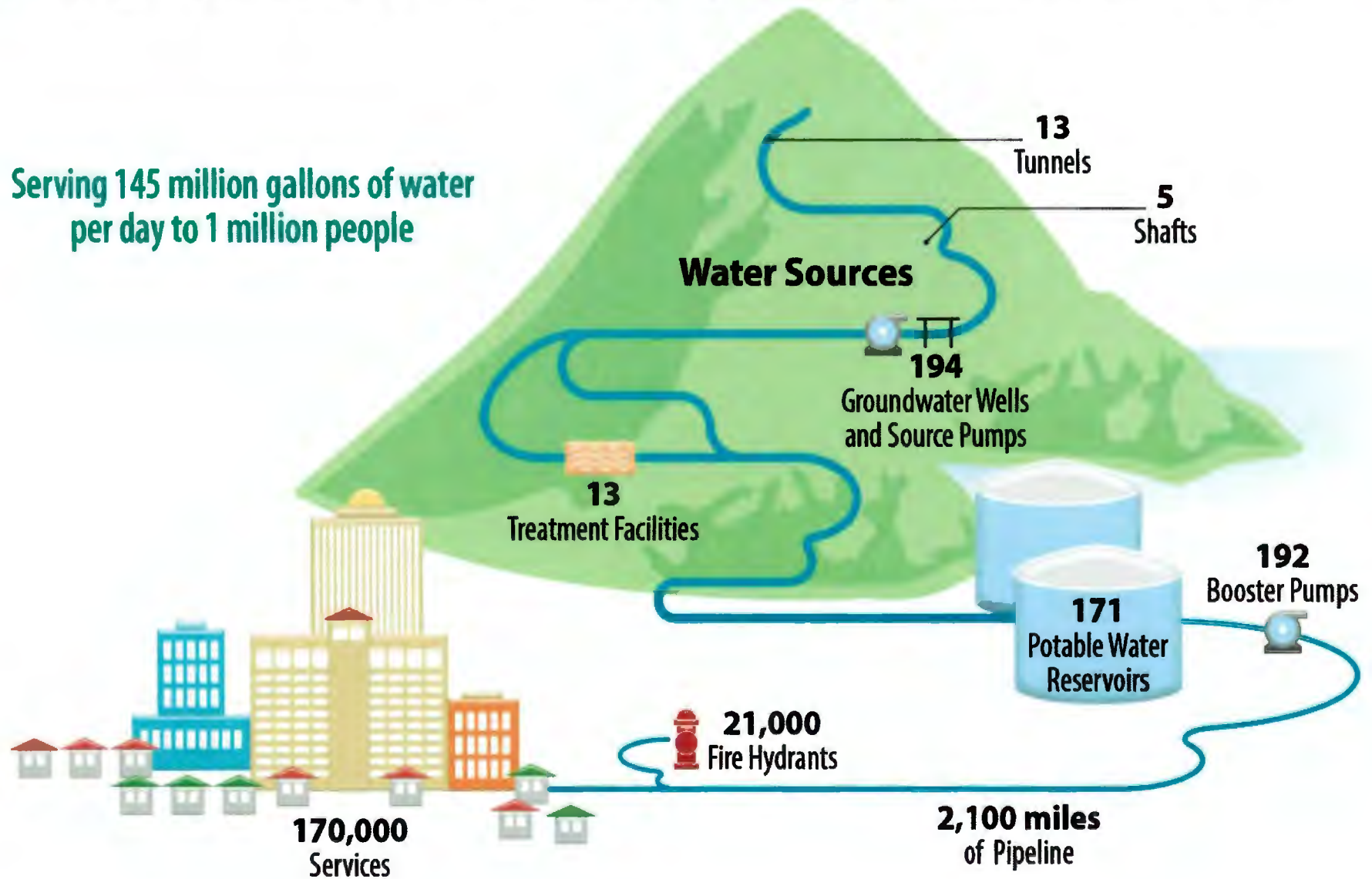
This project supports Water Research Foundation's (WRF) Climate Change Strategic Initiative objective to provide water utilities with a set of tools to assess their vulnerabilities and develop applicable adaptation strategies.

Funded by Honolulu Board of Water Supply and Water Research Foundation through Water Research Foundation's Tailored Collaboration Program



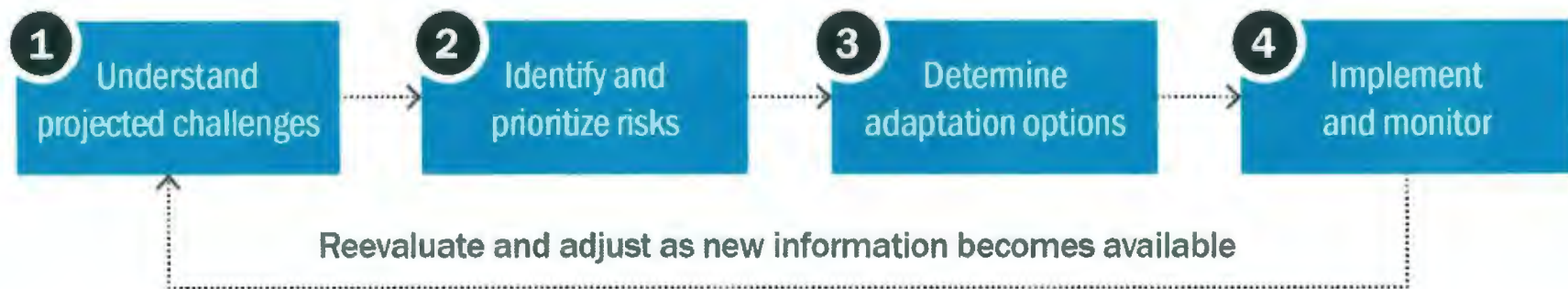
The BWS Water System is Large and Complex

Serving 145 million gallons of water
per day to 1 million people



Project Approach

- Adaptive management is an iterative process for flexible decision making in the face of uncertainties
- Utilized scenario planning to consider a range of potential changing conditions

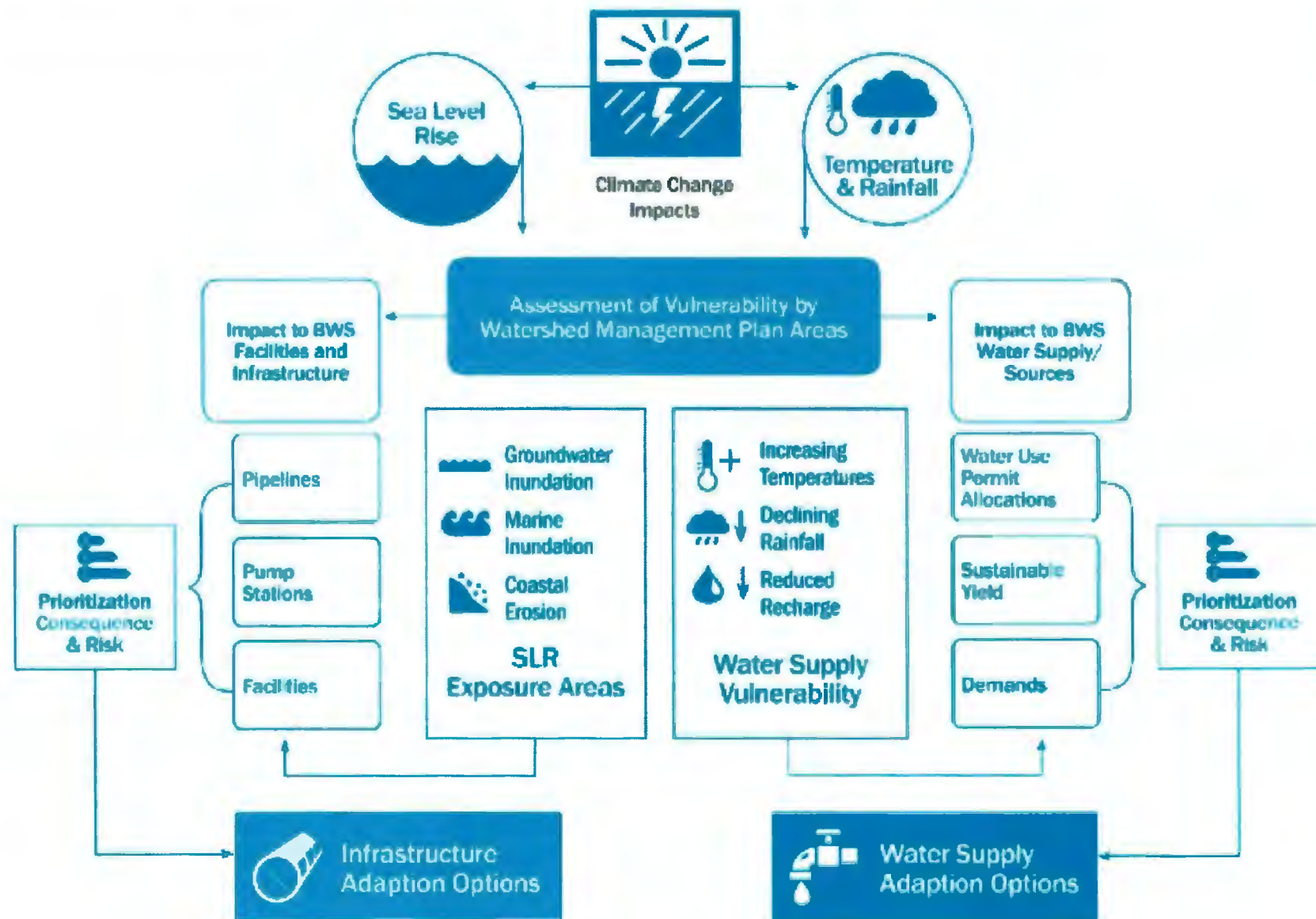


Vulnerabilities & adaptive management strategies identified for 3 time frames:

- Short-term (2020–2030)
- Mid-term (2030–2050)
- Long-term (2050–2100)

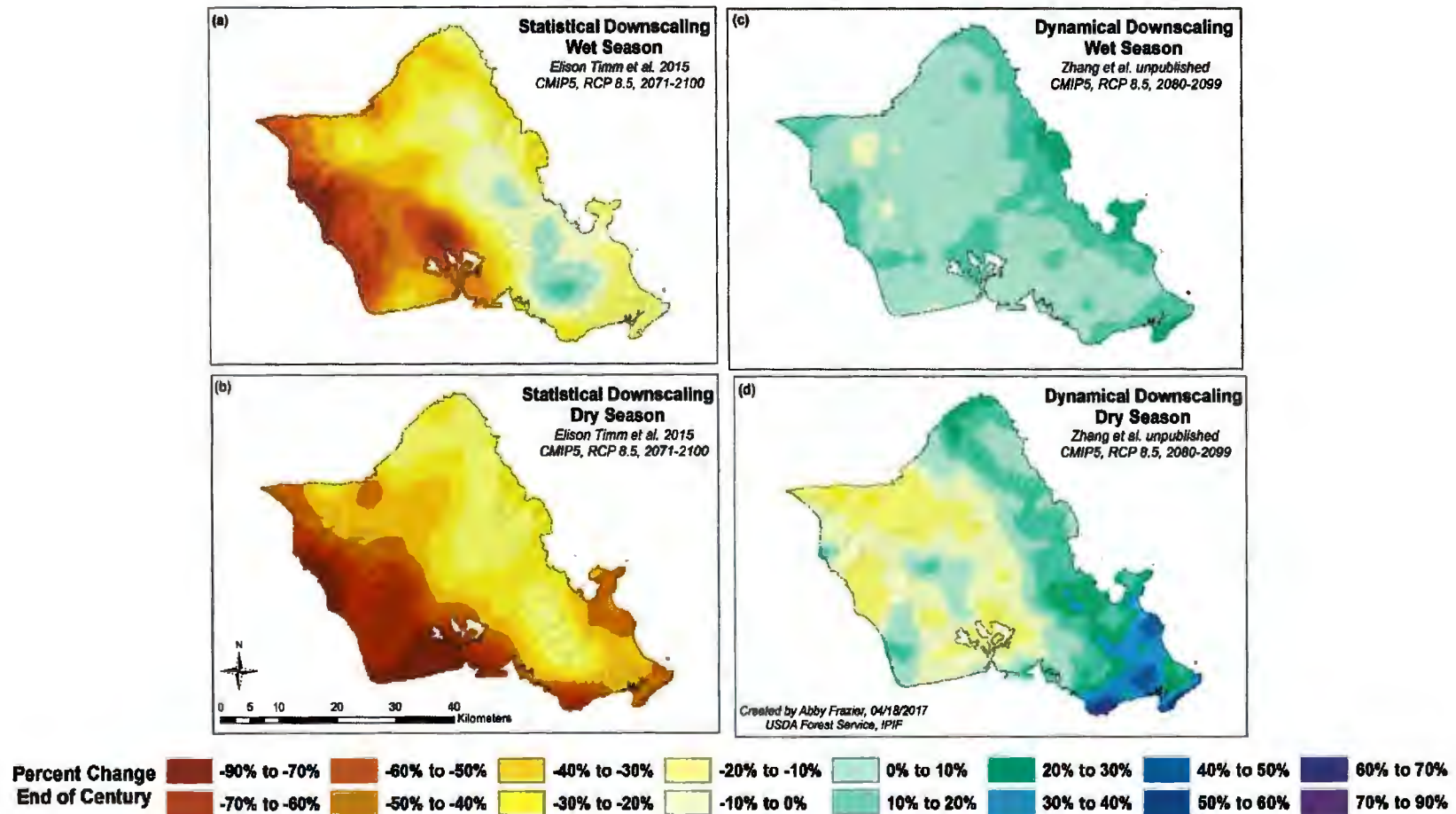
Goal is to develop policies and actions that encourage “no regrets” strategies.

Vulnerability Assessment Approach



Downscaled Climate Models indicate a Range of Rainfall Futures

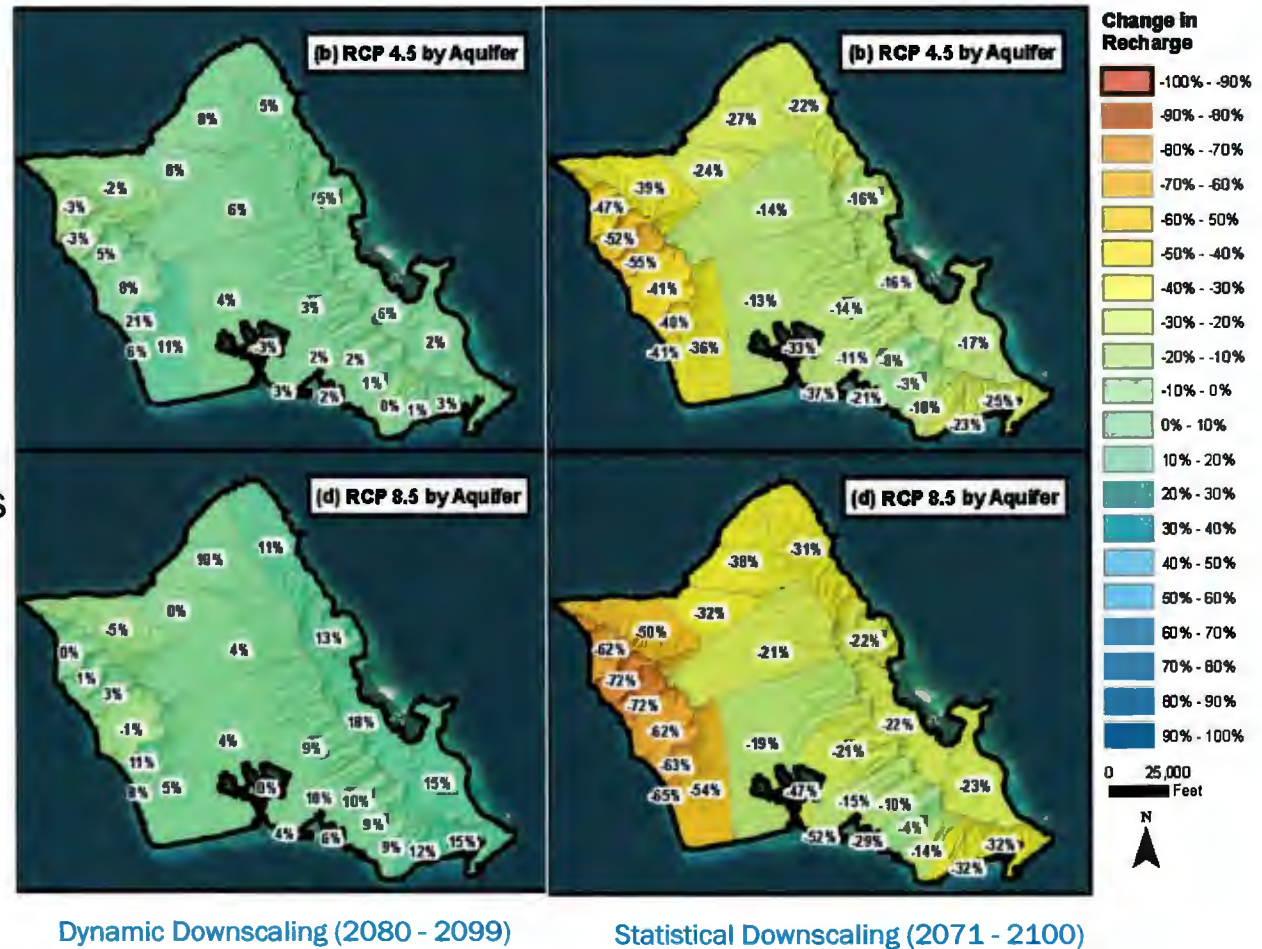
Climate Change - Rainfall Projections



Source: Figure developed by Abby Frazier April 2017

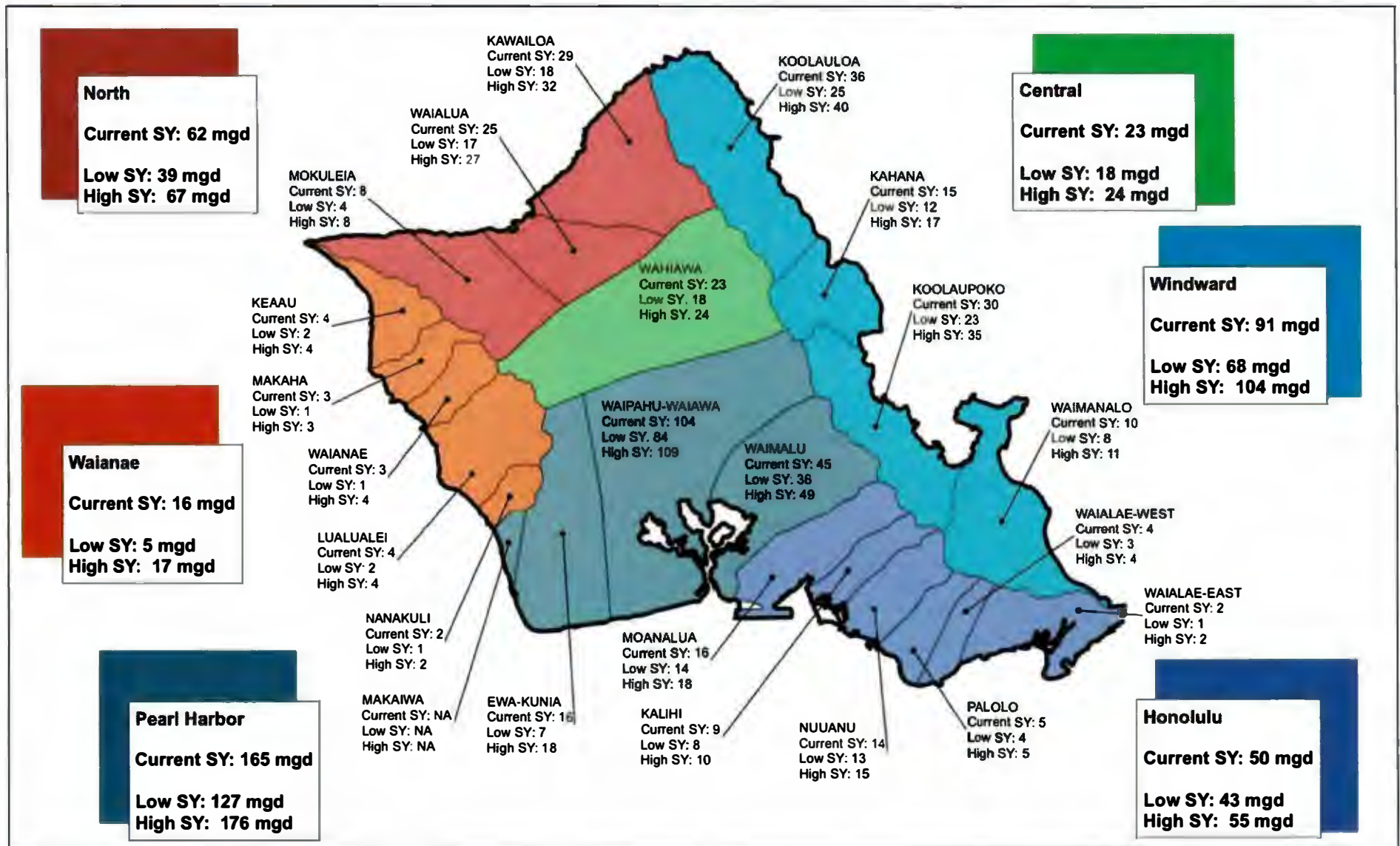
Projected Changes in Recharge from Regression Modeling

- Aquifer recharge estimates were determined by regression modeling, similar to Izuka et al. (2010) USGS.
- Two GHG concentration downscaling scenarios for 2080 - 2099 time period
- Dynamically downscaled scenario projected increases in recharge ranging between -0.3 percent and 21.5 percent depending on the aquifers.
- Statistically-downscaled scenario projected decreases in recharge ranging between -4 and -72 percent for various aquifers.



Sources: Recharge estimates were calculated using data from Dynamic Downscaling models (Zhang et al., unpublished), Statistical Downscaling models (Timm et al., 2015), and present precipitation data (Giambelluca et al., 2013)

Current SY and Potential Range of SY from Climate Forecasts



Preliminary Supply Adaptation Strategies:

Recharge could decrease sustainable yields by ~34%. Statistical model
From 407 mgd to 269 mgd a difference of 138 mgd, Turk, Report #9, B&C.

- Aggressive water conservation, like dual plumbing with recycled water
- Storm water capture in Nuuanu and on-site for new development
- Expanded Reuse at Honouliuli, Mililani, Wahiawa and Schofield WWTP's
- On-site reuse
- Increase transfers from Wahiawa and Waipahu Waiawa aquifers to Waianae and Honolulu. Drill more wells in Wahiawa and Waipahu-Waiawa
- Assertion of Public Trust Water Rights for Domestic Use to retain water use permits in a revocation process
- More desalination in Ewa and possibly for Honolulu
- Desalinated reuse in Honolulu, Waianae and Hawaii Kai where wastewater effluent is too salty for irrigation
- Indirect or Direct Potable Reuse with RO desalination and UV/Ozone disinfection



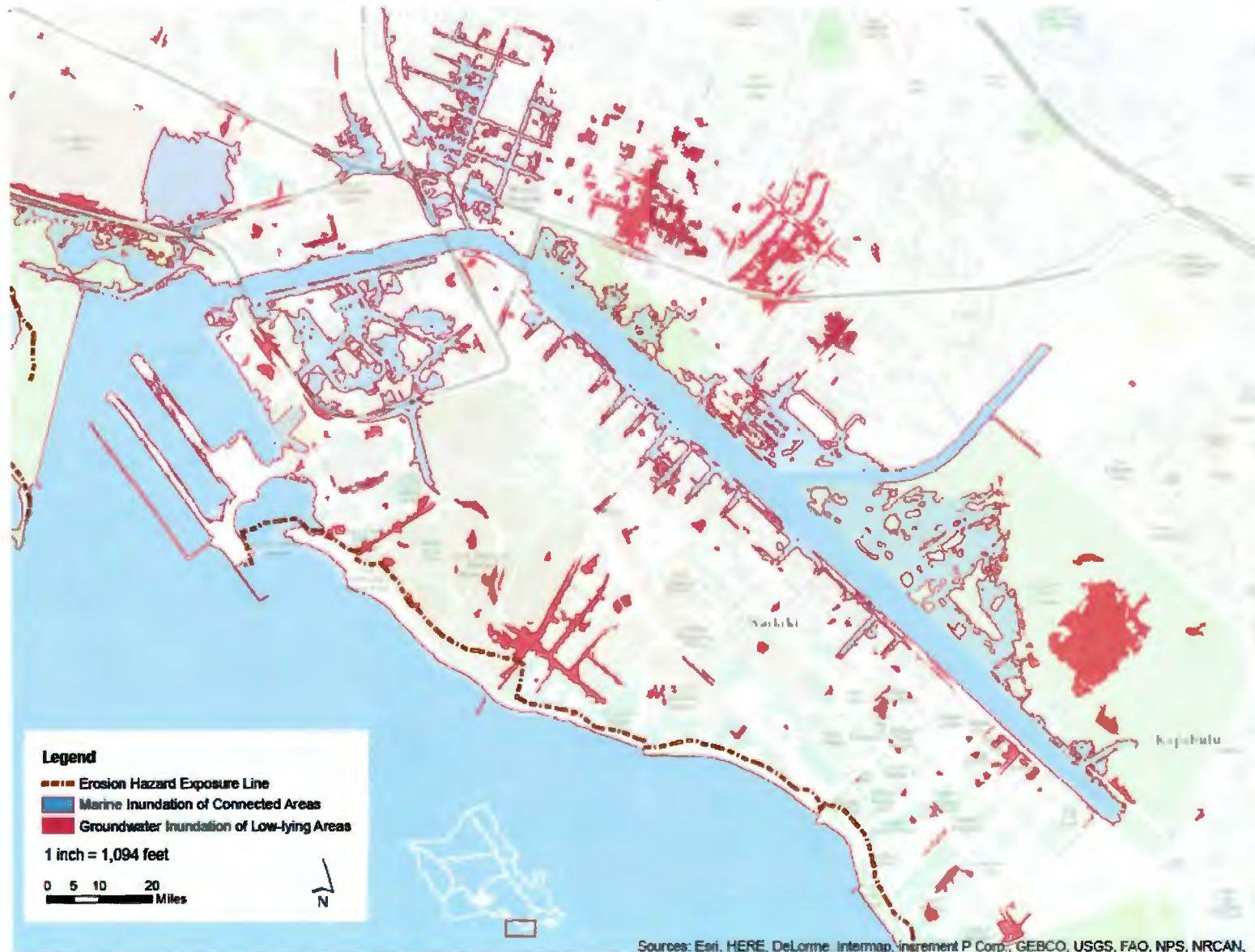
Infrastructure Impacts from Sea Level Rise

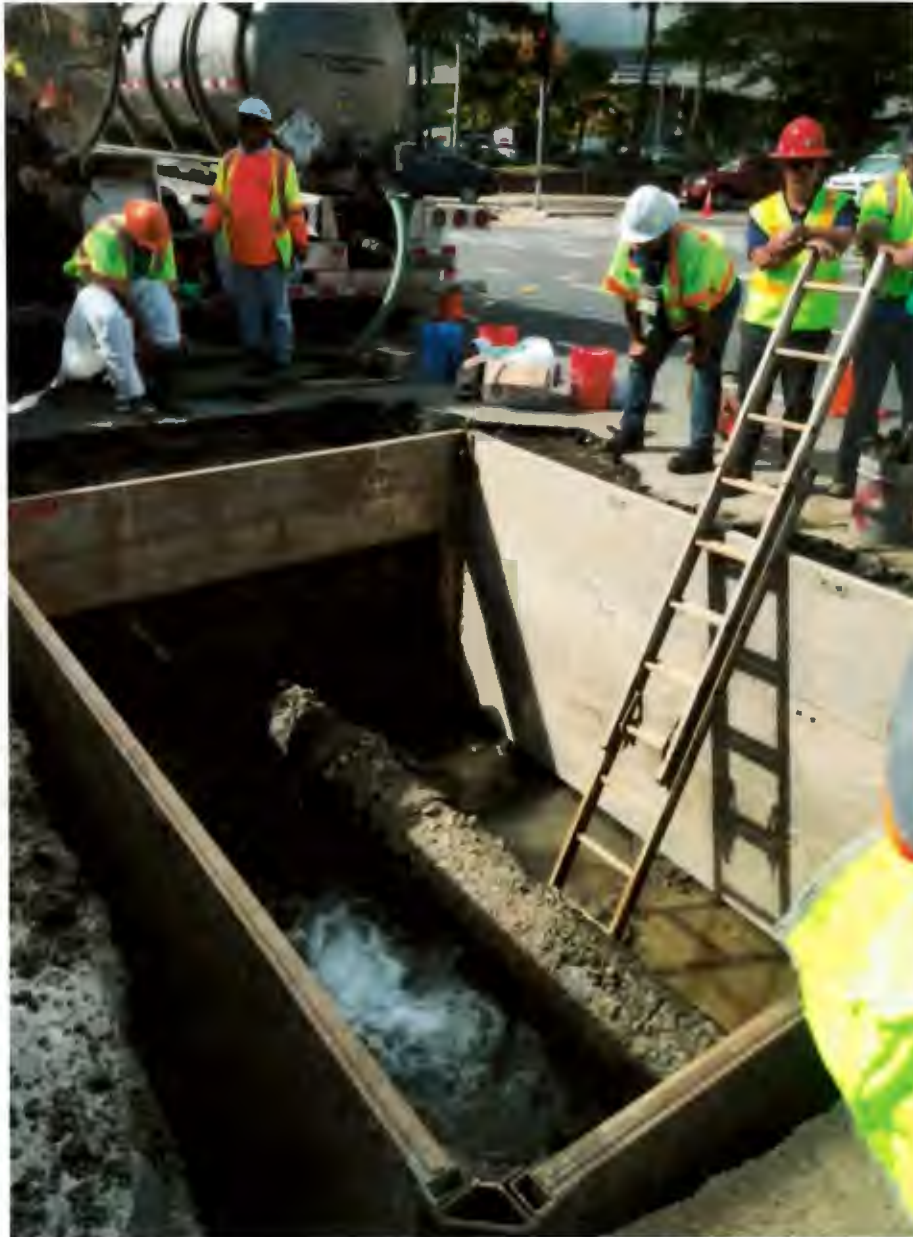
Brown AND
Caldwell



Water
Research
Foundation

Groundwater and Marine Inundation in Waikiki and Erosion Hazard (dashed line) with 3.2 ft of SLR

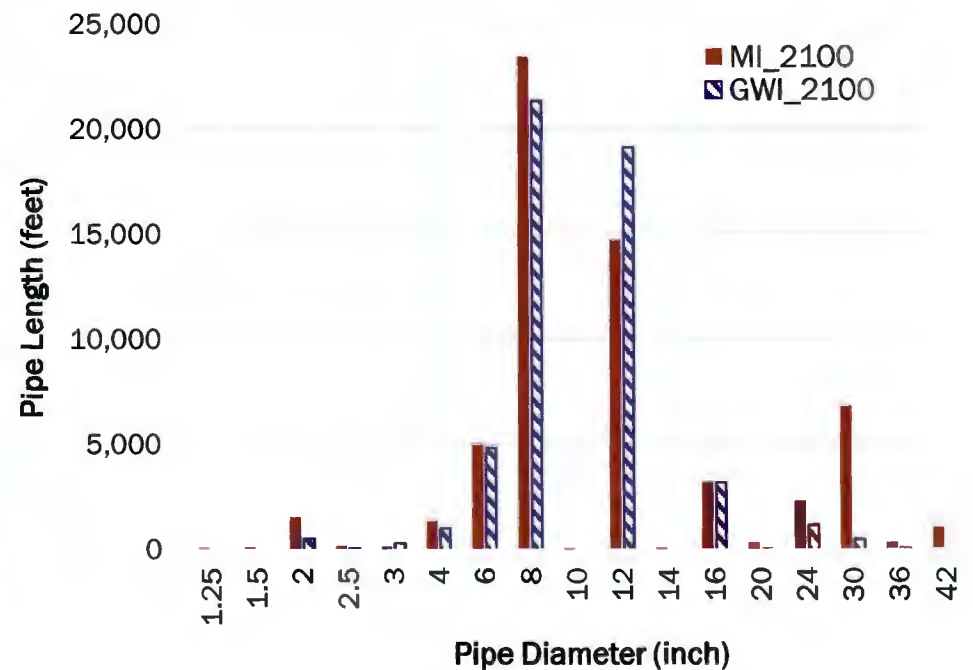
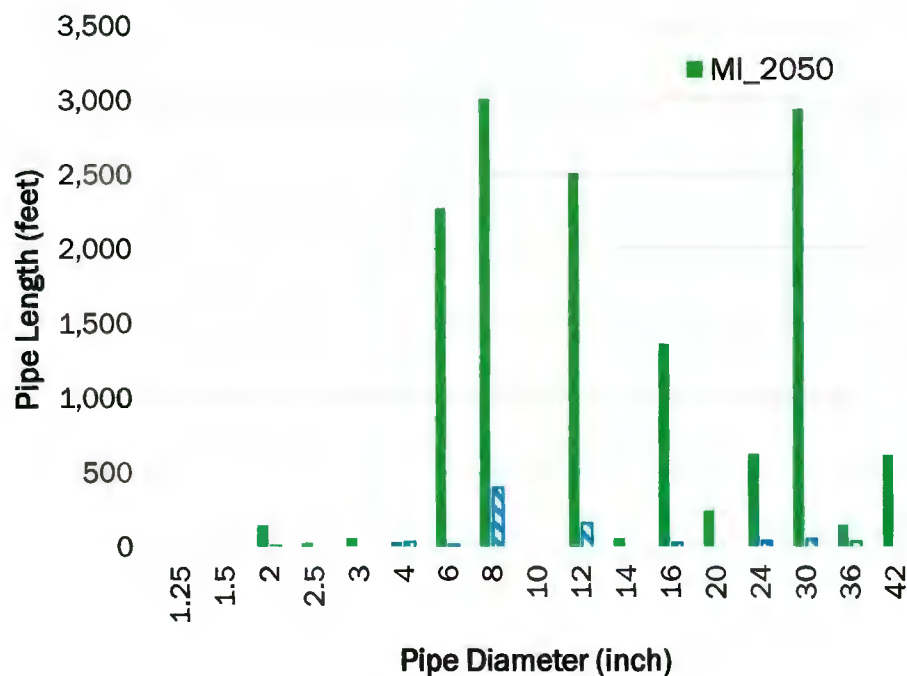




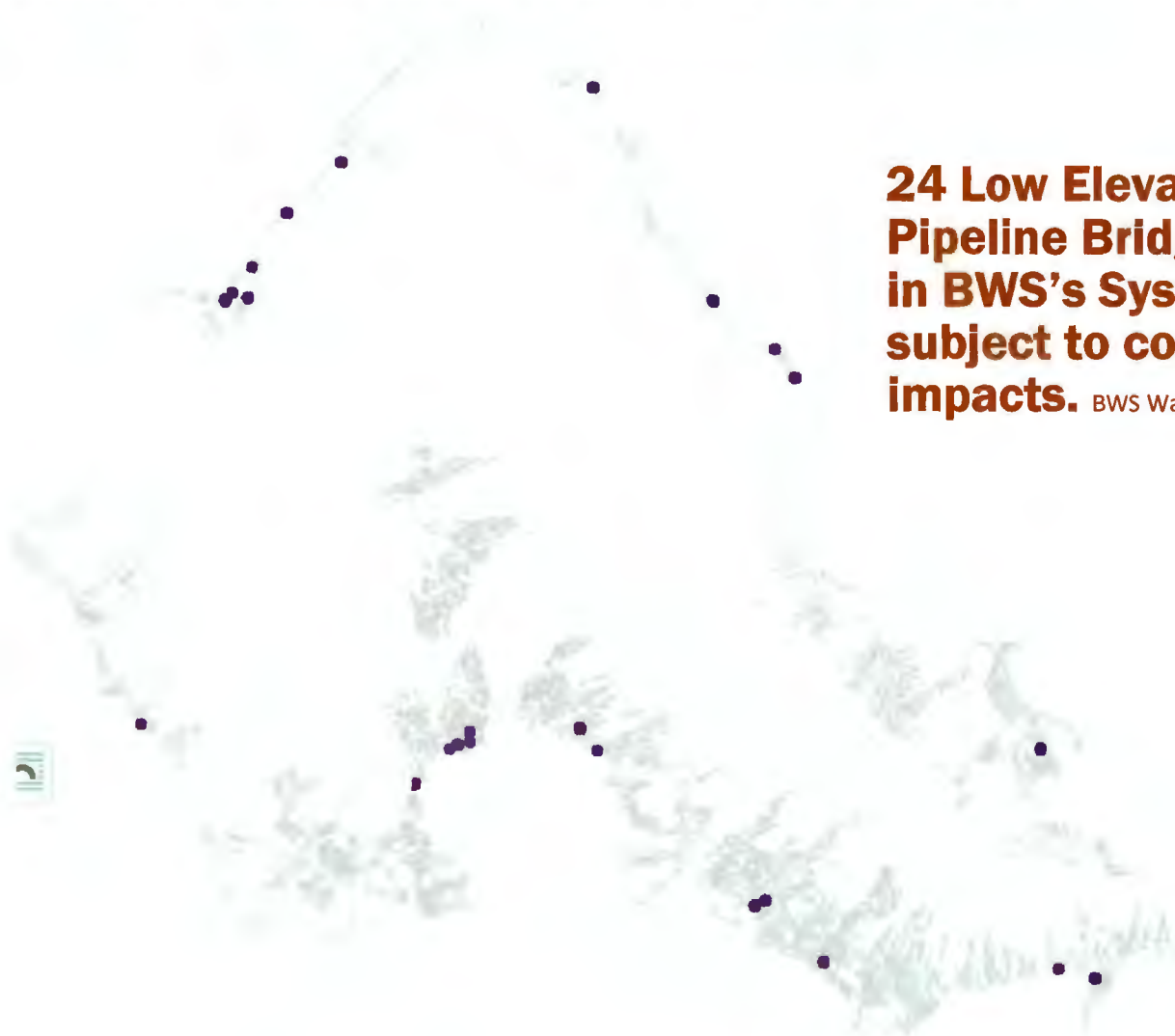
Nimitz & Alakawa, July 3, 2018, 8:00 am, Lowest high tide of the day. Highest tide 1' higher

Corrosion impact to metallic pipelines will increase over the planning horizon

Pipe Lengths Impacted Island-wide by Hazard (feet)						
Time Period	Year	SLR (feet)	Pipe Length for All Diameters (1.25-inch to 42-inch (feet)		Percent of Total BWS Infrastructure Impacted	
			MI	GWI	MI	GWI
Mid-Century	2050	1	14,038	772	0.1%	0.01%
End-of-Century	2100	3.2	60,409	52,026	0.6%	0.5%

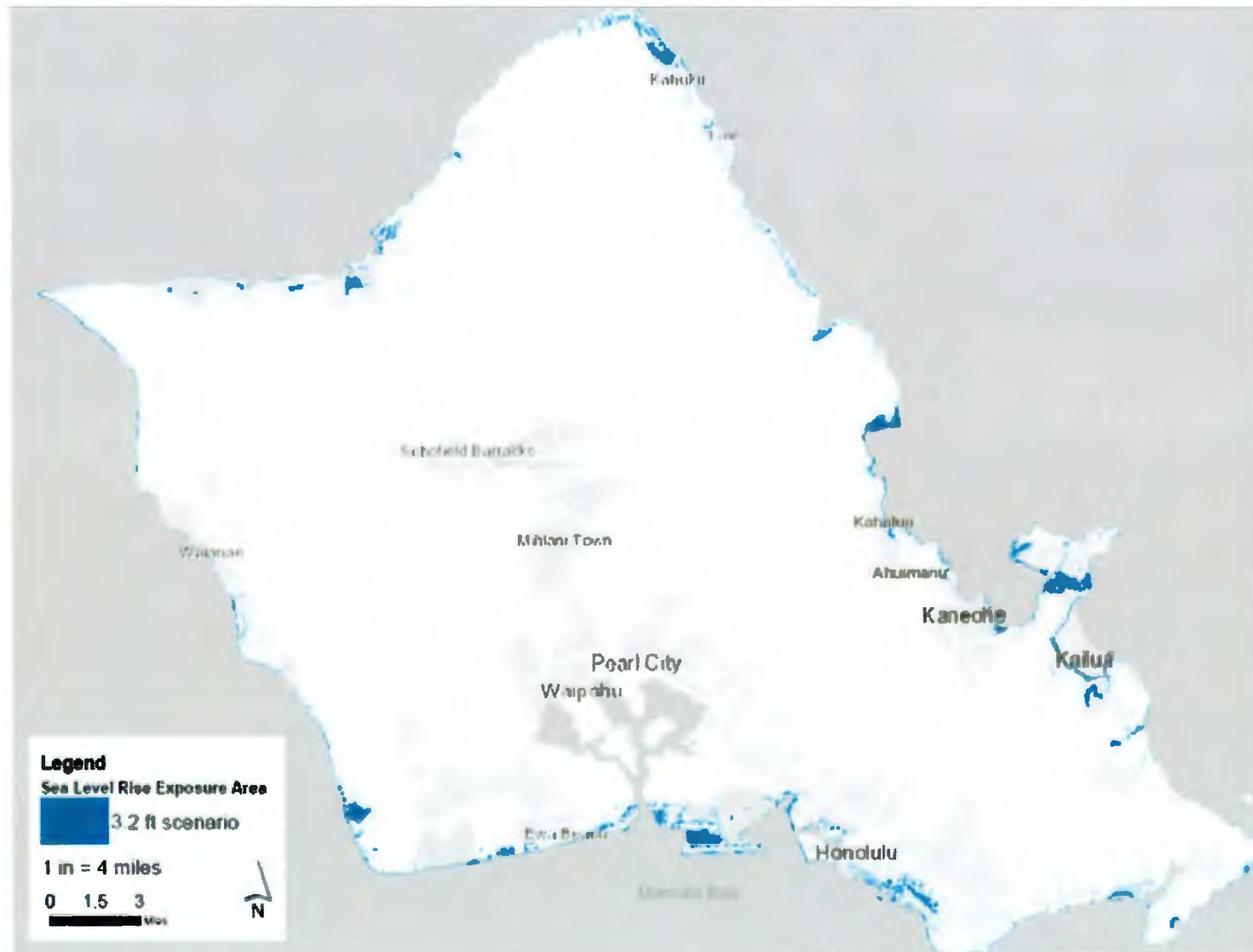


The vulnerability assessment investigated impacts on an island wide and watershed scale

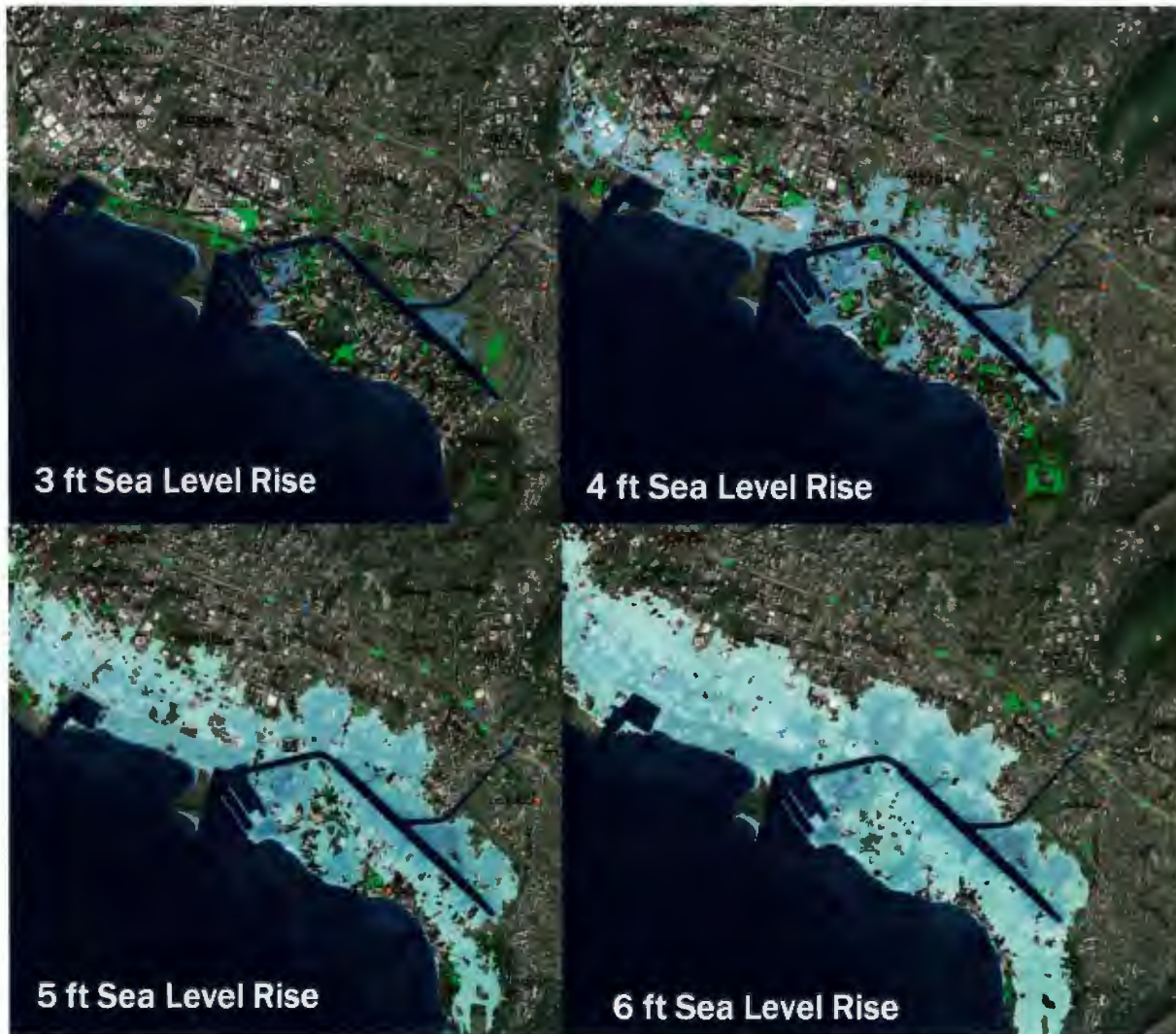


24 Low Elevation/Coastal Pipeline Bridge Crossings in BWS's System may be subject to coastal erosion impacts. BWS Water Master Plan 2016

3.2 feet of SLR Hazard Areas on Oahu



End-of-Century Sea Level Rise Could be Greater



Several recent studies call for physically plausible global mean sea level rise in the range of 6 to 8 ft by the end of this century.

(Decanto and Pollard 2015, Sweet et al. 2017)

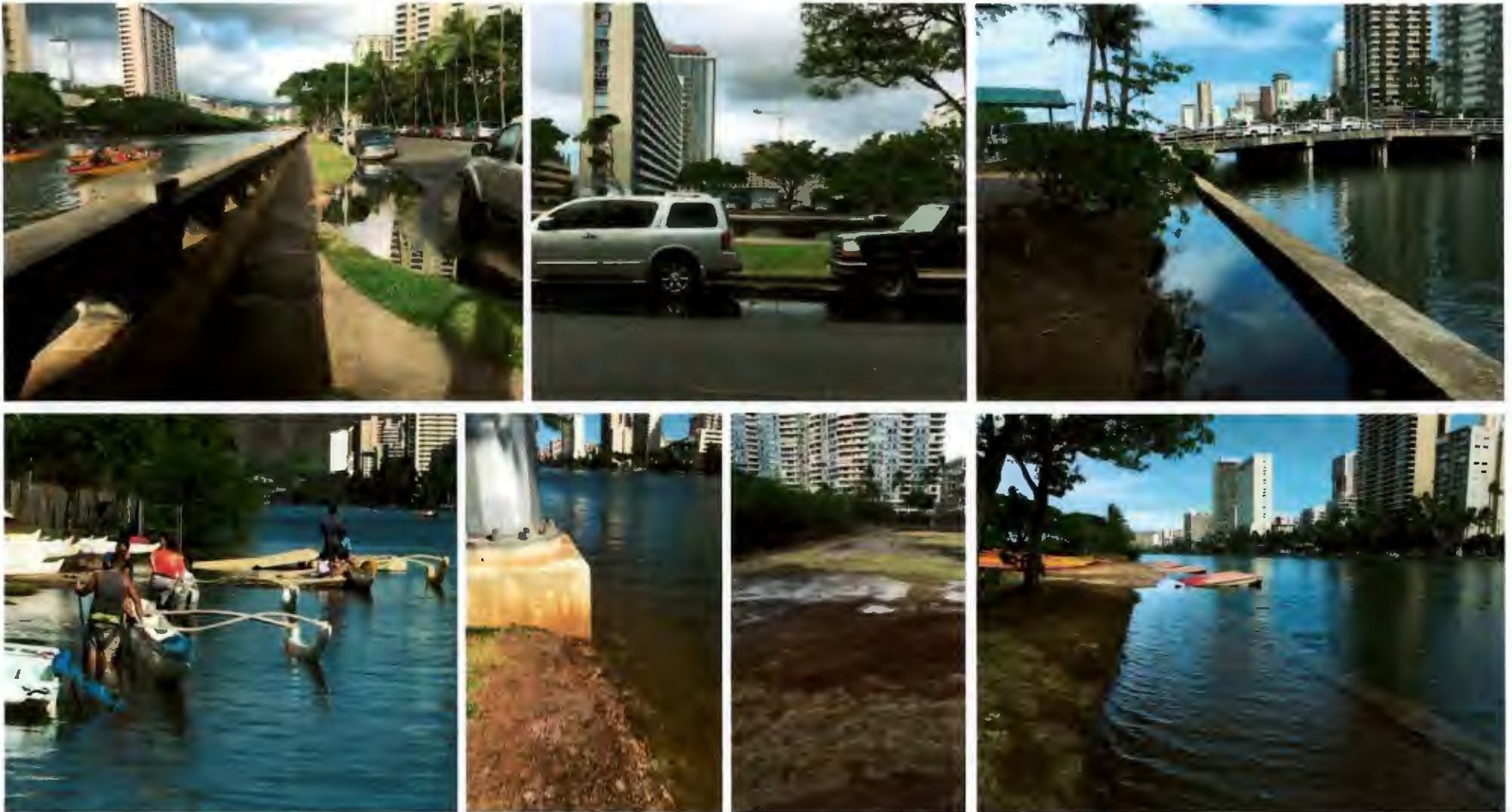
Source: Habel et al. 2017

2017 - King Tide - Waikiki



Courtesy of OCCSR

2017 - King Tide – Ala Wai Canal



Courtesy of OCCSR

2017 - King Tide - Mapunapuna



Courtesy of OCCSR

2017 - King Tide – Maunaloa, Ala Moana



Courtesy of OCCSR

Miami



STORMWATER MANAGEMENT MASTER PLAN



Impacts of Sea Level Rise

- Higher groundwater
- Higher tides
- Increased flooding
- Decreased effectiveness of the existing stormwater system



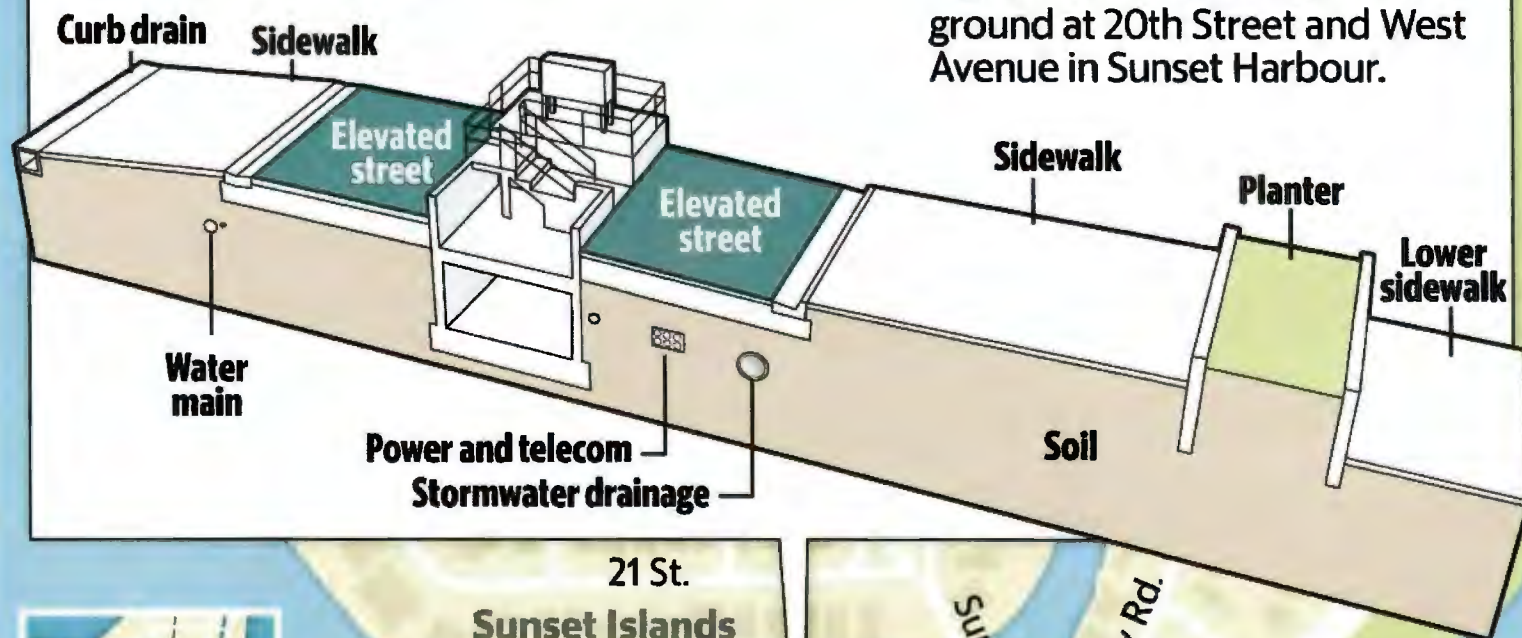
INFRASTRUCTURE RESILIENCY

- Elevating Public & Private Infrastructure
- Stormwater Retrofits
- Updating/Replacing Utilities
- Green Infrastructure

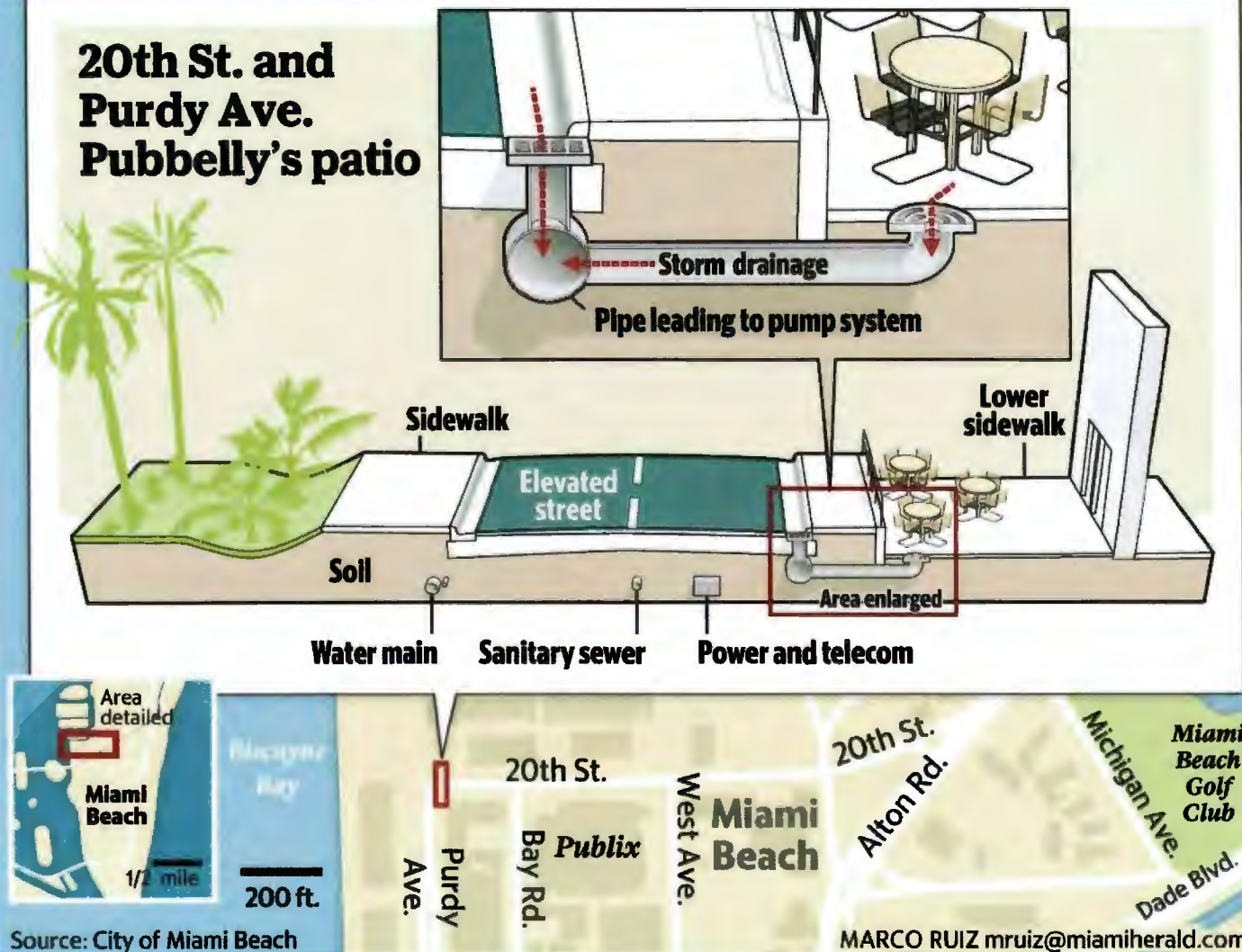


20th Street at pump station 3

The control panel for a pump station now rises out of the ground at 20th Street and West Avenue in Sunset Harbour.



20th St. and Purdy Ave. Pubbelly's patio



This rendering shows the elevated roadway at 20th Street and Purdy Avenue, in front of Pubbelly restaurant. To the right, the patio in front of Pubbelly is about two feet lower than the street. Floor drains down there feed into the same pipes that connect to the curb drains on the road, which routes water to the pump station.

Sunset Harbour

20 Street & Purdy Avenue



Climate Resilience Action Plan Check-list

Sea Level Rise Action Strategy

[illegible]

Collaboration Framework for Implementation of Climate Change Adaptation Strategies

County Framework for Implementation of Climate Change Adaptation Strategies (CCAS)

Coordinate actions and policies of departments within the county (in alignment with state/federal entities).

Set forth long-range objectives and policies for CCH and inform land use and infrastructure decisions.

Coordination of Adaptation Options, Implementation of Adaptation Strategies, and Capital Improvement Projects.

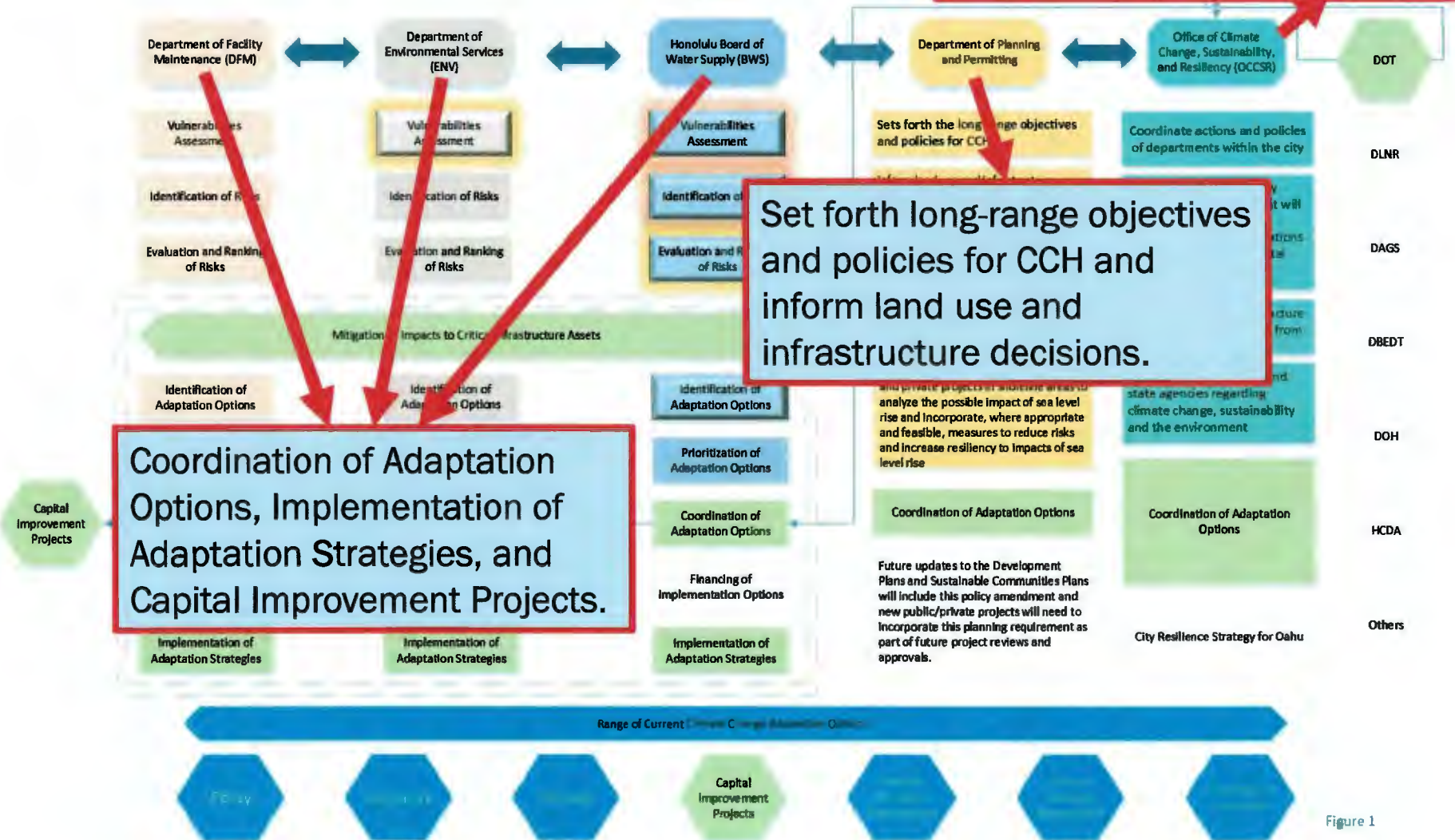


Figure 1

WHAT IS ONE WATER

‘ONE WATER’ – ONE WATER IS AN INTEGRATED PLANNING AND IMPLEMENTATION APPROACH TO MANAGING FINITE WATER RESOURCES FOR LONG-TERM RESILIENCE AND RELIABILITY, MEETING BOTH COMMUNITY AND ECOSYSTEM NEEDS. (WRF, 2017)

*Ahupuaʻa- a section of mountain, valley, and sea.
Image courtesy of Matt Foster published by Maui Nō Ka ʻŌi
<https://mauimagazine.net/about-us/>.*



The One Water Cycle



Survey: Top Reasons to Apply One Water (in order of importance)

1. Greater resilience and reliability
2. Opportunities to optimize regional infrastructure
3. Sustainable community development
4. New regulatory flexibility or opportunity
5. Economic growth opportunity
6. Increased coordination among agencies

The One Water objectives include:

- Increase the understanding of common risks associated with climate change impacts upon critical infrastructure under the jurisdiction of different City and County of Honolulu agencies;
- Identification of specific recommendations for increased coordination and collaborative implementation of adaptation strategies;
- Development of an overall framework for purposes of coordinating mutually beneficial strategies and/or projects.

PROPOSED ACTIONS

1. ESTABLISH ONE WATER FRAMEWORK
2. ESTABLISH ONE WATER PANEL
3. INTEGRATE IN PLANNING
4. COORDINATE ON CIP (RESILIENCE CHECKLIST)
5. PRIVATE DEVELOPMENT CONDITIONS AND CO-MEETING WITH DEVELOPERS
6. DEMONSTRATION PROJECTS
7. DEVELOP INTERAGENCY MOU'S



Acknowledgements

Research Team

Principal Investigators

- Dean Nakano,
- Lynn Stephens, P.E.
- Jon Turk, P.G.

Project Team

- Susan Mukai
- Joanie Stultz



Technical Advisory Committee

- Victoria Keener, PhD, Pacific RISA
- Tom Giambelluca, PhD, University of Hawaii (UH)
- Chip Fletcher, PhD, UH
- Scot Izuka, PhD, US Geological Survey (USGS)
- Delwyn Oki, PhD, USGS
- Lenore Ohye, Commission on Water Resource Management
- Joanna Seto, PE, Department of Health

Project Advisory Committee

- Nancy Matsumoto, Board of Water Supply
- Larna Kaatz, Denver Water/Water Utility Climate Alliance
- Adam Carpenter, American Water Works Association
- David Yates, National Center for Atmospheric Research
- Kenan Ozekin, Water Research Foundation

References

- Decanto, R. and D. Pollard. 2015. *Contribution of Antarctica to past and future sea-level rise*. Nature 531, pages 591–597.
- Habel, S., Fletcher, C., Rotzoll, K., and El-Kadi, A. 2017. *Development of a model to simulate groundwater inundation induced by sea-level rise and high tides in Honolulu, Hawaii*. Water Research. Vol 114, 122-134.
- Giambelluca, T. W., Q. Chen, A. G. Frazier, J. P. Price, Y. -L. Chen, P. -S. Chu, J. K. Eischeid, and D. M. Delparte. 2013. *Online Rainfall Atlas of Hawai'i*. Bull. Amer. Meteor. Soc. 94, 313-316, doi: 10.1175/BAMS-D-11-00228.1.
- Izuka, S. K., Oki, D.S., and Engott, J.A., 2010. *Simple method for estimating groundwater recharge on tropical islands*. Journal of Hydrology, v 387, p. 81-89.
- Stephens, L., Broley, W., and C., Paulson. 2017. *Blueprint for One Water*. Water Research Foundation project #4660.
- Sweet, V. M., Kopp, R. E., Weaver, C. P., Obeysekera, J., Horton, R. M., Theiler, E. R., and C. Zerves. 2017. *Global and Regional Sea Level Rise Scenarios for the United States*. National Oceanic and Atmospheric Administration (NOAA). In partnership with U.S. Department of Commerce, U.S. Geological Survey, U.S. Environmental Protection Agency, and Rutgers University.
- Timm, O. E., T. W. Giambelluca, and H. F. Diaz, 2015. *Statistical downscaling of rainfall changes in Hawai'i based on the CMIP5 global model projections*. Journal of Geophysical Research vol. 120, issue 1, p. 92-112, doi: 10.1002/2014JD022059.
- Zhang, et al., unpublished. Dynamically-downscaled data from Chunxi Zhang (chunxi@hawaii.edu) – October, 2016.

ITEM FOR INFORMATION NO. 2

"January 27, 2020

PARTICIPATION
IN THE CITY AND
COUNTY OF
HONOLULU'S
LEGAL ACTION
AGAINST FOSSIL
FUEL COMPANIES
TO RECOVER
CLIMATE CHANGE-
RELATED COSTS

Chair and Members
Board of Water Supply
City and County of Honolulu
Honolulu, Hawaii 96843

Chair and Members:

Subject: Participation in the City and County of Honolulu's Legal
Action Against Fossil Fuel Companies to Recover Climate
Change-Related Costs

Manager Ernest Lau will be reporting on participating in the City and
County's Climate Change Lawsuit.

Respectfully submitted,

/s/ ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

Attachment"

The foregoing was for information only.

DISCUSSION:

Ernest Lau, Manager and Chief Engineer, gave the report.

Manager Lau reported that the City and County Climate Change lawsuit was discussed in the executive session at the December 12, 2019 Board meeting. The City and County of Honolulu (City) has taken a position to support a City Council resolution to pursue recovery costs for climate change-related expenses. In the December 12, 2019, executive session, the Board elected to participate in the City's lawsuit.

Vice Chair Sproat commented that BWS could be facing significant expenses in building up climate resiliency and that action like this is being taken all across the nation.

ITEM FOR INFORMATION NO. 3

“January 27, 2020

STATUS
UPDATE OF
GROUNDWATER
LEVELS AT ALL
INDEX STATIONS

Chair and Members
Board of Water Supply
City and County of Honolulu
Honolulu, Hawaii 96843

Chair and Members:

Subject: Status Update of Groundwater Levels at All Index Stations

There is one aquifer index well within low groundwater status for the production month of December 2019. Punaluu is under a Caution status. The monthly production average for December 2019 was 131.24 million gallons per day.

As of January 7, 2020, the Hawaii Drought Monitor shows abnormally dry conditions along the leeward coast of Oahu from Ewa Beach to Kaena Point. The National Weather Service forecasts above-normal rainfall through June 2020, due to persistent elevated sea surface temperatures predicted by most climate models.

Most monitoring wells exhibit stable trends.

Respectfully submitted,

/s/ ERNEST Y. W. LAU, P.E
Manager and Chief Engineer

Attachment”

The foregoing was for information only.

DISCUSSION: Barry Usagawa, Program Administrator, Water Resources Division, gave the report. There were no comments or discussions.

**PRODUCTION, HEAD AND RAINFALL REPORT
MONTH OF DECEMBER 2019**

POTABLE

STATION	MGD
HONOLULU (1)	
KULIOUOU	0.05
WAILUPE	0.11
AINA KOA	0.14
AINA KOA II	0.81
MANOA II	0.00
PALOLO	1.16
KAIMUKI HIGH	2.53
KAIMUKI LOW	1.20
WILDER	4.77
BERETANIA HIGH	2.38
BERETANIA LOW	1.76
KALIHI HIGH	3.10
KALIHI LOW	2.14
KAPALAMA	0.69
KALIHI SHAFT	4.06
MOANALUA	1.39
HALAWA SHAFT	14.02
KAAMILO	0.86
KALAUAO	6.17
PUNANANI	8.67
KAAHUMANU	0.25
HECO WAIU	2.55
MANANA	0.29
WELLS SUBTOTAL:	59.09
MANOA TUNNEL	0.17
PALOLO TUNNEL	0.23
GRAVITY SUBTOTAL:	0.40
HONO. SUBTOTAL:	59.49

STATION	MGD
WINDWARD (2)	
WAIMANALO II	0.39
WAIMANALO III	0.00
KUOU I	0.90
KUOU II	0.04
KUOU III	0.39
LULUKU	0.90
HAIKU	0.00
IOLEKAA	0.00
KAHALUU	0.72
KAHANA	0.94
PUNALUU I	0.00
PUNALUU II	4.22
PUNALUU III	0.98
KALUANUI	1.11
MAAKUA	0.24
HAUULA	0.26
WELLS SUBTOTAL:	11.10
WAIM. TUNNELS I & II	0.00
WAIM. TUNNELS III&IV	0.19
WAIHEE INCL. WELLS	0.17
WAIHEE TUNNEL	4.08
LULUKU TUNNEL	0.10
HAIKU TUNNEL	0.98
KAHALUU TUNNEL	1.26
GRAVITY SUBTOTAL:	6.77
WIND. SUBTOTAL:	17.87

STATION	MGD
NORTH SHORE (3)	
KAHUKU	0.30
OPANA	0.14
WAIALEE I	0.42
WAIALEE II	0.35
HALEIWA	0.00
WAIALUA	1.61
N.SHORE SUBTOTAL:	2.83

STATION	MGD
MILILANI (4)	
MILILANI I	1.04
MILILANI II	0.00
MILILANI III	0.61
MILILANI IV	2.24
MILILANI SUBTOTAL:	3.88

STATION	MGD
WAHIAWA (5)	
WAHIAWA	0.85
WAHIAWA II	1.97
WAHIAWA SUBTOTAL:	2.83

STATION	MGD
PEARL CITY-HALAWA (6)	
HALAWA 277	0.61
HALAWA 550	0.00
AIEA	1.14
AIEA GULCH 497	0.35
AIEA GULCH 550	0.20
KAONOHI I	0.93
WAIMALU I	0.00
NEWTOWN	0.83
WAIU	0.60
PEARL CITY I	0.81
PEARL CITY II	1.11
PEARL CITY III	0.25
PEARL CITY SHAFT	0.93
PEARL CITY-HALAWA SUBTOTAL:	7.76

STATION	MGD
WAIPAHU-EWA (7)	
WAIPIO HTS.	1.19
WAIPIO HTS. I	0.71
WAIPIO HTS. II	0.28
WAIPIO HTS. III	1.24
WAIPAHU	3.40
WAIPAHU II	2.03
WAIPAHU III	1.42
WAIPAHU IV	2.62
KUNIA I	4.29
KUNIA II	2.12
KUNIA III	1.18
HOAEAE	5.05
HONOULIULI I	0.00
HONOULIULI II	7.42
MAKAKILO	0.36
WAIPAHU-EWA SUBTOTAL:	33.29

STATION	MGD
WAIANAE (8)	
MAKAHA I	0.00
MAKAHA II	0.16
MAKAHA III	0.35
MAKAHA V	0.15
MAKAHA VI	0.00
MAKAHA SHAFT	0.00
KAMAILE	0.06
WAIANAE I	0.22
WAIANAE II	0.21
WAIANAE III	0.58
WELLS SUBTOTAL:	1.73
WAI. C&C TUNNEL	1.40
WAI. PLANT TUNNELS	0.16
GRAVITY SUBTOTAL:	1.56
WAIANAE SUBTOTAL:	3.29

NONPOTABLE

NONPOTABLE	MGD
KALAUAO SPRINGS	0.28
BARBERS POINT WELL	1.07
GLOVER TUNNEL NP	0.32
NONPOTABLE TOTAL:	1.66

RECYCLED WATER (NOVEMBER 2019)

RECYCLED WATER	MGD
HONOULIULI WRF R-1	6.43
HONOULIULI WRF RO	1.56
RECYCLED WATER TOTAL:	7.99

**PRODUCTION, HEAD AND RAINFALL REPORT
MONTH OF DECEMBER 2019**

PRODUCTION SUMMARIES

TOTAL WATER	MGD
PUMPAGE	122.51
GRAVITY	8.73
POTABLE TOTAL:	131.24
NONPOTABLE	1.66
RECYCLED WATER	7.99
TOTAL WATER:	140.89

CWRM PERMITTED USE AND BWS ASSESSED YIELDS FOR BWS				
POTABLE SOURCES				
WATER USE DISTRICTS		A PERMITTED USE/ BWS YLDS	B DEC 2019	C DIFF. A-B
1	HONOLULU	82.93	59.09	23.84
2	WINDWARD	25.02	13.62	11.40
3	NORTH SHORE	4.70	2.83	1.87
4	MILILANI	7.53	3.88	3.65
5	WAHIAWA	4.27	2.83	1.44
6	PEARL CITY-HALAWA	12.25	7.76	4.49
7	WAIPAHU-EWA	50.63	33.29	17.34
8	WAIANAE	4.34	1.73	2.61
TOTAL:		191.67	125.03	66.63

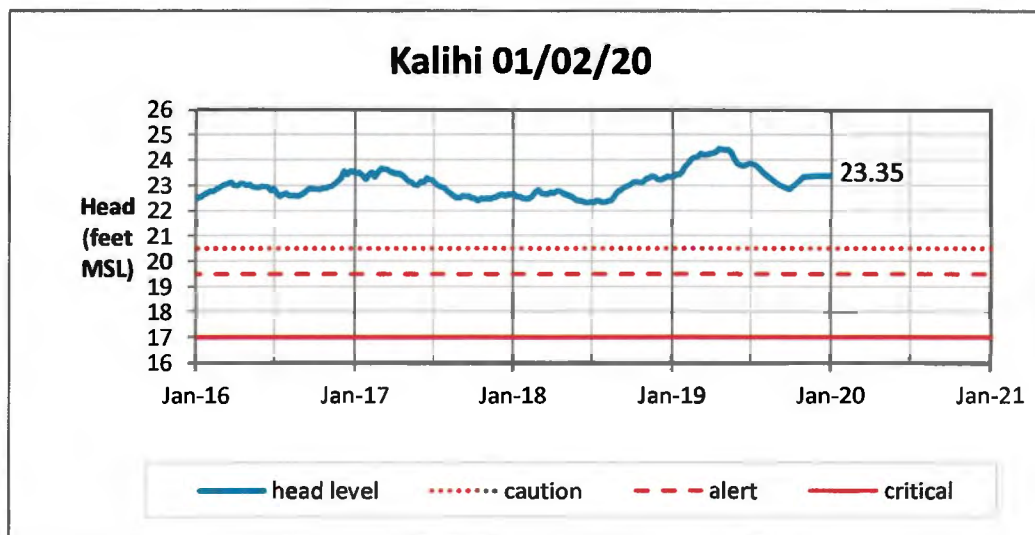
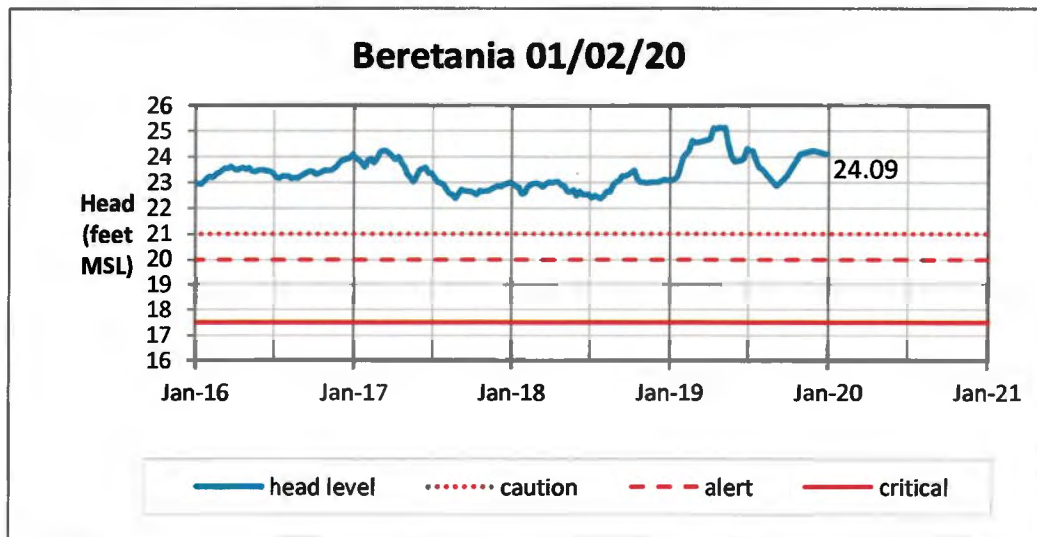
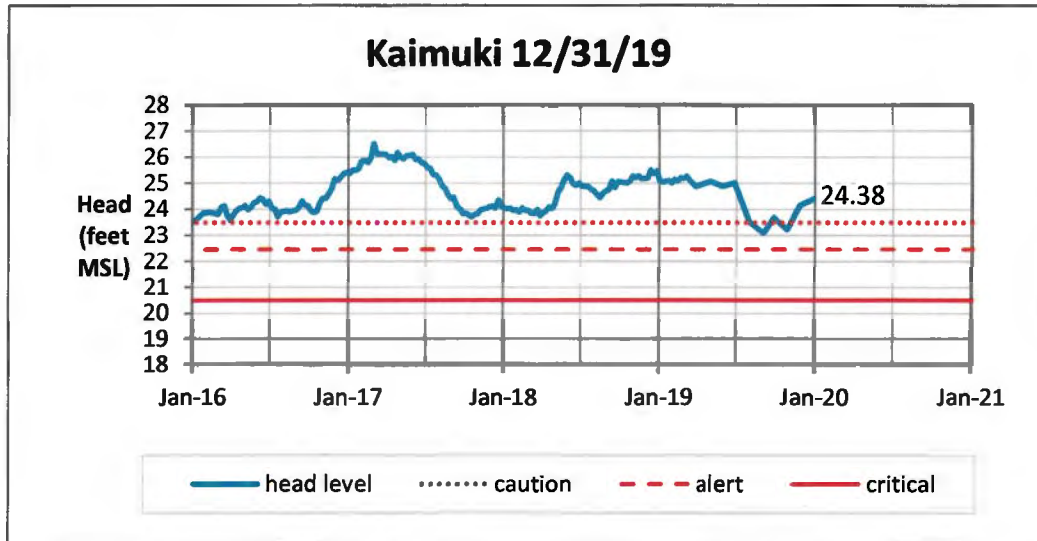
CWRM PERMITTED USE FOR BWS				
NONPOTABLE SOURCES				
WATER USE DISTRICTS		A PERMITTED USE	B DEC 2019	C DIFF. A-B
7	WAIPAHU-EWA (BARBERS POINT WELL)	1.00	1.07	-0.07
TOTAL:		1.00	1.07	-0.07

EFFECTIVE WATER DEMAND PER DISTRICT

IMPORT/EXPORT BETWEEN WATER USE DISTRICTS			
FROM	TO		MGD
2	1	WINDWARD EXPORT	1.63
7	8	BARBERS PT LB	5.23

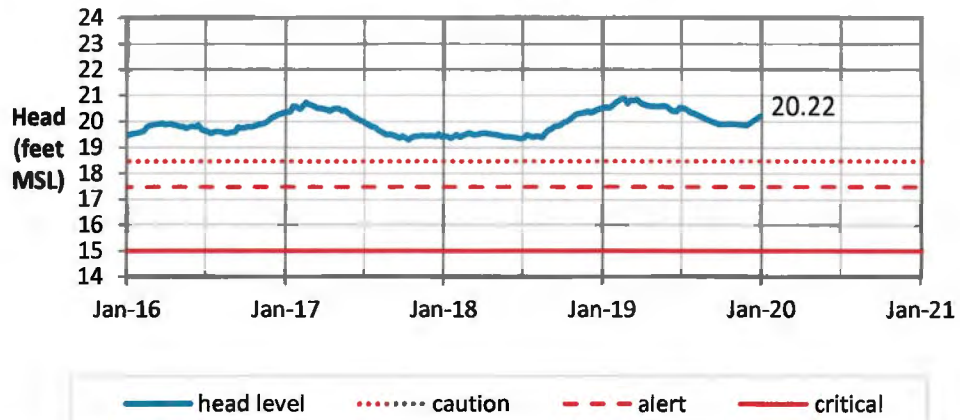
WATER USE DISTRICTS		SUBTOTAL	IMPORT	EXPORT	EFFECTIVE WATER DEMAND
1	HONOLULU	59.09	1.63	-	60.72
2	WINDWARD	13.62	-	1.63	11.99
3	NORTH SHORE	2.83	-	-	2.83
4	MILILANI	3.88	-	-	3.88
5	WAHIAWA	2.83	-	-	2.83
6	PEARL CITY-HALAWA	7.76	-	-	7.76
7	WAIPAHU-EWA	33.29	-	5.23	28.06
8	WAIANAE	1.73	5.23	-	6.96
TOTAL:		125.03	6.86	6.86	125.03

Weekly Head Report

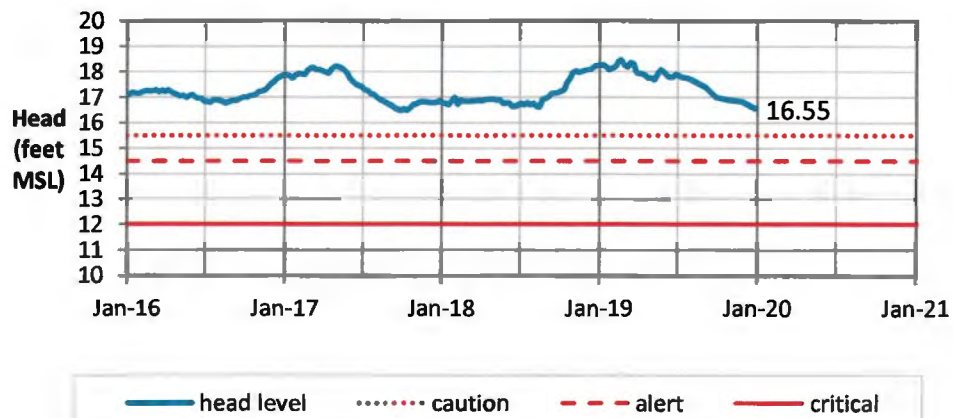


Weekly Head Report

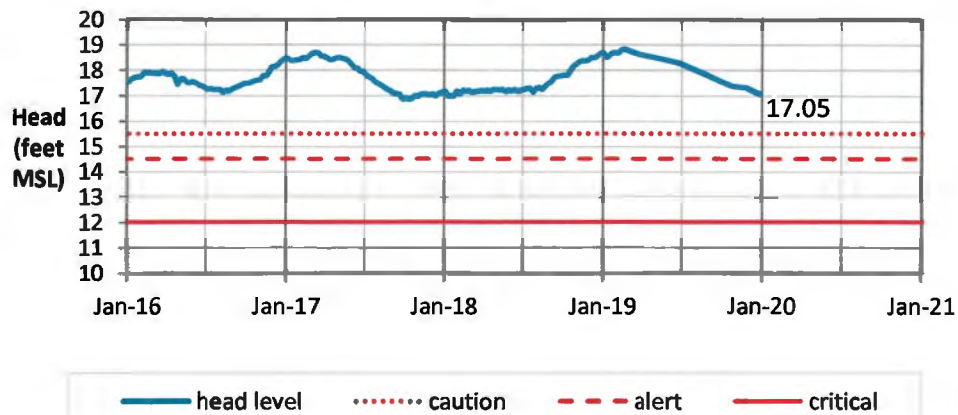
Moanalua 01/02/20



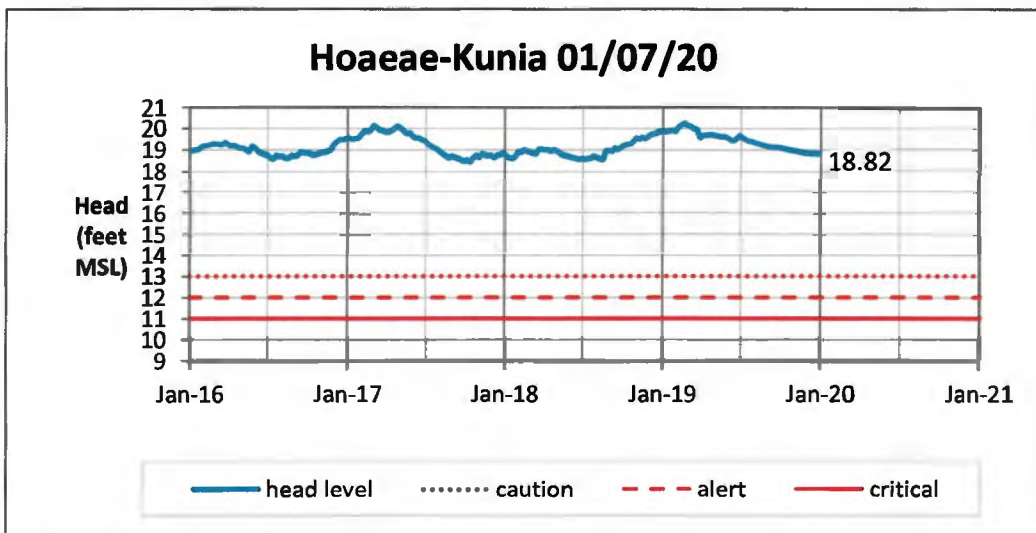
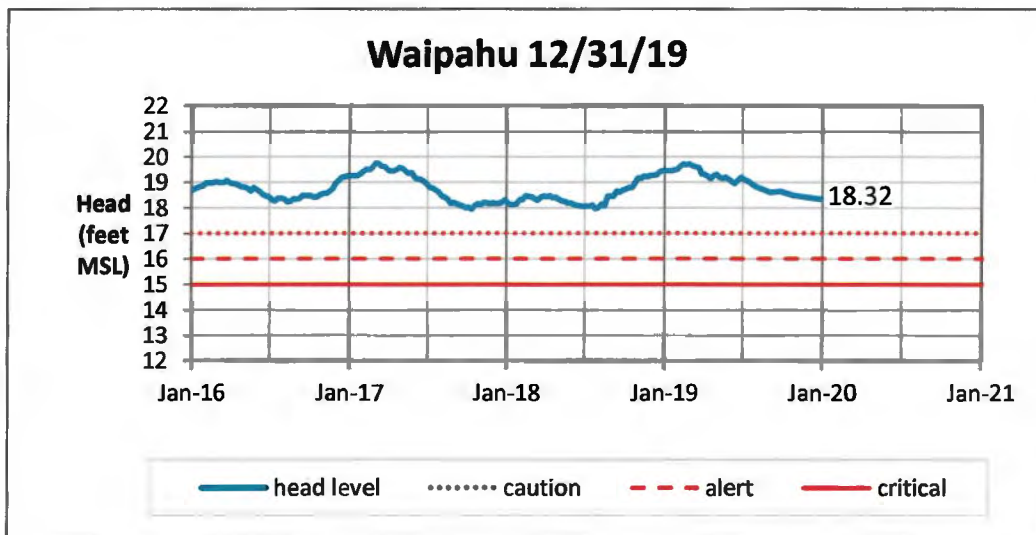
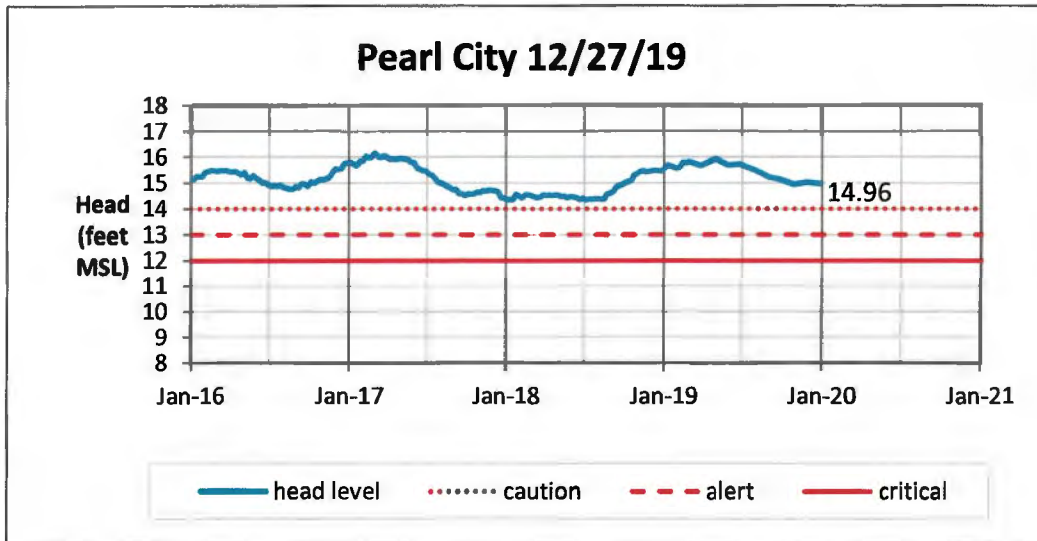
Halawa 01/02/20



Kalauao 12/26/19

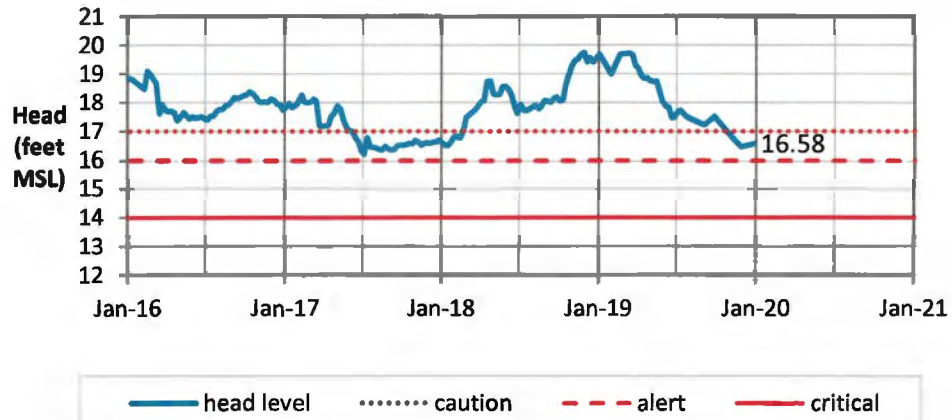


Weekly Head Report

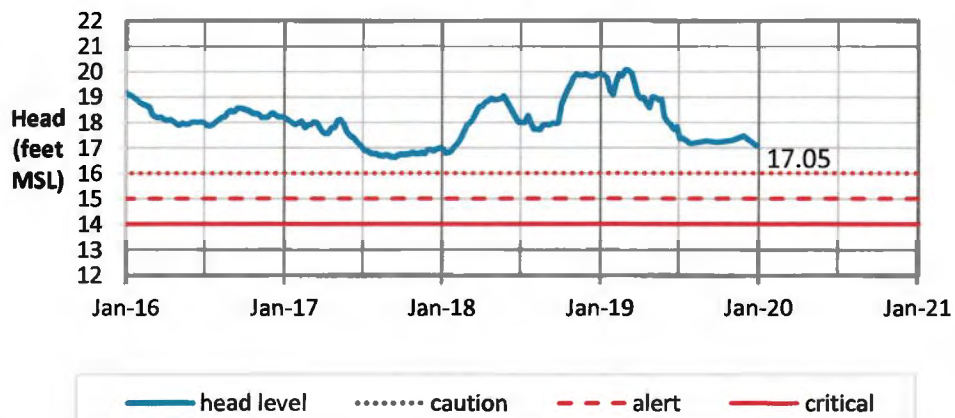


Weekly Head Report

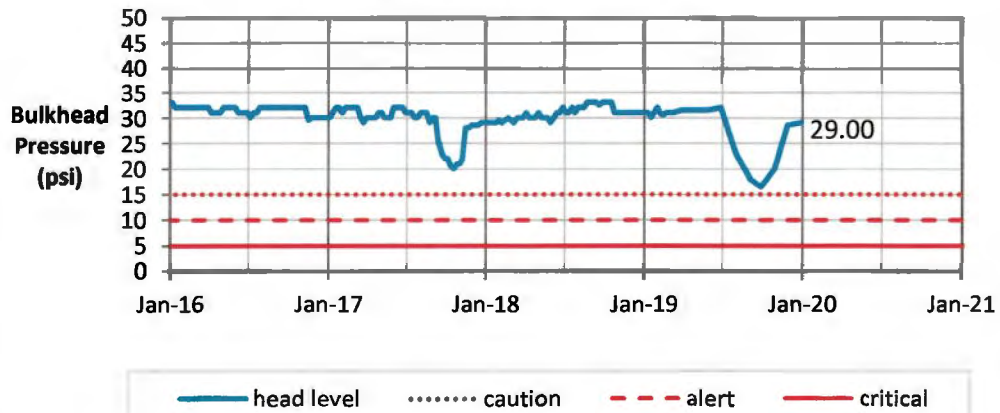
Punaluu 01/03/20



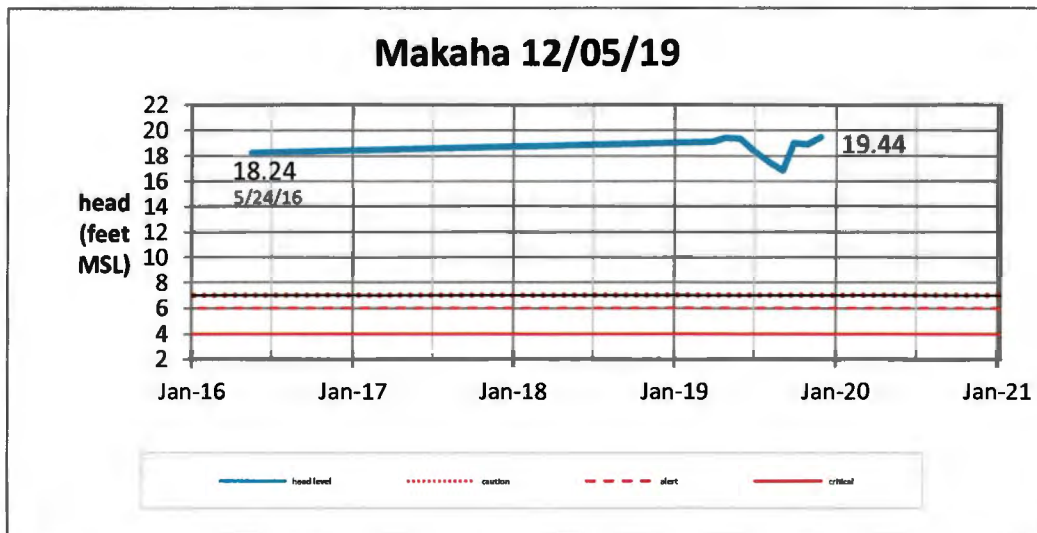
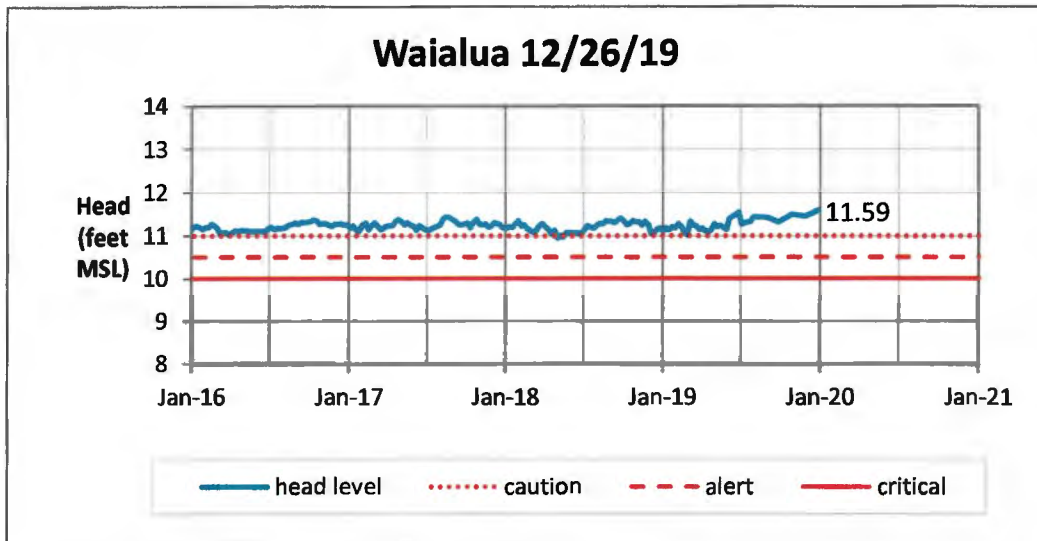
Kaluanui 12/26/19



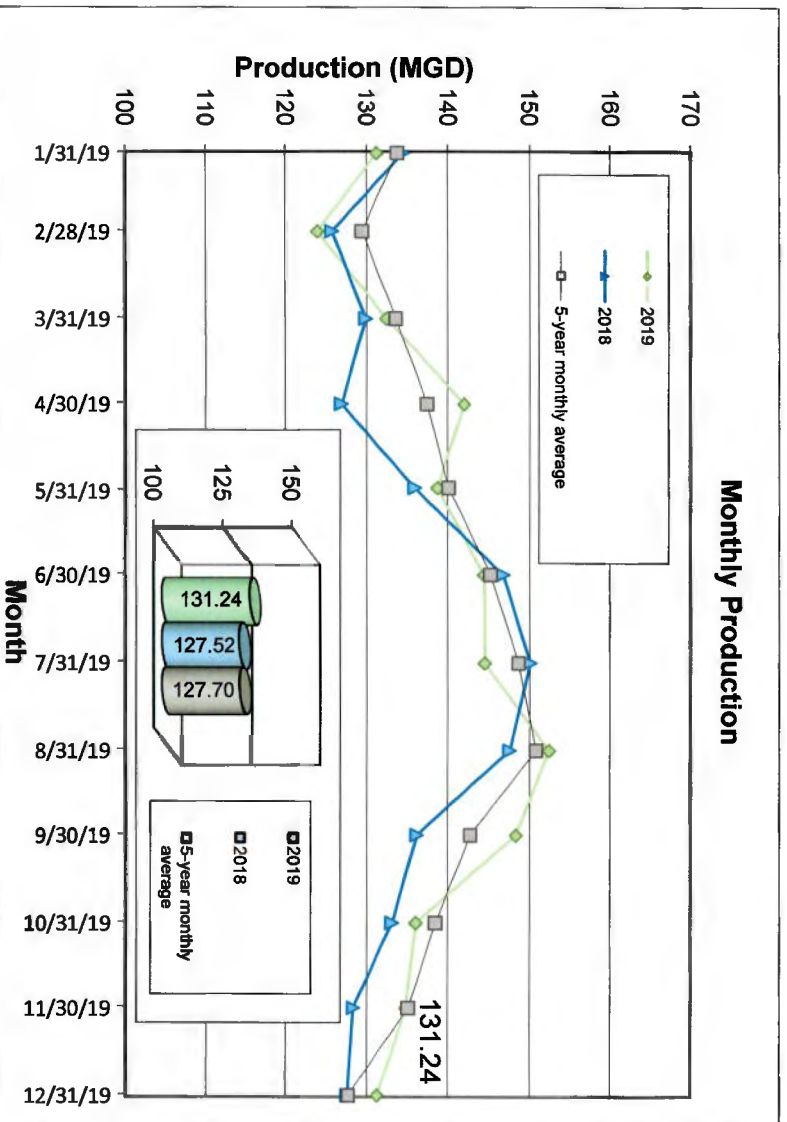
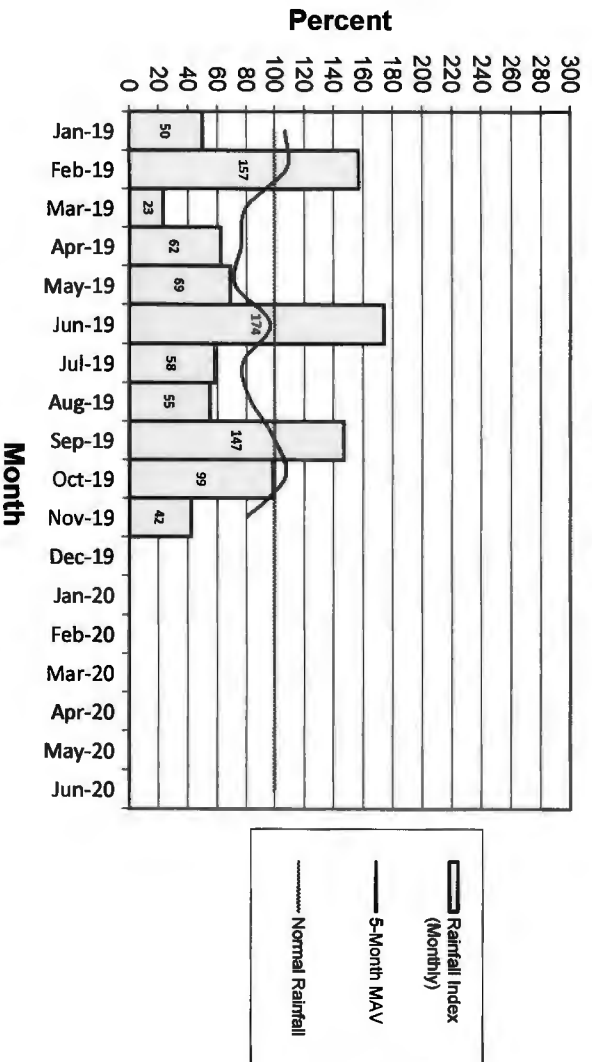
Waihee Tunnel 12/27/19



Weekly Head Report



HONOLULU WATERSHED AREA Rainfall Intake



ITEM FOR INFORMATION NO. 4

"January 27, 2020

WATER MAIN
REPAIR REPORT
FOR OCTOBER
2019

Chair and Members
Board of Water Supply
City and County of Honolulu
Honolulu, Hawaii 96843

Chair and Members:

Subject: Water Main Repair Report for December 2019

Michael Fuke, Program Administrator, Field Operations Division, will report on water main repair work for the month of December 2019.

Respectfully submitted,

/s/ ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

Attachment"

The foregoing was for information only.

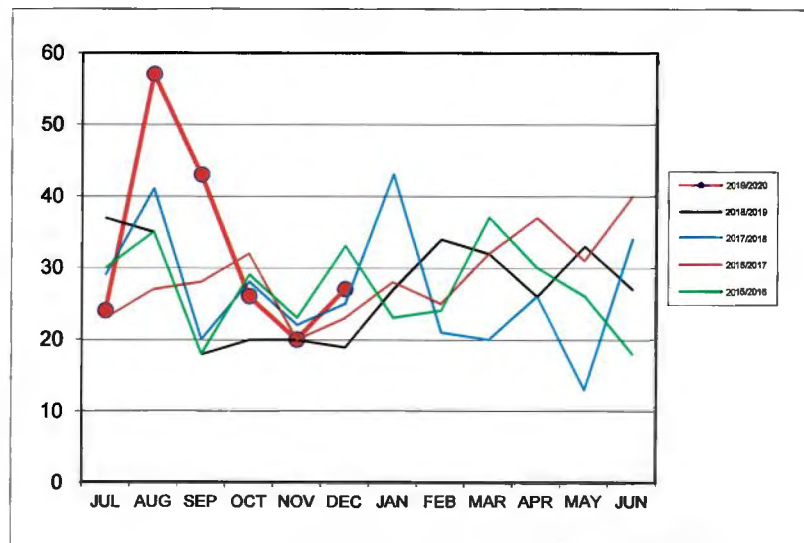
DISCUSSION:

Michael Fuke, Program Administrator, Field Operations Division, gave the report. There were no comments or discussions.

WATER MAIN REPAIR REPORT for December 2019

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	Total
2019/2020	24	57	43	26	20	27							197
2018/2019	37	35	18	20	20	19	27	34	32	26	33	27	328
2017/2018	29	41	20	28	22	25	43	21	20	26	13	34	322
2016/2017	23	27	28	32	20	23	28	25	32	37	31	40	346
2015/2016	30	35	18	29	23	33	23	24	37	30	26	18	326

Date	Address	Size (In)	Pipe Type
12/2/2019	1274 Kuuna St, Kailua	12	CI
12/2/2019	1310 Nanakai St, Pearl City	8	PVC
12/5/2019	47-100 Kopili Pl, Kaneohe	4	DI
12/5/2019	909 Ahua St, Honolulu	8	CI
12/6/2019	91-623 Pupu St, Ewa Beach	8	CI
12/7/2019	86-177 Kawili St, Waianae	16	CI
12/7/2019	14A Lakeview Circle, Wahiawa	6	CI
12/7/2019	11 Lakeview Circle, Wahiawa	8	CI
12/9/2019	Queen Liliuokalani Fwy, Kapolei	42	CC
12/11/2019	86-90 Farrington Hwy, Waianae	12	CI
12/11/2019	2151 Hillcrest St, Honolulu	6	CI
12/11/2019	471 N. Judd St, Honolulu	12	PVC
12/12/2019	63 Dowsett Ave, Honolulu	8	PVC
12/12/2019	642 8th Ave, Honolulu	8	CI
12/15/2019	192 Kailua Rd, Kailua	10	CI
12/17/2019	86-257 Kawili St, Waianae	8	PVC
12/17/2019	47-654 Mapele Rd, Kaneohe	8	CI
12/17/2019	87-615 Manuu St, Waianae	8	CI
12/18/2019	94-975 Kahualani St, Waipahu	8	CI
12/21/2019	3763 Noeau St, Honolulu	8	PVC
12/22/2019	53-470 Kamehameha Hwy, Hauula	30	CC
12/22/2019	715 Mokapu Rd, Kailua	8	AC
12/25/2019	47-100 Kopili Pl, Kaneohe	4	DI
12/27/2019	1962 Hoolaulea St, Pearl City	12	CI
12/28/2019	85-946 Mill St, Waianae	8	CI
12/28/2019	94-1047 Maikai St, Waipahu	8	CI
12/31/2019	92-812 Nohohale St, Kapolei	4	CI



45 miles of pipeline were surveyed by the Leak Detection Team in the month of December.

**MOTION TO
RECESS INTO
EXECUTIVE
SESSION**

Upon unanimously approved the motion, the Board recessed into Executive Session Pursuant to [HRS §92-5(a)(4)] at 2:53 PM to Consult with the Board's Attorney on Question and Issues Pertaining to Matters Posted for Discussion at an Executive Session.

**OPEN
SESSION**


The Board reconvened in Open Session at 3:23 PM.

**MOTION TO
ADJOURN**

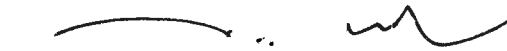
There being no further business Vice-Chair Sproat at 3:24 PM called for a motion to adjourn the Open Session. Ray S. Sasamura so moved; seconded by Jade T. Butay and unanimously carried.

THE MINUTES OF THE REGULAR SESSION BOARD MEETING ON JANUARY 27, 2020 WERE APPROVED AT THE FEBRUARY 24, 2020 BOARD MEETING			
	AYE	NO	COMMENT
BRYAN P. ANDAYA	X		
KAPUA SPROAT	X		
KAY C. MATSUI			ABSENT
RAY C. SOON	X		
MAX J. SWORD	X		
ROSS S. SASAMURA	X		
JADE T. BUTAY	X		

The minutes of the Regular Meeting held on December 12, 2019 are respectfully submitted,


DEANNA THYSSEN

APPROVED:


BRYAN P. ANDAYA
Chair of the Board

FEB 24 2020

Date