

One Water for Climate Resiliency

A White Paper

Prepared for: City and County of Honolulu Climate Change Commission

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EXECUTIVE SUMMARY

Water, in all forms, is critical to Hawaii's built and natural environment and managing it sustainably will be essential as the pressures of development, aging infrastructure, climate change, and sea level rise increase over time. A majority of climate change impacts involve water- usually resulting from too much or too little of it. In 2018, Mayor Caldwell embraced the climate change adaptation planning recommendations from the City Climate Change Commission and issued the Climate Change and Sea Level Rise Directive requiring city agencies to take action to minimize the negative impacts of climate change while setting mid and end of century climate goals for sea level rise and shoreline management. This was a huge step towards holistically planning for resiliency in Honolulu while building collaboration around similar goals¹. Research has shown that climate change compromises freshwater supplies, making water management (the management of freshwater, wastewater, sea water, and stormwater) a key facet of planning for resiliency and adaptation². As pressures are compounded over time, integrated water management should be addressed comprehensively and incorporated throughout planning efforts. A nationally acclaimed technique for encouraging integrated water management is the 'one water' method, which envisions water being managed in a sustainable, inclusive manner while recognizing the intrinsic value of water in every form- stormwater, wastewater, sea water and drinking water alike³. According to the Water Research Foundation's Blueprint for One Water, 'one water' can be defined as "an integrated planning and implementation approach to managing finite water resources for long-term resilience and reliability, meeting both community and ecosystem needs"⁴.

By issuing the 2018 Climate Change Directive (Directive 18-2), Mayor Caldwell took an unprecedented step towards ensuring that the best project and policy decisions are made in regard to climate change, sea level rise, and the safety of Honolulu's residents. To continue the momentum established in 2018, **this White Paper asserts that a supporting ordinance is needed that provides a 'One Water Collaboration Framework' among City agencies to coordinate planning and infrastructure investment for climate resiliency.** This new ordinance will help develop actions and processes for implementing the goals and strategies advised in Directive 18-2. A One Water Collaboration Framework, which fosters integrated water management and is expanded to climate resiliency, is an ideal tool for turning the ambitions of Directive 18-2 into focused, institutionalized action. 'One water' considers the water cycle an integrated system, similar to the Ahupua'a's system, recognizing the connections between

¹ Hawaii Free Press. (2018) Caldwell Issues Directive on Climate Change and Sea Level Rise.

² City and County of Honolulu Climate Change Commission. (2018) Climate Change Brief.

³ US Water Alliance. (2016) One Water Roadmap.

⁴ Water Research Foundation. (2017) Blueprint for One Water.

stormwater, groundwater, wastewater, and sea water and the relationship between land and water. Wastewater management, a key focus right now in Hawaii with the *County of Maui v. Hawaii Wildlife Fund* Supreme Court case, is an additional driver for increasing regulations and developing more integrated solutions across water management. Climate change adaptation and resilience also play a pivotal role. A One Water Collaboration Framework in Honolulu can build on existing City’s regional development and sustainable communities plans and watershed management plans and infrastructure functional plans to identify efficiencies and areas that would benefit from enhanced collaboration. The One Water Collaboration Framework referred to and encouraged by this paper seeks to define the guidance of collaborative actions between separate but interconnected entities⁵.

Honolulu’s one water infrastructure and departments are sufficient at completing the individual goals and tasks prescribed for each agency, but are not designed to elicit collaboration or the sharing of innovative ideas and practices. As the champion of this initiative, Mayor Caldwell will position Hawaii as a leader of ‘one water’ management practices for climate resilience, an approach that is gaining popularity based on its ability to prepare for the increasingly severe consequences of climate change. The actions to establish a One Water Collaboration Framework are detailed in the following report, including incorporating ‘one water’ in functional planning, developing a ‘one water’ panel, drafting a Capital Improvement Program checklist that includes ‘one water’ practices, and creating an opportunity for developers to collectively meet with the departments involved in ‘one water’ collaboration.

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⁵ Water Research Foundation. (2017) Blueprint for One Water.

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- Appendix A: Agencies and Related Planning Documents
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LIST OF ACRONYMS

BFS	Honolulu Department of Budget and Fiscal Services
BLNR	Hawaii Board of Land and Natural Resources
BWS	Honolulu Board of Water Supply
CIP	Capital Improvement Project
CWA	Clean Water Act
CWRM	Hawaii DLNR Commission on Water Resource Management
DDC	Honolulu Department of Design and Construction
DFM	Honolulu Department of Facility Maintenance
DHHL	Department of Hawaiian Home Lands
DLNR	Hawaii Department of Land and Natural Resources
DOFAW	Hawaii DLNR Division of Forestry and Wildlife
DOA	Hawaii Department of Agriculture
DOH	Hawaii Department of Health
DOT	Hawaii Department of Transportation
DPP	Honolulu Department of Planning and Permitting
DPR	Honolulu Department of Parks and Recreation
DTS	Honolulu Department of Transportation Services
ENV	Honolulu Department of Environmental Services
FWI	Fresh Water Initiative
HAR	Hawaii Administrative Rules
HRS	Hawaii Revised Statues
NPDES	National Pollutant Discharge Elimination System
OCCL	Hawaii DLNR Office of Conservation and Coastal Lands
OCCSR	Honolulu Office of Climate Change, Sustainability, and Resiliency
OWMP	Oahu Water Management Plan
ROH	Revised Ordinances of Honolulu
TOD	Transit-Oriented Development

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1. INTRODUCTION

Hawaii’s isolated location in the Pacific provides the perfect conditions for a rigorous and dynamic water cycle, but it also emphasizes the importance of preserving our water resources. As populations rise on Oahu and throughout the Hawaiian Islands, natural landscapes are increasingly replaced with concrete and impervious surfaces (e.g. roofs, roads, parking lots), limiting the likelihood that rainfall will percolate into the aquifer. Additionally, each island has a finite amount of ground surface to collect precipitation that falls, meaning the areas of catchment and recharge are limited. Groundwater inundation, from the water table rising, is the most substantial single-mechanism flood source in Honolulu⁶ that will increasingly threaten island communities with both the damages from floods and the pollutants that can be drawn to the surface. Cesspools and other man-made pollutants such as fuel tanks will put human health and sensitive ecosystems at heightened risk of exposure through groundwater inundation and flooding. Infrastructure such as water lines, sewer lines, and storm drains will be inundated both by the direct impact of rising oceans but also by groundwater expansion. Wastewater is being reused in some situations, but the majority of it is discarded without being utilized as a resource. More frequent tropical cyclones⁷ will only exacerbate the challenge of stormwater runoff and flooding. Climate change also adds pressure to Hawaii’s water system as storms and sea level rise threaten to inundate critical infrastructure. Planning for sea level rise can be particularly challenging since coastal infrastructure is intertwined and managed by multiple, diverse agencies. Elevating a street for sea level rise adaptation, for example, could result in the need to move utilities, shift sewer systems, and retrofit surrounding buildings.

In order to provide resiliency as the climate changes and populations grow, each aspect of the water cycle needs to be valued- stormwater, wastewater, sea water, and freshwater alike. Similar to the ancient

⁶ Habel, S., Fletcher, C.H., Anderson, T.R. et al. Sea-Level Rise Induced Multi-Mechanism Flooding and Contribution to Urban Infrastructure Failure. *Sci Rep* 10, 3796 (2020). Web. <https://doi.org/10.1038/s41598-020-60762-4>.

⁷ City and County of Honolulu Climate Change Commission. (2018) Climate Change Brief.

Ahupua`a system, each process of the watershed has a specialized, valued role, but ultimately it works as an integrated system to provide for both the needs of the community and the environment. With research showing trends of declining rainfall⁸, now is the time to adapt and prepare Hawaii's water management systems for the possibility of changes in the future. The following are impacts of climate change that will likely affect Hawaii's water supply:

- Heavy rainfall events and droughts have become more common.⁹
- The rate of warming air temperature has increased recently at a rate of 0.3°C per decade¹⁰.
- Warming air temperatures lead to heat waves and increased wildfires¹¹.
- Rapid warming at high temperatures impede precipitation¹¹.
- Warming air temperatures increase evaporation¹¹.
- Stream flow has declined already, consistent with decreases in rainfall¹².
- More frequent tropical storms are projected for the waters near Hawaii¹³.
- Sea-level rise can increase saltwater intrusion in parts of the caprock aquifer and cause the groundwater table to rise, resulting in inundation of low-lying areas and infrastructure.¹⁴

2. ONE WATER MANAGEMENT ON OAHU

For the purpose of this White Paper, 'one water management' is defined as the management of all forms of water including stormwater, wastewater, groundwater, sea water, freshwater, graywater, and recycled water. Infrastructure, including roadways, treatment plants, pumping station facilities, and distribution and collection systems are also part of Honolulu's 'one water management' system. For the City and County of Honolulu, water is managed by a network of various city agencies that are required to follow charter and ordinances, local authorities, and state and federal regulations (see Figure 1 for related City and County Departments). In addition, each agency is required to keep the public safe and provide the highest quality of service in managing assets and responding to emergency breaks, spills and service issues- all under the increasing pressures of climate change, limited budgets, and aging infrastructure. With new pressures and the weight of everyday tasks, there are very few resources remaining for resiliency planning, adapting to sea level rise, and researching innovative approaches to tackle these demands. 'One water management' must also take into consideration prioritizing public trust uses of water including 1) maintenance of waters in their natural state; 2) domestic water use of the public, particularly drinking water; 3) the exercise of Native Hawaiian traditional and customary rights; and 4) reservations of the Department of Hawaiian Home Lands (DHHL)¹⁵. 'One water management' works towards protecting groundwater that sustains the natural resources and surface flows critical to Native Hawaii traditional and customary rights.

Although Honolulu faces distinct challenges as an island community, we do have full political control of our watersheds and are fortunately not compromised by the political will of governments upstream. Within one political boundary, Honolulu can be a model for holistically managing all of our watersheds from upland forests, to urban centers, to coastal ecosystems.

⁸ Kruk, M. C., et al. (2015), On the state of knowledge of rainfall extremes in the western and northern Pacific basin, *Int. J. Climatol.*, 35(3), 321-336.

⁹ Kruk, M. C., et al. (2015), On the state of knowledge of rainfall extremes in the western and northern Pacific basin, *Int. J. Climatol.*, 35(3), 321-336.

¹⁰ Giambelluca, T.W., et al. (2008) Secular Temperature Changes in Hawaii, *Geophysical Research Letters*, 35: L12702.

¹¹ University of Hawaii Sea Grant College Program. (2014) *Climate Change Impacts in Hawaii*. A summary of climate change and its impacts to Hawaii's ecosystems and communities.

¹² Kruk, M. C., et al. (2015), On the state of knowledge of rainfall extremes in the western and northern Pacific basin, *Int. J. Climatol.*, 35(3), 321-336.

¹³ Murakami, Hi., et al. (2013) Projected increase in tropical cyclones near Hawaii. *Nature Climate Change*, v. 3, August, pp. 749-754.

¹⁴ Rotzoll, K. and C.H. Fletcher. (2013) Assessment of groundwater inundation as a consequence of sea-level rise. *Nature Climate Change*. 3:477-481.

¹⁵ Hawaii Commission on Water Resource Management. (2008) *Water Resource Protection Plan*.

CITY AND COUNTY OF HONOLULU
CHART OF BOARDS, COMMISSIONS AND COMMITTEES
FISCAL YEAR 2018

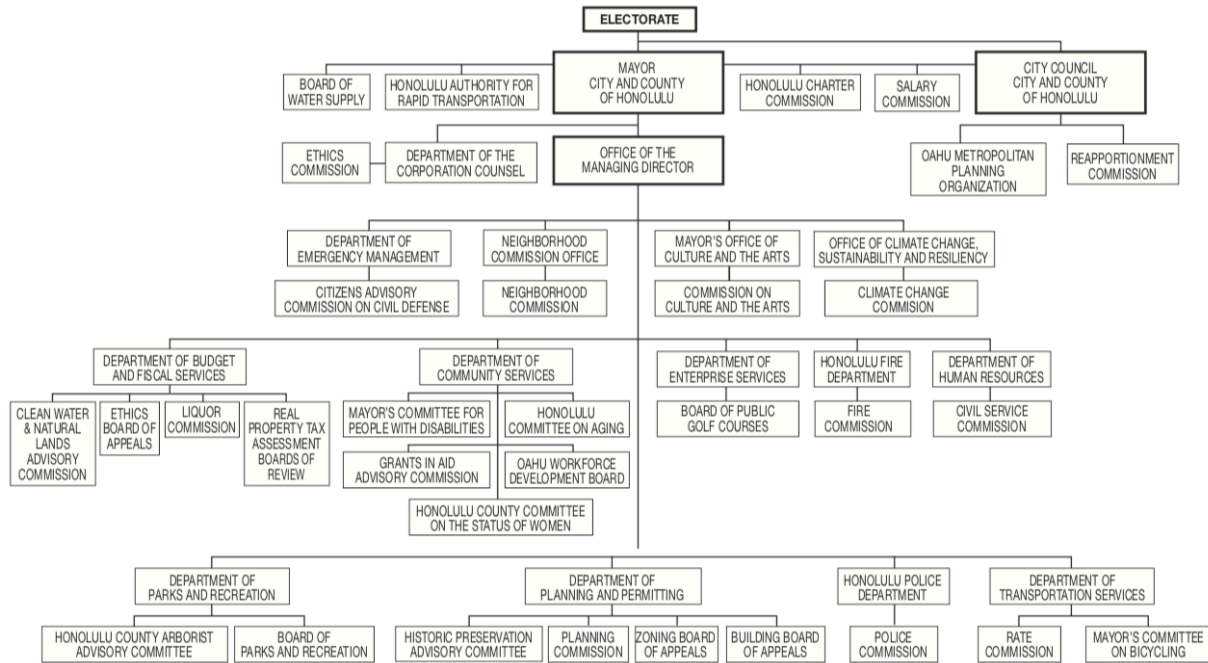


Figure 1. City and County of Honolulu Organizational Chart

2.1 Agency Roles, Rules, and Plans

In order to understand how a ‘one water’ approach to freshwater, stormwater, and wastewater management could work in Honolulu, the following sections outline the key agencies that would need to be involved. For a list of plans associated with each agency, see Appendix A. Rules and Regulations, below, highlights applicable federal, state, and city guidelines that will be referenced for multiple agencies.

UNITED STATES OF AMERICA	
Clean Water Act (CWA)	The primary federal law that protects national waters. CWA establishes the basic structure for regulating discharges of pollutants into the waters of the United States to regulate quality standards. This national act has made it unlawful to discharge any pollutant from a point source into navigable waters, unless a permit is obtained ¹⁶ .
STATE OF HAWAII	
Hawaii Administrative Rules (HAR)	Establish the guidelines, limitations and parameters for specific types of actions within the context of the Hawaii Revised Statutes. Rules are broken down into 23 different titles, each for different agencies and departments.
Hawaii Revised Statutes (HRS)	Hawaii’s written laws: amended to include revisions and repeals. The State Water Code is Chapter 174C of HRS.
CITY AND COUNTY OF HONOLULU	
Honolulu Administrative Rules	City departments and commissions have administrative rules that govern their practices and procedures. BWS and DFM, for example, have their own set of Administrative Rules.

¹⁶ “EPA”. Summary of the Clean Water Act, <https://www.epa.gov/laws-regulations/summary-clean-water-act>.

Revised Ordinances of Honolulu (ROH)	The code, or set of laws, for Honolulu and includes all ordinances of a general and permanent nature for Honolulu. Statewide, national, and international codes are incorporated into the ROH by reference. Includes the Building Code, Plumbing Code, and Water Management. Also known as 'County Code'.
Honolulu City Charter	The governing laws of the City and County of Honolulu. 2017 is the latest edition of the Honolulu City Charter. Changes and additions must be made through voting in a public election.

Table 1. Rules and Regulations

City and County of Honolulu Board of Water Supply: BWS manages Oahu’s municipal water distribution systems, providing residents with safe and dependable water services at a reasonable cost. Revenues from water sales pay for operations and maintenance costs and supplements bonds and impact fees to fund the capital improvement program (CIP). BWS is semi-autonomous and governed by a seven-member Board of Directors. In coordination with DPP and CWRM, BWS develops the Oahu Water Management Plan (OWMP), which is the County Water Use and Development Plan that is a part of the overall Hawaii Water Plan (which is overseen by Commission on Water Resource Management). The OWMP consists of 8 regional Watershed Management Plans for each of the 8 Development Plans areas for Oahu. BWS is advised by rules and regulations pursuant to the authority expressed in the Revised Charter of the City and County of Honolulu and in accordance to Chapter 91 (Administrative Procedure)¹⁷ of the Hawaii Revised Statutes¹⁸ (See Table 1). BWS must also fulfill the requirements set forth by the State Department of Health, Federal Safe Drinking Water Act, Water Use Permits regulated by CWRM, State Water Code and they must follow the set of laws prescribed by the Revised Ordinances of Honolulu¹⁹.

City and County of Honolulu Department of Environmental Services: ENV works in partnership with residents to make sure our island remains clean and safe. They are responsible for operating, maintaining, and upgrading the county wastewater systems along with managing solid waste systems for the City and County of Honolulu²⁰. A full list of ENV’s powers, duties, and functions can be found in Chapter 8 of the City Charter (see Table 1). The Revised Ordinances of Honolulu, Chapter 14, outlines requirements that ENV must follow in providing wastewater services and charging wastewater fees. ENV must carry out all of their responsibilities in compliance with the Clean Water Act and State laws instituted primarily from the Department of Health (DOH) Clean Water Branch. ENV has no shortage of regulatory requirements and are currently working on complying with a consent decree (Table 2) which requires most of their time and resources.

City and County of Honolulu Consent Decree:	On December 17, 2010 the Consent Decree, subsequently amended, was entered among the City and County of Honolulu, the United States Environmental Protection Agency, and the Hawaii Department of Health and several non-governmental organizations. The consent decree outlines a program of improvements to the wastewater collection and treatment systems owned by the City and County of Honolulu on the island of Oahu ²¹ . Annual reports are available on the City and County of Honolulu Department of Environmental Services website.
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Table 2. Honolulu Consent Decree

City and County of Honolulu Department of Planning and Permitting: DPP is responsible for the City’s long-range planning, community planning, administration and enforcement of ordinances and regulations governing development and use of land, codes pertaining to building construction, and City standards

¹⁷ Honolulu Board of Water Supply. (2010) Rules and Regulations.

¹⁸ Hawaii Revised Statutes. (2004) Title 8. Public Proceedings and Records, Chapter 91, Administrative Procedure.

¹⁹ “City and County of Honolulu.” The Revised Ordinances of Honolulu, www.honolulu.gov/ocs/roh.html.

²⁰ “City and County of Honolulu.” ENV Home, www.honolulu.gov/env/default.html.

²¹ The Department of Environmental Services. (2018) 2010 Wastewater Consent Decree.

pertaining to infrastructure requirements. DPP is organized into multiple divisions, including but not limited to the Building Division, the Land Use Permits Division, and the Planning Division. The Planning Division helps establish, promote, and implement long range planning programs and prepares the Oahu General Plan, regional Development Plans, and other special area plans, amongst others. They also review the Executive Capital Improvement Program and Budget for conformance to the General Plan and development plans. Similarly to other City departments, DPP have their own Administrative Rules and are also guided by City Charter and the Revised Ordinances of Honolulu, in particular Chapter 21: Land Use Ordinance (see Table 1). Title 20 of their Administrative Rules include the 'Rules Related to Water Quality', which set requirements for any development or redevelopment project that involves land disturbing activity that requires a building, electric, plumbing, grading, grubbing, stockpiling, or trenching permit. Their rules require all projects to incorporate best management practices (BMPs) for pollution control²².

City and County of Honolulu Department of Budget and Fiscal Services: BFS hosts the chief accounting officer of Honolulu and is responsible for the management of city funds. BFS reports to the mayor on how public funds are received and expended and they prepare the operating and capital program budgets²³.

Department of Parks and Recreation: DPR is responsible for all of the city parks across Oahu. Since parks require irrigation, DPR has the potential to use alternative water resources (rather than potable water) when available. Greywater from the showers and sinks of park bathrooms, for example, can be used for irrigation if regulations required by DOH are met.

City and County of Honolulu Department of Facility Maintenance: DFM administers maintenance programs for a variety of City and County of Honolulu facilities including storm drainage systems. The Storm Water Quality Branch resides within DFM, and their mission is to empower and provide guidance on minimizing the impacts on water quality to protect public health and the environment. The Storm Water Quality Branch must abide by Federal Law's Clean Water Act, Rules Relating to Water Quality, their National Pollutant Discharge Elimination System (NPDES) permit, Hawaii Administrative Rules, City Charter (Chapter 9), and Revised Ordinances of Honolulu (see Table 1). As for authorizations, the Mayor and City Council must approve DFM's budgets and Department of Planning and Permitting (DPP) must authorize any necessary permits. Permitting authority in Hawaii for the NPDES permit has been delegated by the EPA to Hawaii's Department of Health (see Table 3). This branch is greatly involved in reducing polluted stormwater runoff and has developed public education and outreach campaigns to educate the general public about storm water pollution.

City and County of Honolulu Department of Transportation Services: DTS is made up of four divisions: Public Transit, Traffic Engineering, Traffic Safety and Technology, and Transportation Planning. DTS is committed to a robust multi-modal transportation system, where pedestrians, bicyclists, transit riders, and motorists have safe access to Honolulu's transportation infrastructure²⁴. In addition to providing reliable transportation services, DTS designs and implements a complete streets program that aims to create an integrated network of streets for both safety and convenience.

City and County of Honolulu Department of Design and Construction: DDC is the primary agency responsible for the implementation of the City's CIP (except for HART, BWS, and ENV). They work with multiple city departments but as of a charter amendment they no longer connect with ENV. To vet

²² Wakumoto, Randall. (2017) Update on the City's Rules Relating to Water Quality, https://www.honolulu.gov/rep/site/dfm/1300_20180717_Randall_Wakumoto_GUPTF-Water_Quality_Rules.pdf.

²³ City and County of Honolulu. (2017) Revised Charter of the City and County of Honolulu 1973 (2017 Edition), https://www.honolulu.gov/rep/site/cor/Online_Charter_-_06.30.17.pdf.

²⁴ "Honolulu.gov". About DTS, <http://www.honolulu.gov/dts/aboutus.html>.

projects, DDC meets with each department individually unless projects overlap. DDC helps with the design and construction involved in elevating streets, with DTS owning and operating the streets and DFM maintaining them afterwards.

City and County of Honolulu Climate Change Commission: Honolulu’s Climate Change Commission, made up of members with expertise in climate change and the built and natural environments, was established by Oahu voters via an amendment to the City Charter in the 2016 general election. The purpose of the commission is to gather the latest science and information on climate change impacts and provide advice and recommendations to the mayor, City Council, and executive departments as they look to draft policy and plans for future climate scenarios²⁵. In 2018, Mayor Caldwell issued a Mayoral Directive on climate change and sea level rise (Directive 18-2) based on the guiding documents provided by the Honolulu Climate Change Commission.

City and County of Honolulu Office of Climate Change, Sustainability and Resiliency: The creation of OCCSR was also mandated after the 2016 general election. Directed by the City Charter, the Resilience Office tracks climate change science and potential impacts, coordinates actions and policies of departments within the City to increase community preparedness, develops resilient infrastructure, and integrates sustainable and environmental values in City plans, programs, and policies²⁶.

Hawaii Department of Land and Natural Resources: Headed by an executive Board of Land and Natural Resources (BLNR), DLNR is tasked with enhancing, protecting, conserving, and managing Hawaii’s natural, cultural, and historic resources. DLNR is responsible for managing, administering, and exercising control over public lands, water resources, ocean waters, navigable streams, coastal areas (except commercial harbors), minerals, and all interests therein²⁷. DLNR’s jurisdiction includes water resources, State lands, beaches, coastal areas, ocean water, sanctuaries, public fishing areas, recreational areas, wildlife sanctuaries, and natural area reserves.

Hawaii Department of Land and Natural Resources Commission on Water Resource Management: CWRM administers the State Water Code (created in 1987 by Hawaii State Legislature) and their mission is to protect and manage the waters of Hawaii for now and for future generations. CWRM’s decisions are guided by the State Water Code (part of the Hawaii Revised Statutes) and the Hawaii Administrative Rules. The State Water Code recognized the need for comprehensive water resource planning which resulted in the Hawaii Water Plan (see Figure 2), a five-part plan to create more inclusive water management in Hawaii. The Water Resource Protection Plan, part of the Hawaii Water Plan, is CWRM’s roadmap for planning and organizing projects²⁸. CWRM also regulates water management areas, which require existing and new source owners (except individual domestic users or rain catchment systems) to obtain a water use permit and to justify their withdrawals and uses²⁹.

²⁵ “Resilient Oahu.” About the Commission, <https://www.resilientoahu.org/about-the-commission>.

²⁶ “Resilient Oahu.” What we do, <https://www.resilientoahu.org/what-we-do>.

²⁷ “Hawaii.gov”. About DLNR, <https://dlnr.hawaii.gov/about-dlnr/>.

²⁸ “Hawaii.gov”. Commission on Water Resource Management, <https://dlnr.hawaii.gov/blog/category/news/cwrm/>.

²⁹ “Hawaii.gov”. Water Management Areas, <https://dlnr.hawaii.gov/cwrm/groundwater/gwma/>.

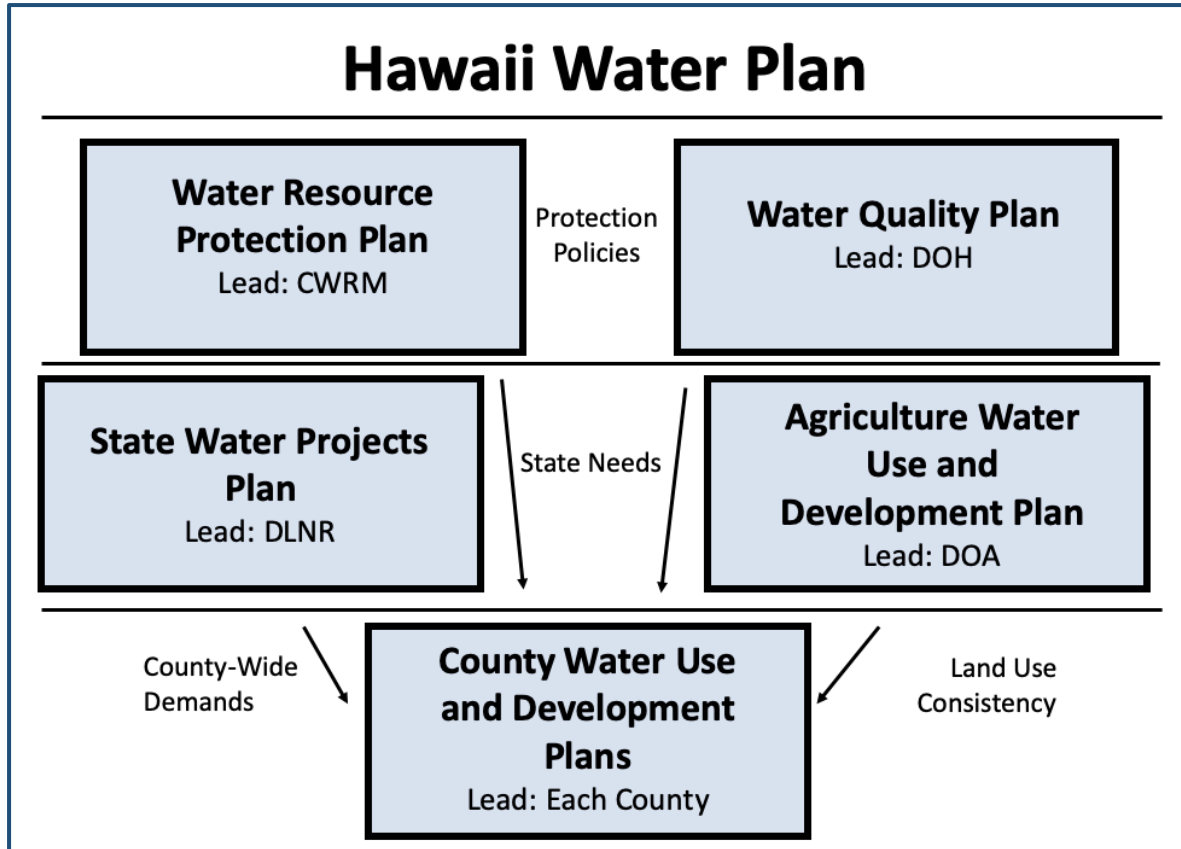


Figure 2. Hawaii Water Plan.

Hawaii Department of Land and Natural Resources Office of Conservation and Coastal Lands: OCCL is responsible for overseeing private and public lands that lie within the State Land Use Conservation District. This also includes privately and publicly zoned Conservation District lands and beach and marine lands out to seaward extent of the State’s jurisdiction³⁰.

Hawaii Department of Land and Natural Resources Division of Forestry and Wildlife: DOFAW’s mission is to responsibly manage and protect watersheds, native ecosystems, and cultural resources while facilitating partnerships, community involvement, and education³¹. DOFAW works on watershed protection, with projects including forest management and fencing to prevent ungulates.

Hawaii Department of Health (DOH): Hawaii DOH’s mission is to protect and improve the health and environment for all people in Hawaii. The Environmental Management Division of DOH, in particular, is responsible for clean air and water and managing both solid waste and wastewater. Federal Law, State Law, and Administrative Rules are the main statutory requirements guiding DOH’s decision making process. DOH is greatly involved with the practices of other agencies, for example their Clean Water Branch is responsible for stormwater and pollution prevention as the EPA delegated authority of the Hawaii’s NPDES permit (Table 3). DOH’s Wastewater Branch is also involved in recycled water, and they are responsible for developing water reuse guidance for both wastewater and gray water. With the Safe

³⁰ “Hawaii.gov”. Office of Conservation and Coastal Lands. <https://dlnr.hawaii.gov/occl/>.

³¹ “Hawaii.gov”. Division of Forestry and Wildlife, <https://dlnr.hawaii.gov/dofaw/>.

Drinking Water Branch also under the Environmental Management Division, DOH is greatly involved in all forms of water: drinking water, wastewater, and stormwater. DOH is also involved in funding, as the administrators of the Clean Water State Revolving Fund and the Drinking Water State Revolving Fund that provide low interest loans for certain systems³².

National Pollutant Discharge Elimination System (NPDES):	The NPDES permit program was created in 1972 by the Clean Water Act. NPDES permits address water pollution by regulating point sources that discharge pollutants to waters of the United States. In order to discharge pollutants through a point source, an NPDES permit is required. NPDES permits are limited to a length of 5 years but can be renewed anytime afterwards. EPA’s Pacific Southwest Region issues all NPDES permits for discharge into federal ocean waters in Hawaii while all other permits are issued by the Hawaii Department of Health ³³ .
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Table 3. NPDES Permits

Hawaii Department of Transportation: Hawaii DOT is responsible for planning, designing, constructing, operating, and maintaining State facilities and infrastructure in all modes of transportation. They work with other State, County, Federal, and private agencies and programs to achieve their goals³⁴. Since roadways are intertwined with storm drains, bridges, pipes, and culverts, DOT is heavily engaged in reducing the pollution in storm water runoff. To do this, DOT Highways Division implements a proactive Storm Water Management Program to comply with its NPDES permit for Oahu MS4 separate storm sewer systems (Table 3). Because highways, harbors, and airports cross tracks with multiple organizations, DOT is used to collaborating on projects with diverse partners. Since projects implemented by DOT need to be maintained constantly, there is limited capacity for going beyond safety and system preservation.

Hawaii Department of Agriculture: Hawaii DOA works to support, enhance, promote, and protect Hawaii’s agriculture and aquaculture industries. Because they’re responsible for developing an Agricultural Water Plan, DOA is part of the Hawaii Water Plan. With Hawaii’s goal of doubling local food production by 2030, water management (including alternative water supplies like recycled water) will be critical in ensuring that ample water resources are available.

2.2 Agency Engagement

‘One water management’ for the City and County of Honolulu consists of an intricate network of agencies working to follow rules, regulations, and plans to ultimately provide for local constituents. When thinking about water on Oahu, BWS generally comes to mind first since they are the municipal supplier and distributor of water resources. Although BWS is a critical component of supplying safe drinking water to the majority of Honolulu’s population, there are multiple forces at work ensuring that drinking water is clean, that wastewater is properly managed, that we manage our water resources effectively, and that the infrastructure supporting our water system is well managed and maintained.

³² “Hawaii.gov”. Environmental Health Administration, <http://health.hawaii.gov/about/links-to-doh-program-information/environmental-health-administration/#EMD>.

³³ “Unites States Environmental Protection Agency”. National Pollutant Discharge Elimination System (NPDES), <https://www.epa.gov/npdes>.

³⁴ “Hawaii.gov”. Department of Transportation Administration, <http://hidot.hawaii.gov/administration/about/>.

Even though each agency that's part of the elaborate 'one water management' web (who are outlined in Section 2.1) have their own goals, objectives, pressures, and budget, they are united by three common threads: they all exist to provide for the constituents of Honolulu, they are all impacted by aging infrastructure, and they are all threatened by the looming pressures of climate change and sea level rise. Additional commonalities, such as being regulated by the Hawaii Water Code or having capital improvement projects, are outlined in Table 4: Unifying Roles. To develop resiliency to pressures while serving the public and continuing daily requirements, agencies will need to build flexibility into their structures and planning to easily navigate any necessary changes. This section will go over the current status of Hawaii's water, wastewater and stormwater systems, outlining the complex network in as simplified a way as possible. Note that this is a preliminary list of local stakeholders and does not yet include every applicable organization. Chapter 4 will elaborate on a 'one water' approach that can help shift our system into one that incentivizes collaboration and leaves room for agencies to be more responsive to change.

	BWS	ENV	DFM	DPP	BFS	DTS	DDC	CWRM	DOH	DOT	DOA	Climate Change Commission	OCCSR
Serve the Public →	X	X	X	X	X	X	X	X	X	X	X	X	X
Report to Mayor →	X	X	X	X	X	X	X					X	X
Have CIP Projects →	X	X	X			X	X	X		X	X		
Manage Infrastructure →	X	X	X			X		X		X	X		
Involved in NPDES →		X	X	X			X		X	X			
Assess capacity for developers →	X	X		X			X						
Regulated by Hawaii Water Code→	X							X					
Budget reviewed by DPP→	X	X	X			X	X						

Table 4. Unifying Roles

The next figure, Honolulu One Water Management Network Diagram (Figure 3), outlines the authorities, policies and plans, external drivers, and beneficiaries of Honolulu's current water system. The diagram focuses on Board of Water Supply, Department of Facilities Maintenance, Department of Transportation Services, and Department of Environmental Services, showcasing guiding principles that connect to each agency (the Clean Water Act and the State Water Code) and plans and guidelines that are specific to each agency (Water Quality Rules, Master Plans, Stormwater Management Plan). Commission on Water Resource Management is an important piece of the diagram as well since it administers the State Water Code, and Department of Design and Construction is integral because it is in charge of designing and building capital improvement projects that help improve the City and County of Honolulu. Department of Planning and Permitting is the only agency that reviews DTS, BWS, DFM, and ENV's budgets for conformance to development plans, a high-level procedure that with some changes could provide a stop gap measure for insuring 'one water' integration and sea level rise adaptation. External drivers that unite each agency, central to this White Paper, are sea level rise, rainfall pattern changes, hazards and natural disasters, and development pressures. The diagram notes the obvious beneficiary, the public, but also

recognizes water quantity and quality as recipients since ultimately clean and ample water supplies benefit a healthy society and healthy ecosystems.

There are three key takeaways from the diagram that are impeding flexibility and collaboration in the ‘one water management’ sector:

1. Although each agency is connected by high level policies (the Clean Water Act and the Hawaii Water Code, for starters) internal planning is done independently, siloed from other agencies except for each being tied to broad development and general plans.
2. For projects such as green infrastructure that can benefit from multiple agencies being involved, there is no checkpoint to ensure that agencies are collaborating and aware of each other’s projects.
3. Reviewing projects for consistency compared to development plans happen too far along in the process to provoke meaningful changes.

For an example of the need to collaborate for the most efficient use of resources, BWS in partnership with DFM could potentially capture, reuse, and recharge stormwater, resulting in potable water conservation and reduced polluted runoff. If water conservation programs could be focused on sewer collection systems that have reached capacity, odor issues and upsizing sewer pipes could be reduced. Instituting collaboration has the potential to result in benefits beyond the initial, obvious drivers. In another example, ENV is singularly responsible for the treatment of wastewater even though various other agencies could use recycled water as a resource. By building collaboration between ENV and those who can use recycled water, multiple agencies benefit and an alternative water source is produced which helps offset wastewater disposal.

Although Honolulu’s current water and wastewater systems are sufficient at providing clean water and properly disposing of wastewater, it doesn’t incentivize collaboration or allow for the sharing of innovation and ideas between agencies. The system now also doesn’t provide a venue for agencies to work together on planning for capacity or designing capital improvement projects. When adapting to sea level rise, for example, there is no current mechanism in place for partnering and designing the elevation of streets together, connecting the various agencies who are impacted. With the current system of separately managed silos, collaboration will be a challenge unless processes are designed now to encourage and elicit teamwork and the sharing of ideas, timelines, concerns, and strategies. Chapter 4 sets the framework for altering Honolulu’s system so that it can be more flexible to the pressures that will ultimately impact every single agency.

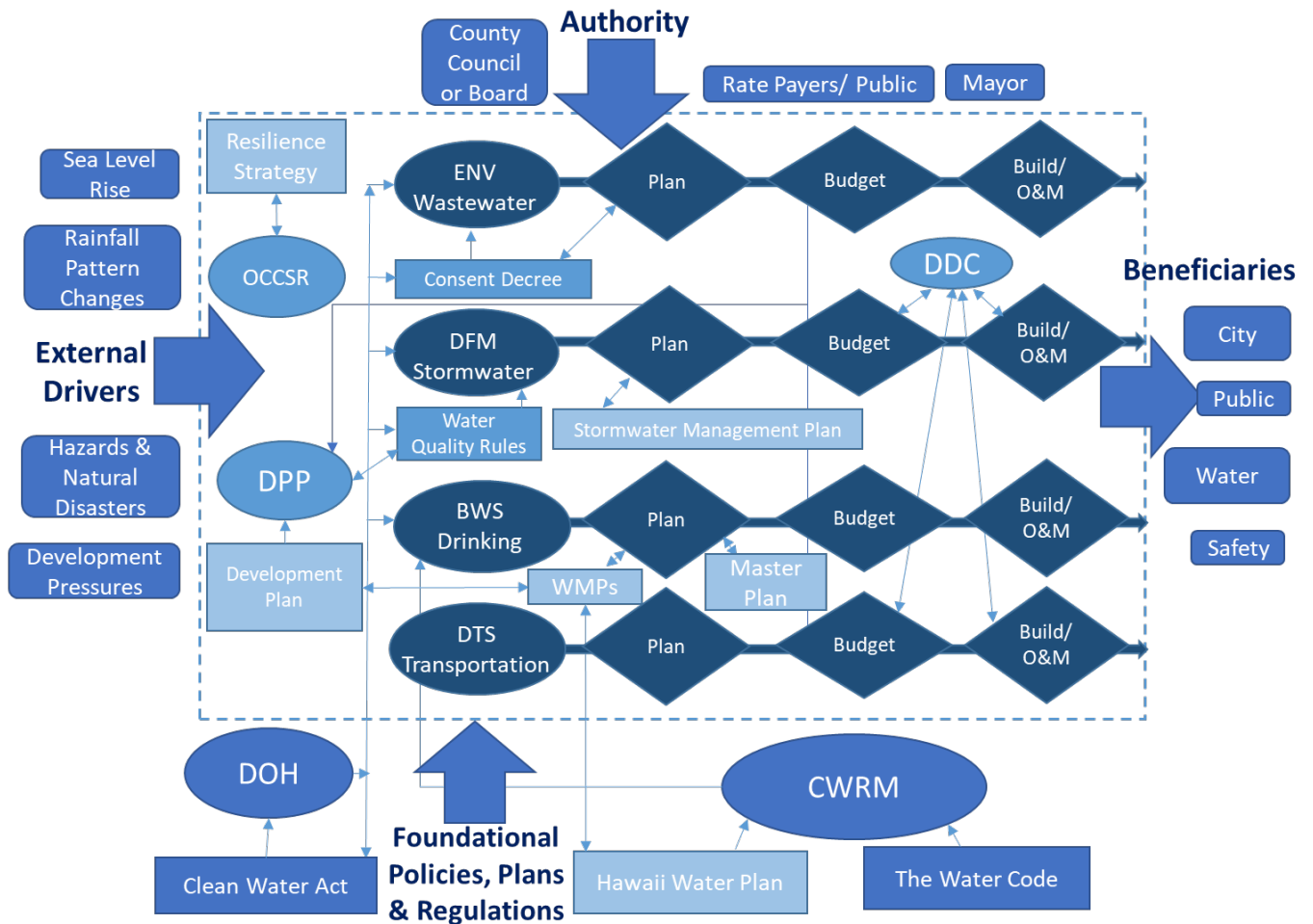


Figure 3. Honolulu One Water Management Network Diagram

3. THE ONE WATER APPROACH

Across the country, innovative leaders are implementing a ‘one water’ strategy that provides the potential to turn challenges into opportunities for advancing more sustainable, inclusive, and holistic methods of integrated water management. See Appendix B for an overview of other regions implementing ‘one water’ strategies. ‘One water’ is a comprehensive, integrated water management approach that views all water, including stormwater, graywater, wastewater, and drinking water, as resources that need to be managed sustainably. **‘One water’ seeks to manage finite water resources while taking into consideration long term resilience, reliability, and the needs of both the community and the environment.** According to the US Water Alliance, there are multiple characteristics of a ‘one water’ approach, including the following:

- All water has value.
- Achieve multiple benefits.
- Take a systems approach.
- Watershed-scale thinking and action.
- Right-sized solutions.
- Partnerships for progress.

- Inclusion and engagement of all.
- Leverage investments in water systems and resources.

Each of these characteristics was developed with the goal of building strong economies, vibrant communities, and healthy natural environments³⁵. Using green infrastructure to mitigate flooding while beautifying neighborhoods and reducing the heat island effect, promoting watershed-level planning and collaboration to address water quality issues, and implementing innovative financing and partnership models are all examples of ‘one water’ approaches that result in multiple benefits, a value of all resources, and the building of partnerships. Climate change and sea level rise have been noted as common drivers for a ‘one water’ approach since collaborating on water related projects helps generate a framework for working together on broader adaptation projects, such as shoreline erosion, elevating streets and infrastructure, and flood risk reduction. Reliability is also a key driver of ‘one water’ since safe and reliable access to water resources is critical for healthy communities. As integrated water management grows in popularity, leaders across the US are being recognized for their innovative programs related to ‘one water’. The following table highlights recognized ‘one water’ initiatives that have excelled at building collaboration and appreciating the value of all water resources.

Location	Leader	Initiative
Los Angeles, California	Mayor Eric Garcetti	LA will recycle 100% of wastewater towards water supplies by 2035.
Houston, Texas	Mayor Sylvester Turner	A city-wide incentive program will encourage the spread of green infrastructure for stormwater management. Incentives include property tax abatements and increased permitting process certainty and speed.
San Francisco, California	Mayor London Breed	Expanded access to drink tap stations to provide locals with access to free, high-quality tap water.
Burlington, Vermont	Mayor Miro Weinberger	Developed a 7-point Clean Water Resiliency Plan to upgrade wastewater and stormwater infrastructure.
New York, New York	Mayor Bill de Blasio	Announced a \$10 billion climate-focused infrastructure plan to protect New York from rising seas.
San Jose, California	Mayor San Liccardo	Goal to recycle or beneficially reuse 100% of wastewater by 2022. Part of San Jose’s Green Vision.
Fort Wayne, Texas	Mayor Tom Henry	Announced \$100 million to be invested in city neighborhoods for water, sewer, and stormwater improvements in 2019.

Table 5. Accolades for Water, Wastewater, and Stormwater

4. THE FRAMEWORK FOR ONE WATER IN HAWAII

4.1 Existing One Water Foundation

³⁵ US Water Alliance. (2016) One Water Roadmap.

In the past few years there have been organized efforts to increase water security, build collaboration around water issues, and value all forms of water in Hawaii. The Hawaii Fresh Water Initiative (FWI), for example, was launched in 2013 to bring multiple organizations together to increase water security in the Hawaiian Islands. The initiative has resulted in a statewide goal to increase water security by 100 million gallons a day by 2030 through water conservation, reuse, and recharge³⁶. The Fresh Water Initiative not only serves as a guide for valuing drinking water, stormwater, and recycled water, it also acts as a catalyst for bringing together statewide leaders towards a similar cause.

Another example of holistic water management in place is the Hawaii Water Plan, a comprehensive plan for guiding the development and implementation of water related policies. The Hawaii Water Plan is comprised of a Water Resource Protection Plan, a Water Quality Plan, a State Water Projects Plan, an Agricultural Water Use and Development Plan, and County Water Use and Development Plans³⁷. Overall objectives for the Hawaii Water Plan include ensuring water quality, the conservation of resources, and the reasonable and beneficial use of water. The Hawaii Water Plan fosters collaboration between state and county agencies and is updated regularly to best focus on the challenges facing water resources across the state.

The recently established City and County of Honolulu Office of Climate Change, Sustainability and Resiliency is also a proponent of holistic water management and ‘one water’ is directly referenced in the 2019 Ola: Oahu Resilience Strategy. Action 28 of the strategy, ‘Chart a Climate Resilient Future by Creating and Implementing a Climate Adaptation Strategy’ describes the importance of expanding opportunities in capture, recharge, and reuse and implementing green infrastructure and sustainable building designs³⁸. The strategy stresses the importance of long-term water and utility infrastructure planning to prepare for the impacts of sea level rise and flooding.

Hawaii has also been progressing on amplifying the use of stormwater and wastewater. In 2018 a Water Reuse Task Force was organized that brought together diverse stakeholders to discuss how to increase alternative water supplies by scaling water reuse. Multiple strategies resulted from this working group including demonstration projects that will help show both developers and the public that reusing water can be safe and feasible. Act 42 in 2015 demonstrates progress for stormwater and infrastructure since it gives counties the power to establish and charge user fees to create and maintain stormwater management systems. This act was specifically designed to mollify the impacts that land use changes have including the increased amount of rain ending up as storm runoff instead of replenishing Hawaii’s aquifers.

Although there has been progress, there is still ample pressure to reconfigure our freshwater, stormwater, and wastewater management systems. Act 125, for example, requires all cesspools in the state to be converted to more sustainable methods by 2050. NPDES permits are another reason to rethink the value of stormwater since they control the amount of discharge allowed in federal waters. Injection wells have also been brought to attention lately with legal cases arguing that they impact coastal ecosystems and coral reefs. Adapting to sea level rise will also greatly benefit from system restructuring since it has cascading impacts throughout City agencies and elevating streets and utilities will require unprecedented collaboration. These challenges make this the perfect time to re-envision the way our freshwater, wastewater, and stormwater systems are managed.

³⁶ Hawaii Community Foundation. (2016) A Blueprint for Action, Water Security for an Uncertain Future.

³⁷ “Hawaii.gov”. Hawaii Water Plan, <http://dlnr.hawaii.gov/cwrm/planning/hiwaterplan/>.

³⁸ City and County of Honolulu Office of Climate Change, Sustainability and Resiliency. (2019) Ola: Oahu Resilience Strategy.

4.2 Goals and Objectives

Since Oahu is an island with limited resources, a ‘One Water Collaboration Framework’ can help lead to enhanced resilience and efficiencies so that water resources can be abundant now while still being preserved for future generations. Nationally, ‘one water’ frameworks are building traction as other utilities are recognizing the challenges of climate change, catastrophic weather events, aging infrastructure, water shortages, and degrading water quality³⁹. By instituting ‘one water’ principles, utilities are realizing more regulatory flexibility and opportunities, which helps increase coordination among agencies and departments.

Specifically for Honolulu, discussions have been held with key stakeholders to set the foundation and direction of a ‘one water’ collaboration framework. Since every geography has its own unique challenges, ‘one water’ blueprints are helpful guidance but ultimately the stakeholders engaged in day to day water processes are key to defining the next steps for developing a ‘one water’ collaboration framework. After a series of interviews with agencies- ranging from the Department of Planning and Permitting to the Department of Transportation Services- the following goals and objectives were determined that will act as a starting point for incorporating ‘one water’.

Goals:	1. Fit for purpose use: value all water in the natural and built environment, utilize fresh, wastewater and stormwater resources for their best use, and preserve water’s quality and quantity.
	2. Increase climate resilience and adaptation for freshwater, stormwater, and wastewater systems including the delivery and collection systems involved.
	3. Find efficiencies to partner on projects for the tax payer/rate-payer benefit, taking advantage of co-benefits, overlapping goals, and limited funding.
Objectives:	1. Establish the authority and develop processes that help enable collaboration on the goals listed above.
	2. Identify pilot projects to demonstrate the multiple benefits of ‘one water’ practices.
	3. Consistent messaging with the public and developers around stormwater, wastewater, and fresh water.

Table 5. ‘One Water’ Goals and Objectives

4.3 Incentives and Benefits

There are multiple benefits to challenging the current water, wastewater and stormwater systems and instituting a ‘one water’ approach that values and integrates all water, increases resiliency and adaptation, and finds efficiencies in project planning. It’s important to first note that this White Paper recognizes that not all department activities will benefit from additional collaboration. Core operation and maintenance activities are critical to a functioning society and are best left to individual departments to handle, but it should be noted that sea level rise will make operations and maintenance more challenging and resiliency planning should be considered for these functions as well. Each department needs to be able to make unilateral decisions and have the autonomy to respond quickly to leaks, spills, or other complications as quickly and efficiently as possible. This being said, there are unrealized benefits from collaboration when planning for capacity and capital improvements.

³⁹ Water Research Foundation. (2017) Blueprint for One Water.

The topics that would benefit most from further collaboration are the ones with the most overlap between multiple departments, and result in numerous co-benefits between stakeholders, include the following:

- Raising infrastructure in the face of rising seas
- Modernizing water, stormwater, and wastewater systems
- Improving water conservation in areas with limited water, wastewater, and stormwater collection capacities
- Slowing down stormwater
- Utilizing ‘streetsheds’ to catch and retain water
- Offsetting disposal and runoff into our oceans through water recycling
- Responding to emergencies
- Renewable energy systems (PV, Co-Gen, Hydro, etc.)
- Integration with agriculture
- Engaging the public
- Collaborating with business, industry, and developers

Given the reality of each city department’s workload and regulatory framework, the benefits and incentives of collaboration need to be strong enough to be worth the additional time and the release of complete control. Potential benefits of a ‘one water’ collaboration framework, based on the current status of Honolulu’s water related systems and discussions with stakeholders, are outlined in Table 7. To realize these benefits, Section 4.3 outlines a process that could help tweak Honolulu’s water, wastewater and stormwater management systems into one that considers a more holistic, ‘one water’ approach. It should be noted that starting small with early actions, then gradually building on that progress is the best way to institute a more integrated, ‘one water’ approach. Not all projects and objectives have the same urgency, so working together to sequence them is another approach that’s been found effective in other areas. Adaptive planning, or long-term planning promoting flexible decision making, can be a useful tactic to include future climatic projections, economic development, and infrastructure capacities in planning processes. By understanding both capacity and challenges, entities can find common ground to overcome challenges and realize the benefits of a ‘one water’ approach.

Benefits	1. Leverage funds to enable projects that couldn’t be completed within a single entity.
	2. Enhanced relationships to be able to work together quickly during disasters and emergency response.
	3. Foster understanding of each utility’s working reality to be able to identify overlapping responsibilities.
	4. Alignment of messaging to shared authorities including the Mayor, City Council and the public.
	5. Protecting and efficiently using water resources by utilizing recycled water and stormwater capture and reuse.
	6. Developing a joint response to developers asking about capacity to ensure responsibility when authorizing future developments. Encourage coordinated master planning.

	<p>7. Developing a place to discuss challenges and first steps in how to adapt to sea level rise and build more resiliency into infrastructure across water, wastewater, and stormwater sectors.</p>
	<p>8. The potential to identify target geographic regions to work collaboratively for sea level rise and resource recovery (through wastewater reuse or stormwater capture, for example).</p>

Table 6. 'One Water' Benefits

4.3 One Water Integration and Actions

To realize the benefits listed in Section 4.2 and to institute a 'one water' management framework, Figure 4 highlights the changes that need to be addressed in relation to Figure 3 in Chapter 2. In this revised approach, the yellow box represents the enhancement of a One Water Panel that reviews the potential for collaboration at the planning, budget, and building points of the process. The exact mechanisms for integrating 'one water' into the current workflow can be further vetted but coordination needs to happen internally to planning, budgeting, and building processes rather than externally through connections to broader plans and regulations.

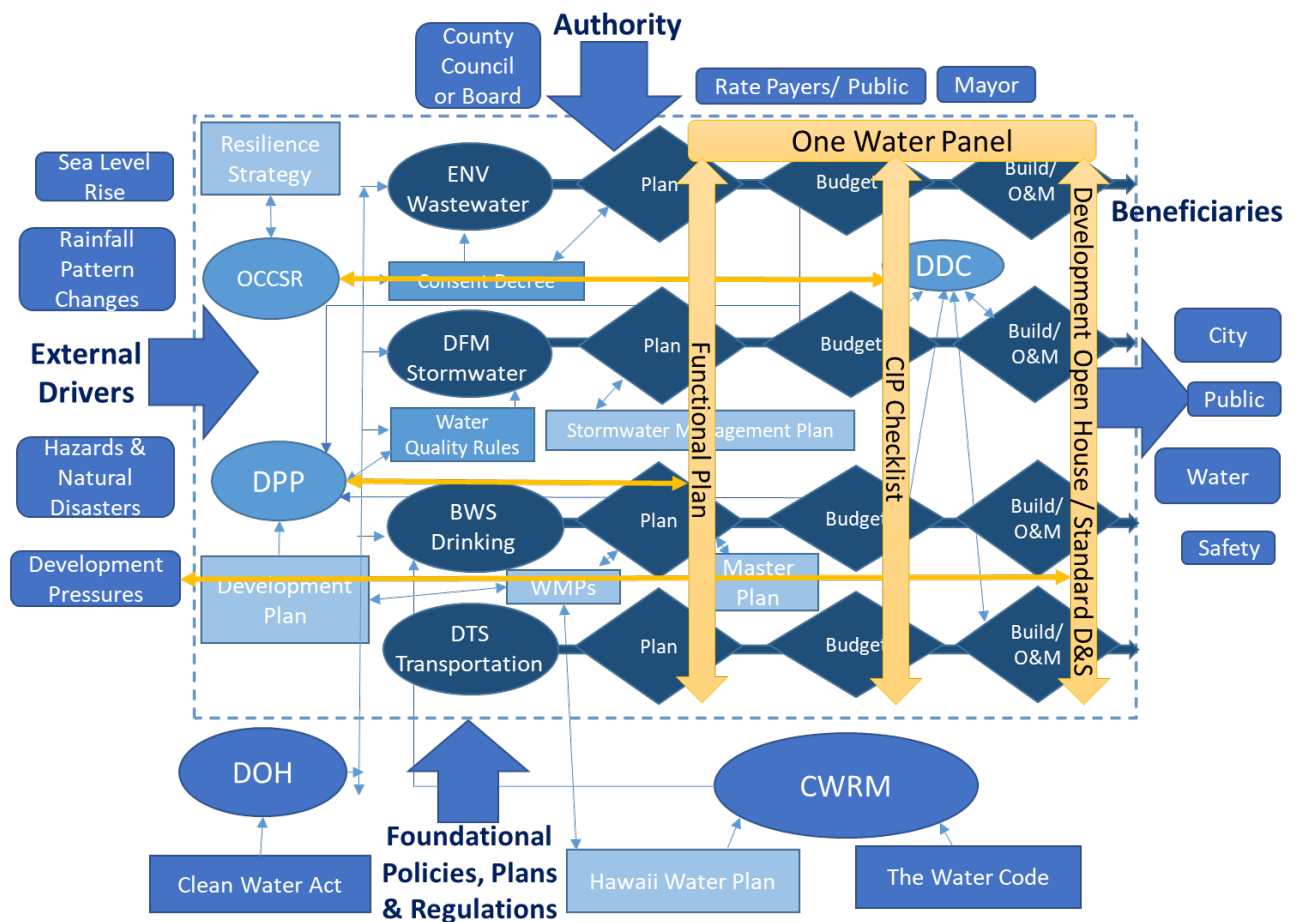


Figure 4. Honolulu One Water Management Network Diagram: Revised

To institute changes to our water, wastewater and stormwater management system and to reach the goals and objectives outlined in this White Paper, an authority on ‘one water’ must be established. In addition, identifying how a ‘One Water Collaboration Framework’ is led and what processes are needed to enable collaboration must be addressed. Based on interviews and an understanding of the reality of constrained resources, the proposed approach is to start small, working within the current system to find opportunities to enhance work rather than restructure or establish new entities. As collaborative projects and programs mature, there will be a need for more robust mechanisms such as expanding the ‘one water’ effort by involving State agencies and NGOs and other relevant stakeholders. Right now, the focus of this White Paper is to utilize the strengths of ‘one water’ to enhance current City processes as quickly as possible given the imminent pressures facing our infrastructure and resources. The following are authority and leadership actions that could lead to the institution of a One Water Collaboration Framework in the City and County of Honolulu.

❖ **ACTION 1 [AUTHORITY]: Issue a ‘One Water Collaboration Framework Ordinance’**

As outlined previously, the Mayor is the unifying authority for departments and entities involved in ‘one water’. Through the support of Mayor Caldwell, a ‘One Water Collaboration Framework Ordinance’ is needed to institutionalize the implementation of the 2018 Climate Change and Sea Level Rise Directive. The ‘one water’ approach aims to ensure the development of a system that is adaptive to future climatic threats. The ordinance should include guidelines for incorporating ‘one water’ in functional planning, CIP management, and developer coordination which will help Honolulu continue to be a leader in climate change preparedness and resiliency and enhance our leadership in ‘one water management’. A ‘One Water Collaboration Framework Ordinance’ will help prioritize ‘one water management’ initiatives while guiding the collaboration between separate but connected entities.

❖ **ACTION 2 [AUTHORITY]: Develop interagency Memorandum of Understanding**

In addition to the authority of the Mayor, agencies involved in ‘one water’ would need a working agreement for interagency collaboration for research and monitoring, policies and procedures, plans and programs, regulations and design standards, capital improvements, budgeting and shared and supplemental funding opportunities. A Memorandum of Understanding should be sufficient to enable collaborative implementation of specific ‘one water’ priorities to mitigate impacts to infrastructure and facilities subject to climate change, sea level rise exposure, coastal erosion, storm surge, drought and flooding.

❖ **ACTION 3 [LEADERSHIP]: Establish a One Water Panel to consult on City projects and programs, private development infrastructure master plans, and updating building codes and design standards as needed**

“If you want to go fast, go alone. If you want to go far, go together” (African Proverb). A One Water Panel similar to the collaboration established in the City’s Complete Streets Ordinance Section 14-33, ROH, requires infrastructure and planning agencies to work together to address the generational challenge of climate change. No one agency can solve this challenge alone. Collaboration toward common objectives builds climate resilience into integrated plans and capital programs. This strategy is cost effective in the long run and results in identifying and leveraging cross-sector benefits and funding for comprehensive projects. A One Water Panel should include the Office of Climate Change, Sustainability and Resiliency, Department of Design and Construction, Department of Environmental Services, Department of Facility Maintenance, Department of Parks and Recreation, Department of Planning and Permitting, Department of Transportation Services, and Board of Water Supply.

A critical question in developing a One Water Collaboration Framework is who will be leading the effort. From a planning perspective someone will have to schedule and organize meetings, facilitate the agenda, and layout the process. 'One water' leadership may require further discussions, but an option to start is to establish a One Water Panel to consult on mutually beneficial projects, programs, and plans such as elevating streets and utilities or assessing areas for managed retreat. A One Water Panel could be an ideal venue for the discussion of building code and design standard changes that are needed as external pressures arise. The Panel could also review private development infrastructure master plans for potential climate change or sea level rise adaptation measures or the inclusion of 'one water' practices. Planning duties could rotate each year through the various agencies involved. Alternatively, a neutral office or entity such as OCCSR or DPP could assume the facilitation role.

While authority and leadership should naturally cultivate the necessary process changes, there are a few proposed process enhancements that have already been identified through the development of this White Paper. These should be vetted further with the respective agencies and incorporated into a Mayor's ordinance as appropriate. As depicted in Figure 4 the coordination to enable 'one water' needs to happen internally to the planning, budget, and implementation processes of each utility. The panel should meet regularly, perhaps monthly, with actions tied to annual budget cycles. Currently, connections occur externally through longer term planning processes that are on different time scales than the year to year program and project priorities. It is important to make space for 'one water' within the process. The following outlines process actions within planning and budgeting that could enhance collaboration.

❖ **Action 4 [PROCESS]: Establish a 'one water' component in the broader planning framework**

Since 'one water' is already incorporated in Oahu's Watershed Management Plans (OWMP), they can act as an example for incorporating 'one water' in all master plans, including general plans and development and sustainable communities plans. OWMPs provide short, mid, and long-range guidance for the sustainable management and use of Oahu's surface and ground water resources. These plans are designed for the entire watershed, from mountain ridges to reefs, and OWMPs are adopted by Ordinance and provide guidance to agencies on 'one water' projects and programs that could be funded by CIPs or operating budgets. Chapter 30, ROH requires the Watershed Management Plan updates be in tandem' and consistent with development and sustainable communities plan updates.

Another avenue for establishing 'one water' concepts in planning is through agency infrastructure Functional Plans. BWS has completed its functional plan in 2016 called the Water Master Plan that includes future water demands and supplies, water quality regulations and treatment, facility condition assessments, capacity expansion and implementation. The Water Master Plan provides the foundation for the 30-year Capital Improvement Plan and water rates and impact fees for funding. BWS with the help of the Water Research Foundation has completed a climate change risk and vulnerability assessment that identifies and mitigates impacts from climate change, sea level rise and coastal erosion. ENV has completed its Facilities Plans for wastewater collection systems and treatment plants with similar components.

The Functional Plans are required by the 2016 City Charter Amendments for DFM, DTS, ENV, and DPR and are intended as long-range plans that should provide condition and capacity assessments, priorities, the phasing of infrastructure and facilities development, and funding strategies to secure financing in alignment with the Development Plans and the City's proposed Climate Adaptation Plan,

as set forth in Ola, Oahu's Resilience Strategy. Since most of the functional plans are at the preliminary stages of being developed, this is the ideal time to require the incorporation of 'one water' practices and climate change and SLR adaptation and resilience within them. With funding limitations, the development of these plans can be challenging for the agencies involved so with this requirement it is advised that funding is also attributed to assist in their development.

❖ **Action 5 [PROCESS]: Coordinating on budgets and CIP checklist for 'one water' climate resiliency**

BWS in its study on climate change impacts, developed a sea level rise adaptation strategy of strategic actions (a climate resilience check list) for a 2100 timescale that anticipates nuisance flooding by mid-century and 3.2 feet or higher of sea level rise by 2100. The check list of components includes research and monitoring, policies and regulations, financing, planning and engineering feasibility studies, public outreach, design and construction for adaptation. This climate resilience check list provides a concrete starting point for 'one water' collaboration. Examples for coordination include a tidal groundwater well monitoring network, incorporating sea level rise exposure areas into special management area districts, updating Flood Insurance Rate Maps with sea level rise, developing resilient building codes and design standards, federal funding assistance, tax incentives for private development adaptation, sea level rise improvement district fees, infrastructure risk and vulnerability assessments, prioritization criteria for inundation and repetitive loss areas, hardening coastal infrastructure, stormwater management plans including sea level rise, determining how high to elevate streets, strategies for managed retreat, consistent climate targets and messaging and phased design and construction.

DPP (by City Charter) is responsible for reviewing the executive operating and capital program and budgets and the BWS 6-year CIP for conformance to the purposes of the general and development plans. DPP has the authority and could engage with the One Water Panel early on in the annual budget process to ensure progress and alignment of the infrastructure agencies efforts with the climate resilience check list.

This 'consistency review' could also be strengthened further and used as a stop gap measure should the proposed priorities not be addressed. The 'one water' collaboration budget package would have a stronger position to obtain necessary budget approvals from the City Council.

Miami-Dade County has incorporated climate and energy performance criteria into their CIP guidelines, ensuring that both new constructions and minor building repairs follow rules that take into consideration the project's environmental impacts. By developing a systematic approach to their review structure, Miami-Dade's capital improvement projects are more likely to improve the quality and performance of the county's infrastructure and advance long-term goals. Miami-Dade has led the way on incorporating climate and energy into CIP planning, providing a strong example for Honolulu to integrate 'one water' concepts in a similar manner.

❖ **Action 6 [PROCESS]: Develop a coordinating mechanism around developers seeking information about capacity and resilience**

This action proposes the creation of an optional 'project open house' for developers, should they so choose, to collectively meet with 'one water' departments (ENV, BWS, DFM, DDC, DPP) to assess capacity, resiliency planning, and the feasibility of new projects. Utilities are frequently approached by developers interested in understanding the capacity of water, wastewater, drainage and street infrastructure for their future development plans. Developers are directly involved with elevating

buildings and preparing freshwater, wastewater, and stormwater systems for the impacts of sea level rise, and a coordinating mechanism would allow them to be included in any innovative planning efforts. Consultations can result in the adjustment of designs and system changes based on available capacity. It is typically the responsibility of developers to fund any system upgrades or changes that result from these meetings. During negotiations with developers is the perfect opportunity to consider 'one water' priorities including low impact development, green infrastructure, rainwater catchment, sea level rise, and water reuse. ENV, BWS and DFM could work together to require the developer to include 'one water' priorities to be able to receive water and wastewater services at their new development. While standard design details are typically how the requirements are communicated to developments, a discussion would allow direct feedback, prevent misinterpretations and allow for creativity. This action could be coordinated with the One Water Panel for scheduling the optional open house.

❖ **Action 7 [IMPLEMENTATION]: Identify and implement One Water demonstration project(s)**

Demonstration projects are ideal for showcasing innovative ideas, especially when proving the safety and efficiency of new technologies. 'One water' demonstration projects have the added bonus of bringing together multiple agencies to design and implement, helping establish collaboration in one water management. A few potential 'one water' projects that showcase a more integrated water system include the following:

- **Ala Wai Stormwater Management Plan:** Stormwater management along the Ala Wai has the potential for multiple demonstration projects related to 'one water'. Stormwater capture, recharge, and reuse could all be established resulting in more sustainable resource management, flood reduction, and awareness of the efficacy of integrated approaches. Collaboration will be integral as well and this project could serve as an example of agencies working together to overcome the challenges of sea level rise.
- **Mapunapuna Sea Level Rise Adaptation:** The areas along Kilihau, Ahua and Kakoi Streets experience storm related flooding but also dry-day high-tide flooding. King tides are especially deep, causing Hawaii Police Department to close intersections for safety purposes and businesses to temporarily close due to on-property flooding. Certain sections are also sinking as sea level rises. Backflow preventers on drain outlets temporarily mitigate the flooding, but it will only get worse because of groundwater inundation adding to marine inundation. Strategies for elevation or managed retreat are needed in this area and a demonstration project could explore adaptive options and costs for consideration.
- **University Avenue Complete Streets:** The Department of Transportation Services designs and implements complete streets, or integrated street networks that enhance both safety and convenience. A complete street project at University Avenue could implement the integrated strategies of complete streets while also including 'streetsheds' along the mauka to makai corridor. Streetsheds proactively manage stormwater (utilizing green infrastructure and low impact development), resulting in increased water recharge, enhanced water quality, and the reduction of flooding. For maintenance, schools and universities could be involved to increase the education potential of the project.
- **Cesspool Conversions:** Hawaii is currently considering the options for cesspool conversions through a Cesspool Conversion Working Group. Cesspool conversions connect to water quality, wastewater management, freshwater protection and non-point source pollution management. Taking a 'one water' approach for cesspool conversions could unlock multi-benefit solutions and could help identify much needed resources to fund the conversion process.

- **Ewa Water Reuse:** Recycled water provides an alternative water source to preserve drinking water for domestic uses and to reduce wastewater disposal into the ocean. Ewa has the potential to expand R-1 recycled water beyond the existing service areas for irrigation and demineralized RO recycled water for power plants and refineries. Demonstration projects are critical for expanding water reuse since they help showcase its safety and reliability. Water reuse is an ideal example of ‘fit for use’, or matching water quality with the best application. New government buildings can be designed with dual plumbing for flushing toilets. The BWS proposed Kapolei base yard and the ENV Honouliuli WWTP secondary treatment expansion are possible candidates for on-site reuse demonstration.
- **Waihee Loi Restoration and Riparian Learning Center.** ‘One water’ collaboration can be applied to natural resource restoration projects. BWS and Parks and Recreation (DPR) are interested in managing their watershed lands in Waihee mauka by establishing a community based farm to restore historic lo’i kalo and auwai to promote sustainable agriculture, watershed protection, forest restoration, and managing hiking access, with a traditional meeting hale for agricultural activities and cultural and educational programs. Through a request for proposals, the BWS and DPR plan to select and award a qualified non-profit community group to restore and operate the Waihe’e Lo’i Restoration and Riparian Learning Center on a long-term agreement. Lessons learned will inform community restoration initiatives in other valleys that the City could collaborate on to advance natural resources restoration while balancing managed recreational access.

5. CONCLUSION

In order to develop freshwater, stormwater, and wastewater systems in Honolulu that are flexible to the external pressures of climate change and sea level rise, this White Paper proposes the issuance of a ‘One Water Collaboration Framework Ordinance’ to accompany the 2018 Climate Change Directive issued by Mayor Caldwell. With rainfall patterns and groundwater levels in decline and salt water intrusion impacting coastal infrastructure, external pressures are already being observed and projections show that these impacts will only intensify as climate change persists. ‘One water’ provides the potential to turn these challenges into opportunities for advancing more sustainable, inclusive, and holistic methods of ‘one water management’. As an island community, Honolulu faces unique challenges but is fortunate to have complete control of local watersheds without politics upstream compromising the value of our water resources. ‘One water’ is considered a comprehensive, integrated approach to ‘one water management’ that recognizes the value and finiteness of all water, seeks to achieve multiple benefits, takes a systems approach, understands the needs of both the community and the environment, promotes partnerships and collaboration, and works upon watershed-scale thinking while including and engaging everyone. Honolulu is already at the forefront of climate change planning and the actions proposed in this White Paper will further excel Honolulu as a global leader in resiliency and adaptation planning.

Since climate change and sea level rise will ultimately threaten each agency involved in ‘one water’ management, with impacts varying in magnitude, developing a system that is flexible to external pressures will be critical to ensuring resiliency and adaptation. Although Honolulu’s water, stormwater, and wastewater systems are sufficient at providing adequate levels of services and meeting the individual goals and tasks currently prescribed for each agency, it is not designed to elicit collaboration or share innovative ideas or projects. The current system of planning, budgeting, and building is only reviewed for consistency with development plans once, in the budgeting stage, which is too far along in the process and too isolated to result in any recommended changes. Although key agencies like ENV, DFM, and BWS are impacted by the same external drivers (sea level rise, rainfall pattern changes, natural disasters, and

development pressures), there are no mechanisms in place for collaborating on solutions that would pacify these pressures. As sea level rise threatens utilities and roadways alike, collaboration will be critical in the future to redesigning Honolulu to adapt to these changes. By instituting a One Water Collaboration Framework, Honolulu can find efficiencies to partner on projects for tax and rate-payer benefit, taking advantage of overlapping goals, while increasing climate resilience and adaptation and developing alternative water supplies along the way. Through identifying overlapping responsibilities, collaboration between entities could result in increased projects in groundwater recharge, stormwater and wastewater reuse, water conservation, emergency response planning, adaptation, public engagement, and best management practices such as green infrastructure.

To introduce 'one water' to Honolulu's water, wastewater and stormwater management system, a One Water Panel should be developed to advocate and check for collaboration opportunities during the planning, budgeting, and building steps of the current process. This panel could also review private development infrastructure master plans for resiliency, adaptation, and innovation and collaboratively review applicable codes, standards, and development regulations for any applicable updates. Included in this checklist could be ensuring 'fit for use', or making sure that the correct type of water is being used for its appropriate purpose. With the Revised Charter of Honolulu requiring the incorporation of functional plans for DFM, DTS, ENV, and DPR, along with BWS, connecting these to 'one water' and including them in the review process is one possible approach for instilling collaboration and informing one another of current projects. The budget and building stages are also potential review points, and a 'development open house' at the building/ operation and maintenance stage would allow developers to be included and multi-agency cooperation on capacity vetting to exist.

In addition to the One Water Panel, there are other approaches that would help institute 'one water' in Honolulu's freshwater, stormwater, and wastewater management. The recommendations provided by this White Paper include creating an MOU or interagency agreement around specific 'one water' priorities, including 'one water' in broader planning frameworks, and developing a coordinated mechanism around developers seeking information and capacity. Incentivizing collaboration would also help bring agencies together when designing solutions to complex external challenges. These suggestions should be vetted further with stakeholders involved in the process and then revised as necessary.

In order to initiate the 'one water' approach and to officially institute it as part of the City and County of Honolulu, **this White Paper strongly recommends a formal 'One Water Collaboration Framework Ordinance' building upon the momentum of the 2018 Climate Change Directive that outlines 'one water' process enhancements.** This ordinance can help better define the priorities of 'one water' management and help guide collaborative actions between groups of separate but connected entities. 'One water' will ultimately help transform our current water, stormwater and wastewater infrastructure systems into one that embraces collaboration while cooperatively preparing for the unforgiving impacts of climate change and sea level rise. Mayors across the United States are receiving accolades in one water management for instituting 'one water' practices, using innovation to offset wastewater disposal, and incorporating aesthetically pleasing green infrastructure in stormwater management practices. The concepts outlined in this White Paper provide tangible concepts that will help transform the objectives of the 2018 Climate Change Directive into action. By following the nationally acclaimed 'one water' method, Honolulu will simultaneously become a leader in natural resource management and resource recovery while adapting to sea level rise and climate change.

APPENDIX A: Agencies and Related Planning Documents

Agency	Planning Documents
City and County of Honolulu Board of Water Supply	<p><i>Oahu Water Use and Development Plan, 1990:</i> Sets forth the allocation of water to land use through the development of policies and strategies to guide the County in its planning, management, and development of water resources to meet projected demands.</p>
	<p><i>Watershed Management Plans:</i> Regional watershed management plans that will comprise the Oahu Watershed Management Plan. These plans will be used to meet the requirements of preparing a county water use and development plan under the State of Hawaii Water Code and City and County of Honolulu ordinance. Provides guidance to agencies on ‘one water’ projects and programs that could be funded in their CIP and operating budgets.</p>
	<p><i>BWS Water Master Plan, 2016:</i> Establishes a 30-year infrastructure plan for the island wide water system to meet the commitment of the BWS employees to deliver safe, dependable, and affordable water, now and into the future. Acts as a functional plan for water. Formulates recommendations, including consistency with watershed management plans and development of strategies to ensure long-term sustainability in the face of growth, climate change, and other challenges. Identifies and prioritizes Capital Improvement Program projects and establishes the long-range financial plan for supporting revenues and investments.</p>
	<p><i>BWS and Water Research Foundation’s Impacts of Climate Change on Honolulu Water Supplies and Planning Strategies for Mitigation.</i> A vulnerability assessment to identify and adapt to climate change risks to: (1) fresh water supply from forecasted temperature increases and reduction in precipitation, (2) groundwater quality from salt water 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 3.2 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.</p>
City and County of Honolulu Department of Environmental Services	<p><i>North Shore Regional Wastewater Alternatives Plan, 2012:</i> Evaluates alternatives for wastewater collection, treatment, and disposal for the North Shore.</p>
City and County of Honolulu Department of Facility Maintenance	<p><i>Storm Water Management Plan, 2016:</i> Designed to address the requirements of the NPDES Permit and reduce the discharge of pollutants to and from its MS4 to protect water quality and to satisfy the appropriate water quality requirements of the Clean Water Act.</p>
City and County of Honolulu	<p><i>Development Plans:</i> These eight regional plans provide the vision and implementing policies and guidelines for each of the areas. They guide City land</p>

Department of Planning and Permitting	use approvals and infrastructure improvements and private sector investment decisions.
	Storm Water BMP Guide, 2017: Provides planning and design guidelines to support implementation of the Water Quality Rules. Presented in this manual are the minimum design and technical criteria for the analysis and design of storm drainage facilities and water quality. This document also provides guidance for storm water quality during the planning phase and Operations and Maintenance (O&M) guidance. Lists recycled water as an O&M recommendation.
	Water Quality Rules, 2018: Complete set of rules that help compliance with Hawaii State Constitution, Hawaii Revised Statutes, Revised Ordinances of Honolulu, and the NPDES permit.
City and County of Honolulu Climate Change Commission	Climate Change Brief, 2018: Describes the local, regional, and global impacts of climate change as documented by the peer-reviewed scientific literature and credible empirical data sources.
	Sea Level Rise Guidance, 2018: Showcases research on the implications of sea level rise.
City and County of Honolulu Office of Climate Change, Sustainability, and Resiliency	Ola: Oahu Resilience Strategy, 2019: Honolulu’s community-driven resilience strategy that outlines pillars, goals, and actions for maintaining and enhancing a thriving city even in the face of challenges and changes.
Hawaii Department of Land and Natural Resources-Commission on Water Resource Management	Water Resource Protection Plan, 2008: Guides in protecting and sustaining statewide groundwater and surface water resources, watersheds and natural stream environments.
	State Water Projects Plan, 2017: To provide a framework for planning and implementation of water development programs to meet projected water demands for State projects.
	Update of the Hawaii Water Reuse Survey and Report, 2013: Discusses the status of water reuse in Hawaii along with obstacles, funding mechanisms, and opportunities for moving forward.
	Hawaii Drought Plan, 2017: Discusses strategies for mitigating and adapting to drought in Hawaii and includes how climate change will impact water availability.
	Hawaii Water Conservation Plan, 2013: Identifies and implements water use and delivery efficiency measures to conserve the freshwater resources of Hawaii. This plan primarily focuses on the “demand side” measures of water use and delivery efficiency measures and programs to implement them.
Hawaii Department of Health	Water Quality Plan (Draft), 2014: To protect the public health and sensitive ecological systems by preserving, protecting, restoring and enhancing the quality of ground and surface water throughout the State of Hawaii.
	Hawaii’s Nonpoint Source Management Plan 2015-2020: A culmination of the planning that the State of Hawaii has done in past years for polluted runoff control and, at the same time it sets forth a plan for activities that State and County agencies, federal agencies, and Hawaii’s citizens can undertake to control polluted runoff.

<p>Hawaii Department of Transportation</p>	<p><i>DOT Strategic Plan 2015-2018 (2019 pending)</i>: This 3-year plan focuses on building a sustainable economy, investing in people, and transforming government, and sets a goal to “create social and physical environments that promote and support good health for all.” Goals include strengthening environmental health protection policies.</p>
	<p><i>Storm Water Management Program Plan, 2015</i>: Describes the program elements and associated best management practices (BMPs) administered by the Storm Water Management Program in order to comply with applicable storm water requirements and reduce the discharge of pollutants from the MS4 to State Waters to the Maximum Extent Possible.</p>
<p>Hawaii Department of Agriculture</p>	<p><i>Agricultural Water Use and Development Plan, 2003</i>: To assess State and private agricultural water use, supply and irrigation water systems through a long-range management plan.</p>

APPENDIX B: National Perspectives on One Water Programs

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National Perspectives on One Water Programs

Board of Water Supply
(BWS) for the City and
County of Honolulu

October 2019

**CDM
Smith**

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Appendix A One Water Case Studies: Interview Guide
Appendix B Organization Charts

List of Acronyms and Abbreviations

BOE	City of Los Angeles, Bureau of Engineering
CCATF	Miami-Dade County Climate Change Advisory Task Force
CII	Commercial, Industrial, and Institutional
CIP	Capital Improvement Program
Compact	Southeast Florida Regional Climate Change Compact
GM&B	Greater Miami & the Beaches
CITY	Los Angeles
ICLEI	ICLEI-Local Governments for Sustainability
IRP	Integrated Resources Planning
IWRP	Integrated Water Resources Plan
LA IRP	Water Integrated Resources Plan
LADWP	Los Angeles Department of Water and Power
LASAN	City of Los Angeles Bureau of Sanitation
LCRA	Lower Colorado River Authority
MWD	Metropolitan Water District of Southern California
NGO	Non-governmental organization
OWA	One Water Academy
RUC	Resilient Utility Coalition
SFPUC	San Francisco Public Utilities Commission
WASD	Miami-Dade Water and Sewer Department
Water Forward	Austin's Water Forward Integrated Water Resource Plan

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Section 1

Introduction

1.1 One Water Defined

One Water is a relatively new paradigm for the management of water resources that takes a more integrated, holistic approach. In this context, source water supply, drinking water, wastewater and stormwater are viewed as “one water” that undergoes both natural and man-made transformations as it progresses through the urban water cycle. One Water as a planning process can: (1) define aspirational goals and guiding principles for coordinated management of water resources; (2) engage public stakeholders in transformative ways for consensus-building; and (3) unveil and evaluate multi-benefit/multi-purpose projects that would otherwise not be realized by traditional utility planning that is often done in silos. One Water as a framework for the implementation and operation of projects, can lead to greater resiliency and sustainability, improved environment and watershed health, and enhanced social justice and economic revitalization.

When implemented at the most comprehensive scale, One Water should incorporate all municipal/institutional functions where water plays a vital role, as illustrated in **Figure 1**.

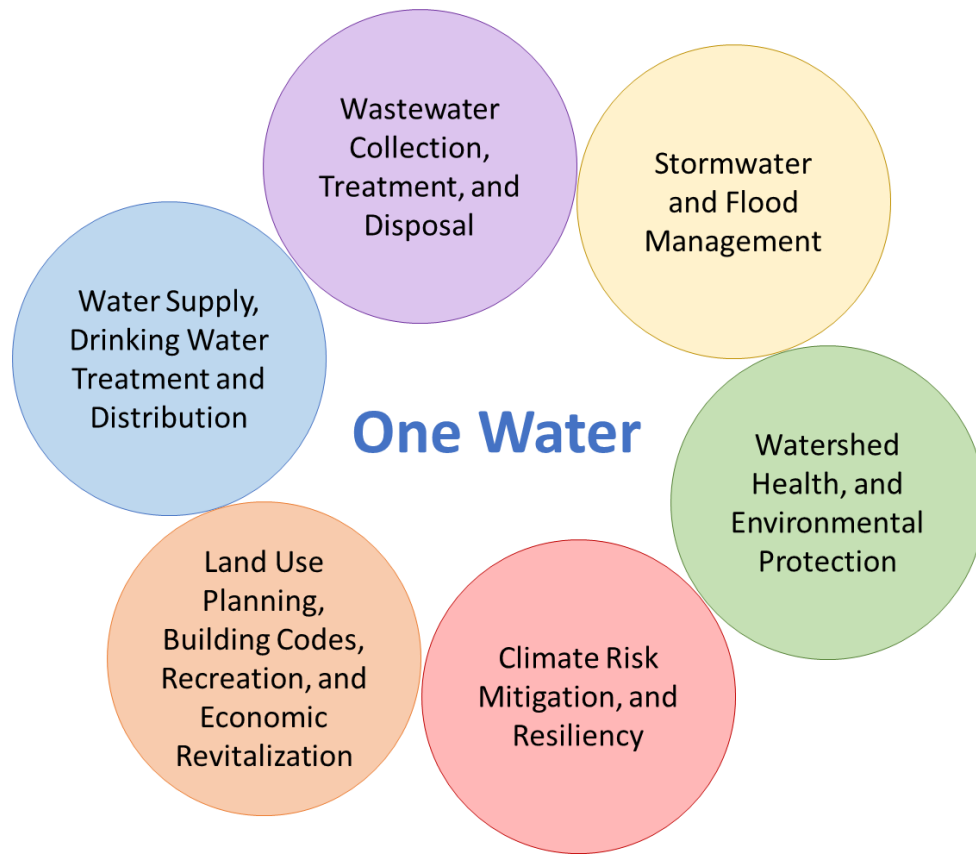


Figure 1. Functions that Should be Considered for Comprehensive Application of One Water

One Water is gaining momentum quickly, and several organizations and research centers are focused on its principles. The U.S. Water Alliance (<http://uswateralliance.org/>) is a premier organization driving One Water education and practice. It holds its annual One Water Summit across the nation to share lessons learned and engage leaders from utilities, resource agencies, environmental organizations and other non-government organizations (NGOs), and businesses. The Water Research Foundation has embraced One Water as one of its core focus areas and has produced several resources on the matter, including the *Blueprint for One Water* (see **Figure 2**). This blueprint documents several case studies and insights from utilities across the United States.

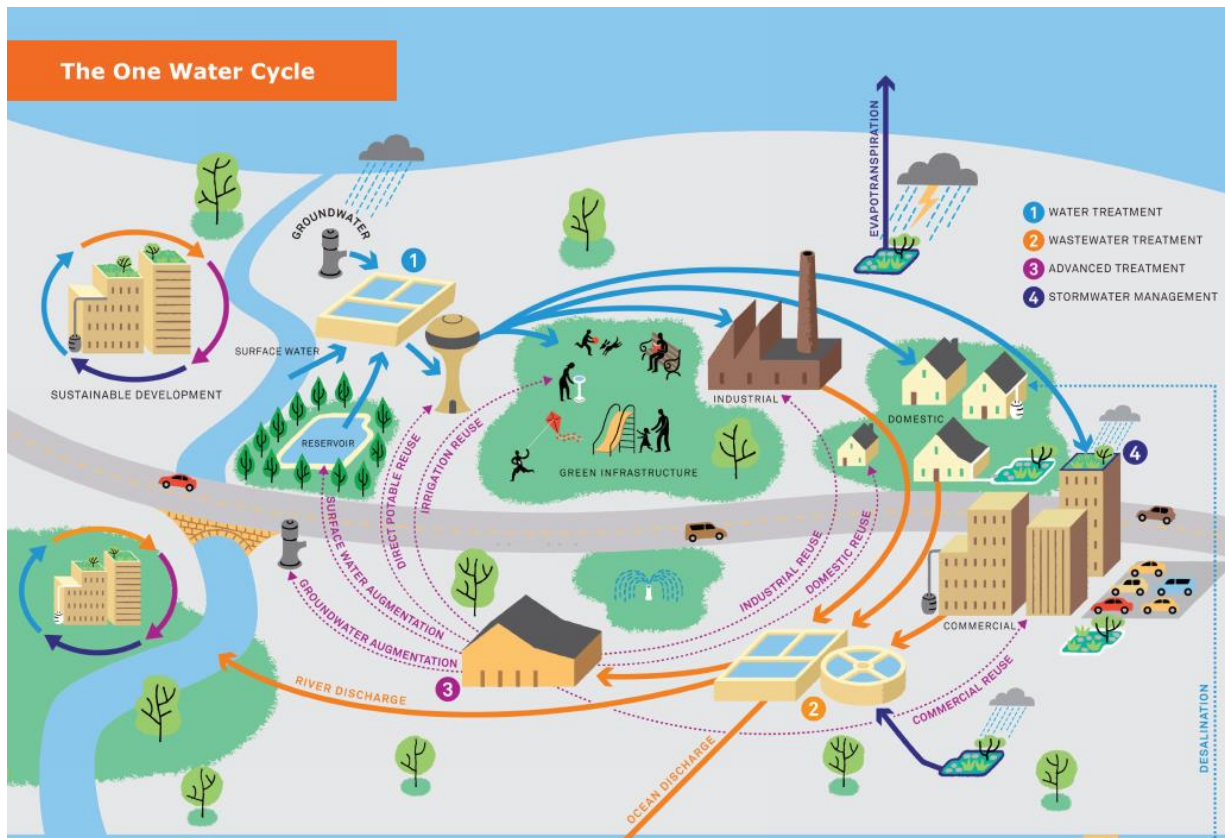


Figure 2. One Water Cycle
(Source: *Blueprint for One Water*, Water Research Foundation, Project #4660)

Building upon the foundation of the 100 Resilient Cities initiative funded by The Rockefeller Foundation, there is an emerging recognition that water is fundamental to all urban systems. Within this context, reducing risk and improving resilience necessitates consideration not just of the urban environment, but of the entire watershed encompassing the region. The City Resilience Index is the foundation of the 100 Resilient Cities strategy development process.

1.2 Integrated Water Resources Planning vs One Water

In the 1970's as traditional energy sources from fossil fuels became more limited and interest in renewable energy was beginning to take hold, several large energy utilities embraced Integrated Resources Planning (IRP) instead of traditional least-cost planning. Energy IRP focused on demand-side and supply-side options, as well as incorporation of other objectives such as

environmental protection and community benefits. In the early 1990's several water utilities (mostly in water-scarce areas in the U.S.) began exploring IRP—renamed Integrated Water Resources Planning (IWRP)—as a new paradigm for water supply management.

Today, many water utilities are using IWRP for the management of water supply and to help guide future infrastructure investments. Most IWRP efforts incorporate water conservation, reuse of wastewater for non-potable demands, and stormwater capture to stretch existing fresh water supplies; and many plans explore alternative water supplies such as potable reuse, aquifer storage and recovery, and desalination of brackish groundwater and seawater. While the inclusiveness of conservation, reuse, and stormwater capture provides significant environmental and social benefits; these benefits are often considered secondary to system reliability, resiliency and cost. It is also important to note that IWRPs are mostly implemented by water utilities. Stakeholder involvement is common in the preparation of IWRPs, but at greatly varying degrees.

One Water is usually implemented as the result of a directive from elected officials or by the leaderships within several utilities or an integrated utility (one that manages water, wastewater and stormwater). One Water may or may not have a strong water supply focus, but almost always has a strong watershed health/environmental focus, along with providing strong community benefits. One Water's is being broadened to incorporate climate resiliency, including floods, storms, and sea level rise in contrast to IWRPs. Stakeholder involvement for One Water tends to be more comprehensive and public-facing when compared to IWRP. It is also important to note that many One Water programs are called IWRPs or by other names entirely and many such efforts can be seen has hybrids between IWRP and One Water (see **Figure 3**).

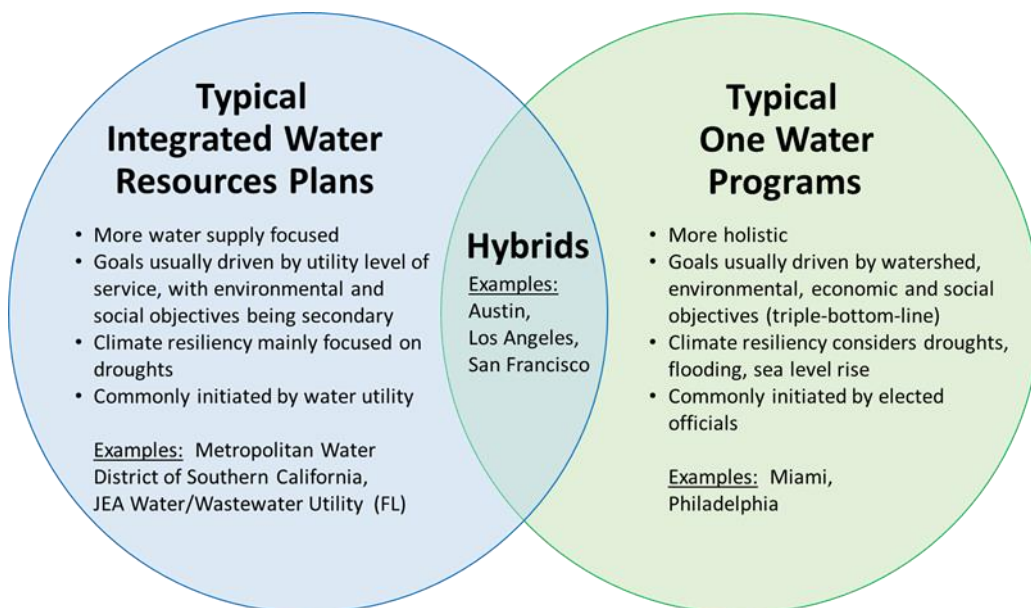


Figure 3. Comparing IWRP and One Water

1.3 Purpose of Research

The purpose of this research is to compare and contrast One Water programs conducted by large cities in the United States that have relevancy to issues facing the City and County of Honolulu's water resources management and climate resiliency, and to draw important lessons learned. CDM Smith, working with the Honolulu Board of Water Supply staff, identified four One Water programs for this effort:

1. One Water LA – City of Los Angeles, CA
2. One Water SF – City of San Francisco, CA
3. Austin Integrated Water Resources Plan – City of Austin, TX
4. City Water Resilience Framework –Miami-Dade County, FL

For each of these programs, CDM Smith compiled a short summary of the efforts and interviewed key staff from the water utilities that are charged with implementing these programs using a common interview guide (see **Appendix A**).

While the four One Water programs summarized in this research are unique in terms of addressing local conditions and achieving specific planning objectives, they can provide useful insights in terms of planning process, involvement of public stakeholders, partnerships, and follow-through for City and County of Honolulu in its consideration of developing a One Water program.

1.4 Organization

This document is organized into the following four sections

Section 1 – Introduction provides an overview of the One Water framework, compares typical Integrated Water Resources Planning with One Water initiatives, describes the purpose of this research, and summarizes the organization of this document

Section 2 – One Water Program Case Studies describes each of the four selected One Water Programs. Each case study consists of two parts, a Background section compiled from publicly available documents and an interview conducted by CDM Smith with key members of each of the four One Water programs.

Section 3 – Lessons Learned from One Water Programs provides an analysis of commonalities and difference between the various programs, in addition to an assessment of implications for the City and County of Honolulu as it considers its own One Water program.

Section 2

One Water Program Case Studies

This section presents case studies for each of four One Water programs:

1. One Water LA – City of Los Angeles, CA
2. One Water SF – City of San Francisco, CA
3. Austin Integrated Water Resources Plan – City of Austin, TX
4. City Water Resilience Framework –Miami-Dade County, FL

The first part of each case study presents background information summarized from publicly-available documents and internet searches. The background section includes the following elements:

- Lead Organization – includes a brief description of the organization leading the effort, including its governance, service area, and direct area of responsibility in the urban water cycle
- Plan Background – provides a brief overview of the plan and its vision
- Planning Elements – summarizes the major studies or plans were part of this effort
- Stakeholder Involvement – provides a high-level description of who was involved and how they were involved
- Outcomes - compiles the major initiatives, programs, and projects resulting from the program, and
- References – documents the sources of information reviewed.

The second portion of each case study summarizes interviews conducted by CDM Smith with key members of each of the four One Water programs. An interview guide was prepared as a framework for each interview and is included in **Appendix A**. The interviews focus on the following topic areas:

- Drivers
- Process/Planning
- Outcomes/Recommendations
- Follow-through
- Final Thoughts

2.1 One Water LA, City of Los Angeles, CA

2.1.1 One Water LA Background

Lead Organization(s)

City of Los Angeles, Bureau of Sanitation (LASAN) and Los Angeles Department of Water and Power (LADWP)

Service Area	
Area (square miles)	Population Served
473	4 million

Lead Organizations Sphere of Direct Responsibility			
Wastewater	Stormwater	Water	Power
Yes*	Yes*	Yes**	Yes**

*LASAN is a bureau within the City of Los Angeles, Department of Public Works. It is governed by a Board of Public Works consisting of five commissioners appointed by the Mayor and confirmed by the City Council. Its budget and rates are established by the City Council.

**LADWP is an enterprise department within the City of Los Angeles. It is governed by a Board of Commissioners appointed by the Mayor. Its budget and rates are established by the Board with no City Council action required.

Plan Background

In 2007, Los Angeles (City) completed its first IRP with a planning horizon of year 2020. The IRP was the first time that the City examined wastewater, stormwater and water in a holistic, interconnected manner. The planning effort was a partnership between the City’s LASAN and LADWP. Since then, the City’s water resources situation has changed, especially due to the worst drought in California history that began in 2012. This drought resulted in substantially less water from imported sources from the Metropolitan Water District of Southern California (MWD), which the City is a member, and LADWP’s Los Angeles Aqueducts. In addition, the City faces sustainability challenges, new stormwater quality regulations, and threats from climate change. In response to these challenges and to help achieve water sustainability, the City initiated OneWaterLA to build on the success of the IRP and extend the planning horizon to 2040.

Vision Statement

OneWaterLA is a collaborative approach to develop an integrated framework for managing the City’s watersheds, water resources, and water facilities in an environmentally, economically, and socially beneficial manner. OneWaterLA will lead to smarter land use practices, healthier watersheds, greater reliability of our water and wastewater systems, increased efficiency and operation of our utilities, enhanced livable communities, resilience against climate change, and protection of public health.

Objectives

1. Integrate management of water resources and policies by increasing coordination and cooperation between all City departments, partners, and stakeholders.
2. Balance environmental, economic, and societal goals by implementing affordable and equitable projects and programs that provide multiple benefits to all communities
3. Improve health of local watersheds by reducing impervious cover, restoring ecosystems, decreasing pollutants in our waterways, and mitigating local flood impacts
4. Improve local water supply reliability by increasing capture of stormwater, conserving potable water, and expanding water reuse
5. Implement, monitor, and maintain a reliable wastewater system that safely conveys, treats, and reuses wastewater, while also reducing sewer overflows and odors
6. Increase climate resilience by planning for climate change mitigation and adaptation strategies in all City actions
7. Increase community awareness and advocacy for sustainable water by active engagement, public outreach, and education

Planning Elements

The OneWaterLA 2040 Plan takes a holistic and collaborative approach to consider all of the City's water resources from surface water, groundwater, potable water, wastewater, recycled water, dry-weather runoff, and stormwater as One Water. Also, the plan identifies multi-departmental and multi-agency integration opportunities to manage water in a more efficient, cost effective, and sustainable manner. The Plan represents the City's continued and improved commitment to proactively manage all its water resources and implement innovative solutions, driven by the City's Sustainable pLAN, a sweeping set of environmental and water resources goals regarding per capita water use, increases in reuse and stormwater capture, and reduction in greenhouse gases.

Stakeholder Involvement

LASAN and the LADWP collaborated on the Plan's development, partnering with other City departments, regional agencies, academia, NGOs, the business community, and public stakeholders. The City's stakeholder process and public outreach had several components as depicted in **Figure 4**.

At the heart of the stakeholder processes were three main sub-groups: (1) steering group of key City department heads from LASAN, LADWP, Bureau of Engineering (BOE), Community Planning, Parks and Recreation, and Building and Zoning; (2) a larger group of City department officials, and representatives from regional agencies, such as LA County Public Works, Metropolitan Water District of Southern California, and Regional Water Quality Control Board; and (3) a small group of interested parties and experts representing key environmental groups, business groups, and neighborhood councils. These three stakeholder sub-groups were responsible for: helping draft

vision statements and guiding principles, identifying strategies, reviewing key technical evaluations, and helping with recommendations.

The next component of One Water LA's stakeholder process involved several day-long workshops of a broader group of public stakeholders that indicated they wanted to be involved for additional insights and involvement. Each workshop built from previous workshops, the stakeholders in this wider group agreed to attend them all.

To help communicate One Water LA to the public-at-large, LASAN developed fact sheets, a website, and presented at various outreach functions throughout the City.



Figure 4. Components of Stakeholder and Public Outreach for One Water LA

Outcomes

The IRP (as noted) and OneWaterLA key outcomes include:

- Voter-approved \$500 million bond measure for funding multi-purpose water quality, restoration and water supply projects (resulting from the IRP)
- Stakeholder support for wastewater rate increases (resulting from the IRP)
- Stakeholder support for indirect potable reuse (resulting from the IRP)

- Identification of current and future water-related integration opportunities among City departments, regional agencies, and other stakeholders
- Identification of strategies and proposed projects to maximize potable reuse opportunities
- Identification of strategies and projects to maximize stormwater capture
- Policy and program recommendations that help achieve the OneWaterLA Vision and Objectives
- Identification of funding sources to further implement the Plan's programs and policies
- Increased stakeholder awareness about the City's water challenges, ongoing collaboration activities, and long-term water management strategies to become a more water-resilient city
- Increased collaboration between various City departments and regional agencies on water-related projects, programs, and policies due to strengthened and new relationships developed

Key long-term initiatives to optimize and enhance the urban water cycle include:

- Increasing stormwater capture and recharge in the aquifers through distributed green infrastructure projects and programs
- Increasing use of the groundwater basins for storage through new recharge projects
- Expanding recycled water for irrigation, commercial, industrial, and groundwater recharge uses
- Expansion of water conservation, especially in landscape transformations and industrial cooling towers
- Balancing water supply needs with environmental needs, such as preserving the LA River
- Exploring potable reuse options using advanced treated wastewater
- Exploring potable reuse opportunities outside of the San Fernando Groundwater basin through interagency partnerships

LA's Water Cabinet

The mayor of Los Angeles initiated a Water Cabinet in 2015 consisting of the mayor and a number of key department heads, general managers, and outside advisors to achieve aggressive water conservation goals and promote vertical and interagency integration. Learning about the challenges each City department faces with its projects allowed these different groups to understand how their work impacted, and was impacted by, water.

References (Links to Website Reports)

Blueprint for OneWater WRF:

<https://www.waterrf.org/resource/blueprint-one-water>

LA's Water Integrated Resources Plan and OneWater LA background information and links to reports:

[https://lacitysan.org/san/faces/home/portal/s-lsh-es/s-lsh-es-owla/s-lsh-es-owla-au;jsessionid=boayAKEjLSDsvnNTa-YUHe1d4KZ7Z0N5IK-IXLedieVfEBNQgn8v!-2009047303!-309283975?_afLoop=7601126614238580&_afWindowMode=0&_afWindowId=null&_adf.ctrl-](https://lacitysan.org/san/faces/home/portal/s-lsh-es/s-lsh-es-owla/s-lsh-es-owla-au;jsessionid=boayAKEjLSDsvnNTa-YUHe1d4KZ7Z0N5IK-IXLedieVfEBNQgn8v!-2009047303!-309283975?_afLoop=7601126614238580&_afWindowMode=0&_afWindowId=null&_adf.ctrl-state=13am5cm0z2_1#!%40%40%3F%3Dnull%26%3D7601126614238580%26%3D0%26%3D13am5cm0z2_5)

[state=13am5cm0z2_1#!%40%40%3F%3Dnull%26%3D7601126614238580%26%3D0%26%3D13am5cm0z2_5](https://lacitysan.org/san/faces/home/portal/s-lsh-es/s-lsh-es-owla/s-lsh-es-owla-au;jsessionid=boayAKEjLSDsvnNTa-YUHe1d4KZ7Z0N5IK-IXLedieVfEBNQgn8v!-2009047303!-309283975?_afLoop=7601126614238580&_afWindowMode=0&_afWindowId=null&_adf.ctrl-state=13am5cm0z2_1#!%40%40%3F%3Dnull%26%3D7601126614238580%26%3D0%26%3D13am5cm0z2_5)

2.1.2 One Water LA Interview

Drivers

One Water LA was an extension of the highly successful Water Integrated Resources Plan (LA IRP). The LA IRP had a planning horizon of 2020 and did not take into account climate change. In addition, LASAN and LADWP wanted to engage a greater sphere of stakeholders, both public and interdepartmental. Other drivers included more attention to social justice and incorporation of the Mayor's Sustainable pLAN, which sets targets for water efficiency and per capita water use, water reuse, stormwater capture, and reduction of greenhouse gases.

In addition to these drivers, the City of Los Angeles puts a high importance on working with environmental groups and NGOs in a proactive and cooperative manner rather than reactive manner that in the past resulted in lawsuits and mistrust.

Process/Planning

While in many regards, One Water LA was an outcome of the Mayor's highly green policies regarding water and energy, it was still primarily driven by the leadership within LASAN and LADWP. One way One Water LA differed from the LA IRP was involvement of virtually all of the City's departments that interact with water in some way. Another key difference was the use of a smaller group of public stakeholders to form a stakeholder advisory group, which met more frequently than the larger group of stakeholders (see **Figure 4**). This advisory group was key in getting consensus from the larger group and acted like ambassadors for the City in advocating the recommendations to the public at large.

Public workshops of invited stakeholders, numbering roughly 150, were held during the two phases of One Water LA. Phase 1 was the development of future gaps and utility needs, and defined the vision statement, objectives and guiding principles used for Phase 2. Phase 1 lasted approximately one year and built enormous trust between City departments and public stakeholders. A guiding principles document was prepared at the end of Phase 1.

Phase 2 was the development of master plans for the wastewater and stormwater utilities, as well as coordination in LADWP's plans and studies, such as the Water Conservation Potential Study,

Water Reuse Master Plan, and Stormwater Capture Master Plan. Phase 2 also developed key strategic initiatives, policy recommendations, and climate resiliency actions.

Outcomes/Recommendations

- Wastewater Capital Improvement Program (CIP)
- Stormwater CIP
- Climate Resiliency Plan
- Set of 35 recommended City policies, with prioritization of 3 that City Council should enact immediately
- Greater coordination with LADWP with regard to water conservation, water reuse and stormwater capture for water supply
- White papers on distributed/lot-scale solutions, indicating opportunities, limitations, challenges

Follow-Through

- Recommended projects are phased using a trigger approach (e.g., growth, regulations, climate change)
- Institutional changes were made to LASAN at wastewater plants to include staff that had knowledge about reuse to coordinate with LADWP
- Memorandum of Agreements between LASAN and LADWP regarding stormwater management, where LASAN's responsibility is primarily water quality and LADWP is primarily water supply
- Engagement with stakeholders periodically to summarize progress
- Reporting progress to Mayor's Water Cabinet

Final Thoughts

One Water can be a very useful framework but be careful that it doesn't become a new reporting entity that usurps existing organizations and city departments. It is most useful to view all water with a more holistic lens to identify where multi-purpose projects can be implemented and also coordinate water management across all relevant city departments and regional agencies.

One Water is also a great tool for educating the public and garnering greater stakeholder advocacy, important for rate increases. Use of a smaller public stakeholder advisory group is a great tool to understand issues, values and gain consensus, but it also comes with a high potential for conflict between members and between departments. One Water takes more time and cost than traditional water planning, but payoff is significantly greater in the end.

2.2 One Water SF, City of San Francisco, CA

2.2.1 One Water SF Background

Lead Organization

San Francisco Public Utilities Commission (SFPUC)

Lead Organization Service Area	
Area (square miles)	Population Served (Retail)
47	887,000

Lead Organization Sphere of Direct Responsibility			
Water	Wastewater	Stormwater	Power
Yes	Yes	Yes*	Yes

* San Francisco is served by a combined stormwater/sewer system

SFPUC is a department of the City and County of San Francisco with separately-managed enterprises for water, wastewater, and power. Their mission is to provide our customers with high quality, efficient and reliable water, power, and sewer services in a manner that is inclusive of environmental and community interests, and that sustains the resources entrusted to our care. One third of delivered water goes to retail customers in San Francisco, and the remaining two thirds is wholesale deliveries to 27 suburban agencies in Alameda, Santa Clara, and San Mateo Counties. SFPUC also provides emission-free power to San Francisco’s municipal departments and other customers.

Plan Background

In October 2016, SFPUC staff kicked off OneWaterSF by publishing the OneWaterSF Vision, to “Optimize the use of [San Francisco’s] finite water and energy resources to balance community and ecosystem needs, creating a more resilient and reliable future.” This vision encourages staff to provide greater water and energy resource resiliency and reliability, create opportunities to optimize water infrastructure, and contribute to the livability and sustainability of SF.

Planning Elements

Rather than starting implementation of OneWaterSF with voluminous planning documents, SFPUC assembled a diverse internal OneWaterSF Working Group representing each of SFPUC’s resource areas (Water, Wastewater, Power, Finance, and External Affairs). The group serves as an open platform to share ideas and discuss how OneWaterSF can enhance projects and programs to provide multiple benefits for SFPUC, its customers, and the environment.

Subsequently, SFPUC developed a set of initiatives that work towards tangible implementation of the OneWaterSF vision and guiding principles:

1. Sending Biosolids to the Marketplace, Not the Landfill: Biosolids Product Development and Market Research

2. Realizing the Water Supply Benefits of Daylighting a Historic Creek: Yosemite Creek Daylighting Project
3. Being Responsive to an Evolving Business Industry: SFPUC collaboration with the private development community to advise on implementing additional decentralized treatment facilities in San Francisco
4. Advancing the Science of Purified Water: PureWaterSF
5. Reducing our Environmental Footprint Through Resource Recovery: Assessment of Industry Practices for Biogas Use
6. Putting Stormwater Runoff Back in the Ground: Downspout Disconnection for the Westside
7. Producing Fit-for-Purpose Water: Expanding Non-potable Water for Sewer Flushing
8. Expanding Our Recycled Water Impact: Examining Reuse Opportunities for Recycled Water in San Francisco
9. Building on Success to Strengthen OneWaterSF: OneWaterSF Development

Stakeholder Involvement

SFPUC works with boards, commissions, and committees to design, implement and evaluate its policies and programs to understand the priorities of those impacted by our decisions, be accountable to community concerns, and foster a culture of transparency:

- Citizens Advisory Committee (Water Subcommittee, Wastewater Subcommittee, Power Subcommittee, Environmental Justice Subcommittee, Small Business Subcommittee)
- Rate Fairness Board
- Revenue Board Oversight Committee
- Southeast Facility Community Facility Commission
- Water System Improvement Program Small Firm Advisory Committee
- Residential Users Appeals Board

Establishing the Non-Potable Water Program required collaboration across water and wastewater groups within SFPUC, as well as with external stakeholders such as the Department of Public Health and private developers. This collaboration has enabled SFPUC to successfully develop one of the most innovative onsite water reuse programs in the nation.

Outcomes

- **Educator/School Education Program:** Develop curriculum to educate SF students on their role in the resource cycle

- **College Hill Learning Garden:** an education and demonstration garden to teach local students about how they can help cities transition to ecologically friendly water, food, energy, and waste systems. Features rain gardens, native plants, water hand pumps, a green roof, and a composting toilet. Built by SFPUC. Operated in partnership with Education Outside, a local nonprofit. Workshops and free field trips provided to any San Francisco school.
- **OneWaterSF Learning Lab: Zoo Exhibit:** Create a public exhibit for San Francisco Zoo visitors centered around resource use and recovery. Treat green waste and animal manure produced at the Zoo and convert it into a biosolids-based compost to grow animal feed on an on-site farm. Use recycled water for irrigation. Use heat recovered from wastewater treatment to warm a small plant nursery
- **Partnering for innovation:** Establish internal and external partnerships that allow SFPUC to streamline process of identifying and testing new technologies
- **New service connection process improvement project:** Design and implement an Online Customer Portal for application and monitoring of new water service requests
- **Blue Green Academy/Center for Stormwater Solutions:** Create a program to provide technical training, open to the public, for SFPUC partners related to Green Infrastructure project conception, construction, and maintenance. Outcomes for 2018 include developing and launching a program website, setting the first year's training schedule, and developing the Stormwater Management Ordinance Design training. Require new and redevelopments that create or replace 5,000 square feet or more of impervious surface to manage stormwater on-site,
- **Gleneagles Non-Potable Feasibility Study:** Assess the feasibility of constructing a non-potable water system at Gleneagles Golf Course, the City's last golf course using potable water for irrigation.
- **Biosolids Demonstration Garden:** Plan and construct a biosolids demonstration garden at the Southeast WWTP. Biosolids are a nutrient-rich organic byproduct of wastewater treatment. Biosolids increase water holding capacity, return nutrients back to soils, and increase soil capacity for carbon storage
- **Biosolids Product Development and Market Research:** In partnership with the University of Washington, assess the feasibility of producing high quality soil amendments suitable for use in landscaping, construction projects, and soil replenishment
- **Westside Downspout Disconnect Pilot:** Provide resources to property owners to disconnect downspouts from the sewer system and redirect the stormwater to rain barrels and landscaped areas
- **Westside Recycled Water Project:** use recycled water for irrigation of Golden Gate Park instead of local groundwater that is fit for drinking

- **San Francisco Groundwater Project:** blend up to 4 MGD of local groundwater into the City's drinking water supply.
- **Regional Groundwater Storage and Recovery Project:** enhance reliability during periods of drought by providing additional groundwater to San Francisco and neighboring communities
- **Rainwater Harvesting:** Since 2008, SFPUC has offered rebates and incentives to residents to encourage rainwater harvesting. SFPUC partnered with San Francisco's Community Challenge Grant Program to offer Urban Watershed Stewardship Grants for community-based projects that help manage stormwater
- **Expanding Non-potable Recycled Water for Sewer Flushing:** In 2017, SFPUC ran a pilot program to use recycled water in lieu of potable water to flush sewer lines. The pilot demonstrated the feasibility of using recycled water to flush sewers and the need for new sewer flushing trucks capable of treating water onsite, rather than needing to obtain water from the treatment plant itself
- **Daylighting a Historic Creek:** SFPUC, in partnership with the community and San Francisco Recreation and Parks Department, is working to daylight the historic Yosemite Creek, which flows directly into the combined sewer system. The new creek bed will add stormwater capture capacity for non-potable reuse, new green space, and native habitat for birds and butterflies
- **Integrating Green Infrastructure into Design:** install green roofs with native plants to reduce stormwater runoff, increase energy efficiency, and reduce life cycle costs
- **Opportunities for Recycled Water in San Francisco:** SFPUC prepared a White Paper to review the evolution of water reuse in San Francisco and to assess future opportunities
- **Water Saving Device Distribution:** SFPUC provides incentives for water efficient devices, such as low-flow showerheads, and garden hose shutoff nozzles, to help homes and businesses save water.
- **Automated Water Meter Program:** Millions of gallons of water are lost every day due to leaks. Install new automated water meters nearly all of San Francisco's water accounts. Transmit hourly water consumption data to SFPUC's billing system by wireless network.
- **Non-Potable Water Program:** Working closely with the San Francisco Department of Public Health and Department of Building Inspection, SFPUC has created resources for both single-building and commercial building owners to comply. To date, the Non-potable Water Program has over 80 projects in various stages of design, permitting, construction, and operation. Include in the Non-Potable Water Program is PureWaterSF, a 9-month pilot project that takes water from the SFPUC headquarters' onsite reuse system, treats it to drinking water standards, collects treatment data, and then uses the treated water for toilet flushing.

- **Laundry-to-Landscape Program:** Use graywater for washing clothes and yard irrigation. Deliver graywater harvesting kits to San Francisco residents and train them in installation and maintenance
- **Urban Water Management Plan:** This 2015 UWMP update presents the latest information on the SFPUC's retail and wholesale service areas, RWS and other water systems operated by the SFPUC, system supplies and demands, water supply reliability, Water Conservation Act of 2009 compliance, water shortage contingency planning, and demand management. In addition, this update includes the SFPUC's current (Fiscal Year 2014-15) and projected demands and supplies for its retail and wholesale customers over the next 25 years. Retail demand projections have been updated to reflect population and employment growth, socioeconomic factors, and the latest conservation forecasts.

References (Links to Website Reports)

<https://www.sfwater.org/index.aspx?page=1091>

<http://www.advancesinwaterresearch.org/awr/20170406/MobilePagedArticle.action?articleId=1108748#articleId1108748>

<https://www.sfwater.org/index.aspx?page=1218>

<https://www.sfwater.org/Modules/ShowDocument.aspx?documentID=8839>

2.2.2 One Water SF Utility Interview

Drivers

The start of OneWaterSF was a request from General Manager Harlan Kelly. Maximizing the value of SFPUC's resources is part of the mission of SFPUC, and since all of its 3 enterprises stem from water, taking a One Water approach supported this. Each of the 3 enterprises has different service areas. The funds between the enterprises cannot be comingled. Each enterprise has its own mission. These factors have resulted in the development of silos between the enterprises within SFPUC.

In reality, SFPUC has been doing one water for a long time via its integrated resources planning. What Mr. Kelly wanted was a cultural change. One Water is now what is expected – it is about the intention – doing it deliberately.

Process/Planning

An internal working group of 10-12 people from across each of the 3 enterprises was formed to develop a vision statement and guiding principles. In developing the guiding principles, it was with the intent that they could be applied citywide, to other departments. However, there is not the bandwidth within SFPUC to do that right now.

In developing the principles and initiatives, internal stakeholders were engaged via the working group. However, there are opportunities to engage external stakeholders, for example Recreation and Parks Department, to provide more holistic services such as recycled water for irrigation.

The mayor is now looking to SFPUC as the organization that can drive beyond a traditional model of being a siloed service provider and instead provide cross-department collaboration to improve the level of service.

Within SFPUC, there are no MOUs, inter-enterprise agreements, etc. as part of OneWaterSF. This was intentional. They wanted the process to be organic. MOUs are used to establish cost-sharing agreements with City agencies/departments for specific multi-benefit projects where these benefits can be quantified and apportioned.

Outcomes/Recommendations

With regard to water and sewer, there is a common thread in the area of life safety and emergency response that enables the organization to collaborate across the two enterprises. Sink hole response is an example – they happen where there is water. At a sinkhole location, by knowing if there are water pipes, sewer pipes, or both, SFPUC can be more efficient in its response. Furthermore, the way that SFPUC is organized with bureaus (serving a cause not a department) necessitates sharing of resources. Current “emerging technologies” industry trends that cross water/wastewater discipline lines, as well as more global challenges we face, inform the group and point to the direction of sharing and collaborating. As an example, think about redirecting and repurposing water before it hits a central wastewater plant and how that water’s constituents, such as organics, nutrients, temperature etc., can be viewed as resources.

Implementation of the Non-Potable and Stormwater Ordinances has been much smoother as a result of OneWaterSF. But the ordinances are not a result of OneWaterSF, they would have been put in place with or without it.

With regard to decentralized projects, SFPUC is implementing lot-scale greywater, blackwater, and stormwater capture/rainwater harvesting solutions.

2019 is the first time that metrics have been created for OneWaterSF. Each enterprise has its own set of metrics already, and metrics for OneWaterSF had purposefully been avoided so that the program could remain flexible, adapt with time, and continue to be what they felt it needed to be. The decision to establish metrics in 2019 was to showcase the good work resulting from OneWaterSF.

OneWaterSF is really intended to be about intention rather than a program unto itself. However, by thinking about a given project from the perspective of multiple benefits consistent with the one water paradigm, it has revived some projects that had lost some momentum when they were considered only in the context of a single enterprise silo. The process helps to build support for projects in their infancy through the identification of multiple benefits.

Internal collaboration that is happening between the enterprises at SFPUC as a result of OneWaterSF is making it much easier to work with developers who are proposing new projects. We don’t come across like a siloed organization like we used to. It takes intentionality to not do this.

With regard to the annual initiatives developed as part of the OneWaterSF process, we are not trying to create new projects or do additional work that would otherwise not exist. Instead, we’re

trying to highlight OneWaterSF projects, identify multiple benefits, and establish a basis for collaboration in order to get difficult/complex projects done.

Follow-Through

Growing OneWaterSF beyond SFPUC is a question of “bandwidth” for members of the group and limitations on resources. At some point it will grow, but currently other departments within the City are not engaged.

Project costs can be allocated/shared across the 3 enterprises with identification and quantification of multiple benefits. SFPUC also has the ability to issue grants to other organizations to assist with other aspects of project implementation. Regarding external funding, it is not clear if there is a direct benefit from OneWaterSF, except that multi-benefit projects are more attractive. For the power enterprise, they are trying to access cap and trade funds rather than grants or other water-related funding sources.

Conducting research in the public sector is difficult because the public sector as a whole is very risk averse. If ratepayer money is spent on something and it doesn't end up working out, this is viewed very negatively. But, especially in the wastewater sector, we're pushing harder on innovation by sharing the risk through the engagement of multiple agencies and/or project partners. An example is with biosolid resources. Application and testing are done at various sites by Parks and Rec, while SFPUC focuses on producing the product. No one agency takes all the risk.

New ordinances do have some fees associated with them, enough to cover cost of administration. On the flip side, for people who implement non-mandatory projects we do offer grants. We don't offer grants for projects that are mandatory under the ordinances, however.

Final Thoughts

The interviewees would recommend a One Water approach to others, noting that “We cannot solve our challenges by ourselves.” Having a framework like this helps to move staff along with getting things done. It helps staff be more creative and innovative with the work that they're already doing.

One Water also seems like an obvious thing to do.

Start small and build from there. Keep it organic. Growing organically and minimizing bureaucratic red-tape is a better way to start this program.

One interviewee stated “One Water helps me do better the things that I already do. Day to day, I'm more efficient. My work has a broader context, it is now more meaningful. Our people understand how what they do – their part- fits into the overall organization.”

OneWaterSF is on the General Manager's mind all the time.

More could be done, and it could be done faster if there were staff whose responsibilities were dedicated to this. Current staff are implementing the program with whatever time is available. This is the constraint that has kept the program from extending out to other parts of the city, e.g. the Office of Resilience and Capital Planning.

2.3 Water Forward: Integrated Water Resources Plan, City of Austin, TX

2.3.1 Water Forward Background

Lead Organization

Austin Water

Lead Organization Service Area	
Area (square miles)	Population Served
540	1 million

Lead Organization Sphere of Direct Responsibility			
Water	Wastewater	Stormwater	Power
Yes	Yes	No	No

Austin Water is responsible for high-quality, reliable, and affordable water supply. The utility operates three large water treatment plants that treat source water from the lower Colorado River. Austin Water also operates an extensive wastewater and water reuse system. Reuse water is currently only used for outside irrigation. The Director of Austin Water reports to the City Manager. The city is governed by 10 City Council Members elected by district, and an at-large Mayor. A Water and Wastewater Commission is advisory to the City Council.

Planning Elements

For more than 100 years, Austin Water has been committed to providing reliable, high quality, sustainable, and affordable water and wastewater services to its customers. Austin's Water Forward Integrated Water Resource Plan (Water Forward) will support that enduring commitment for the next 100 years and beyond. The Water Forward recommendations were developed using a holistic, 'One Water' planning approach that balances multiple objectives such as water reliability, social, environmental, and economic benefits. Consistent with 'One Water' practices, Water Forward incorporated several key principles: (1) viewing water, wastewater, and stormwater as important resources to be managed sustainably; (2) matching the right water quality (treatment) to the right type of water demand; (3) accounting for future climate change to increase reliability and resiliency; (4) reflecting community values and social needs; and (5) developing an adaptive implementation approach for recommended projects and actions.

The planning elements of this effort included:

- Modeling the availability of surface water for use by Austin under historical and climate changed hydrologic conditions
- Preparation of a spatially detailed water demand forecast by sector and end use of water (e.g., toilet flushing, showers, clothes washing, irrigation, industrial cooling, industrial process, etc)
- Identification and conceptualization of demand-side and supply-side options, including decentralized or lot-scale solutions
- Use of multi-criteria decision analysis to score and rank portfolios of demand-side and supply-side options
- Adaptive management of recommended strategies based on risk triggers and successful implementation of projects
- Extensive stakeholder involvement and public outreach/education prior, during and after plan development

Stakeholder Involvement

During the recent historic drought, City Council convened the Austin Water Resource Planning Task Force in April 2014 to evaluate the City's water needs, to examine and make recommendations regarding future water planning, and to evaluate potential water resource management scenarios for Council consideration. Support for the integrated water resource plan development process was provided by the Water Forward Task Force, City staff from other departments, especially Watershed Protection Department, Office of Sustainability, and Austin Energy and outside consultants.

Public outreach included input through over 80 outreach events, including five Water Forward Public Workshops, four Targeted Stakeholder Meetings, and 10 Summer Series events (one in each City Council district). Austin Water has delivered presentations and/or outreach materials at more than 60 community events, information sharing sessions, community group meetings, seminars/professional events, and district town halls. Fact sheets and dedicated website were also developed.

Outcomes

Candidate Future Water Conservation and Demand Management Strategies

- **Utility-Side Water Loss Control:** Expand Austin's existing water loss program to reduce leaks
- **Commercial, Industrial, and Institutional (CII) Ordinances:** mandatory water-saving upgrades for cooling towers and steam boilers. Code changes approved by City Council in June 2017. Implementation is underway. Targets existing development HVAC uses.
- **Landscape Transformation Ordinances:** Develop a new ordinance to require water-efficient landscapes at new single family residential developments

- **Landscape Transformation Incentives:** Incentives for existing development to encourage reductions in water needs for outdoor irrigation through regionally appropriate landscapes
- **Alternative Water Ordinance and Incentives:** This option would require or incentivize on-site (building-scale) alternative water use of rainwater, stormwater, graywater, blackwater, and/or air conditioning condensate through a mix of new ordinances and incentive programs.
- **Lot Scale Stormwater Harvesting:** Capture and storage of stormwater runoff generated from impervious surfaces within the lot boundary of multi-family residential or commercial development. The collected stormwater is then used to supply a range of onsite demands.
- **Lot Scale Rainwater Harvesting:** Capture and storage of roof water to supply a range of onsite demands at the lot/building scale.
- **Lot Scale Graywater Harvesting:** Reusing water from the laundry, shower and bath at the lot/unit scale to meet non-potable demands.
- **Lot/Building Scale Wastewater Reuse:** Onsite capture and treatment of wastewater generated from a building (commercial or high-density residential) for onsite reuse via a dual piping system to supply outdoor demands and non-potable indoor demands.
- **Air Conditioning Condensate Reuse Ordinance:** Collection of air conditioning condensate water from new development with a cooling capacity over 200 tons.

Candidate Future Water Supply Options

- **Aquifer Storage and Recovery:** ASR is a strategy in which water can be stored in an aquifer during wetter periods and recovered at a later date.
- **Direct Potable Reuse:** Blend advanced treated water with raw drinking water and send the blend to the headworks of a conventional drinking water treatment plant
- **Additional Supply from Lower Colorado River Authority (LCRA):** This option would involve securing additional supply from the LCRA through a new or amended contract.
- **Off-Channel Storage Reservoir:** Construction of a new off-channel reservoir in the Austin region using source water from the Colorado River when available
- **Community Scale Distributed Wastewater Reuse:** Collecting, treating, and reusing effluent from the wastewater system in localized new development areas
- **Community Scale Sewer Mining:** Extraction of wastewater from the existing centralized wastewater collection system, treatment to non-drinking water quality at a small wastewater treatment plant, and reuse at the community
- **Community Stormwater Harvesting:** Collecting, treating, and reusing excess stormwater runoff from impervious urban surfaces at the community or neighborhood scale

- **Community Rainwater Harvesting:** Collecting, treating, and reusing roof water from new development areas from a dedicated roof water drainage network

References (Links to Website Reports)

<http://austintexas.gov/waterforward>

<https://data.austintexas.gov/Utilities-and-City-Services/Austin-Water-Statistics/87qq-mkwq>

2.3.2 Utility Interview

Drivers

Austin is completely reliant on surface water from the Lower Colorado River and its network of storage reservoirs for its potable water demand. The most recent drought (2008-2016) was the new drought of record and total reservoir storage in the Colorado River system was dangerously close to being at “dead” storage levels. Despite implementation of stage 3 drought actions restricting outdoor water use, storage levels were still declining. If it had not been for heavy rains that followed in 2017, the City would have had to take even more drastic measures to reduce water demands. During this drought, the City Council convened a special task force to make recommendations on how to be better prepared if another drought like this occurred in the future. One key recommendation was the development of an IWRP.

Other drivers for the Water Forward program included long-term climate resiliency, ensuring water supply reliability given the City’s strong economy and projected population growth of 4 million by the next century, and reflecting the strong environmental and sustainability ethic of the Austin community. In fact, even though Austin Water has a robust water conservation program and recycled water system, public stakeholders wanted a bigger push in sustainable water development, including rainwater harvesting and stormwater capture.

Process/Planning

Austin Water took the lead to develop the Water Forward program, working closely with a Council-appointed Water Forward Task Force and representatives from the City’s watershed protection, sustainability and energy departments. Austin Water examined premier IWRPs and One Water programs around the U.S. and Australia in order to help develop a Request for Proposal for a consultant to prepare its Water Forward program. Working closely with the Task Force, the RFP was developed and CDM Smith, teamed with the Australian firm GHD, were selected to prepare Austin’s plan.

The Task Force met on mostly a monthly basis during the preparation of the Water Forward program, where Austin Water and consultants presented planning objectives, demand-side management and supply alternatives, evaluations of climate change impacts, and analysis of the performance of water resources portfolios (made from combinations of demand-side management and supply alternatives). These presentations and collaboration between Task Force members, Austin Water and consultants represented the heart of the planning process.

In addition, a robust public outreach program was developed to solicit input from the public at large. This outreach included:

- 5 public workshops throughout City

- 10 community meetings at public libraries in each Council district
- Attendance at other standing public events, 90 in total.
- Website and online surveys

Outcomes/Recommendations

The recommendations from the Water Forward plan centered around four themes: (1) increase diversity of City's water supply; (2) develop greater sustainability through expanded demand-side management practices; (3) achieve long-term climate resiliency; and (4) use adaptive management to make periodic adjustments over time.

The recommendations for near and long-term included expansion of water conservation in the areas of AMI, water loss control, AC condensate reuse, and landscape transformation. Other demand-side management options recommended included greywater/blackwater, rainwater harvesting and community stormwater capture. The recommendations for expanding reuse included expansion of traditional recycled water system for irrigation, sewer mining and decentralized reuse, and indirect potable reuse. Supply alternatives were prioritized to implement aquifer storage and recovery, brackish groundwater desalination and a new surface reservoir.

In addition to the recommendations, the following activities/outcomes are occurring now:

- Convened working groups within AW to develop specifics and targets for increased conservation and reuse, and storage strategies
- Held public workshops on decentralized lot-scale rainwater harvesting/greywater
- Holding stakeholder/public workshops on new ordinances
- Plans to hire a consultant for ASR concept
- Hired consultants on AMI to replace all meters with smart meters
- Water loss staff working group to reduce system losses

Follow-Through

In terms of follow through, Austin Water will continue to lead the process and implementation of projects/programs, working with other City departments as appropriate/needed. Progress reporting will occur as follows:

- Austin Water presents status and reporting to Task Force every other month
- City Council will get an annual report on the progress

At this time no formal partnerships or MOAs have been developed with Austin Water and other City departments, but that could change.

Final Thoughts

Water Forward is a big endeavor, and the utility CIP to implement all recommendations will be large. Issues such as affordability, equity and environmental justice will be challenging.

While One Water is a good lens from which to view all water resources (water, stormwater and wastewater), it can be intimidating at first. Austin benefited from a severe drought and very dedicated community Task Force that made it possible to think big and innovatively. Without drivers that cause a big threat, One Water might be harder to get traction.

2.4 City Water Resilience Framework, Miami-Dade County, FL

2.4.1 City Water Resilience Framework Background

Lead Organization

Miami-Dade Water and Sewer Department (WASD)

Lead Organization Service Area	
Area (square miles)	Population Served
400	400,000 (retail)

Lead Organization Sphere of Direct Responsibility			
Water	Wastewater	Stormwater	Power
Yes	Yes	No	No

Miami-Dade Water and Sewer Department is one of 25 departments within Miami-Dade County. The County is governed by a Board of County Commissioners consisting of 13 elected individuals serving staggered 4-year terms. The Mayor of Miami-Dade County is elected countywide to serve a four-year term and is considered a "strong mayor." The mayor is not a member of the County Commission, appoints all 25 directors who oversee the operations of the County Departments and has veto power over the Commission. A mayoral appointment and veto can only be overridden by a two-thirds majority of the County Commission.

Planning Elements

In 2006, Mayor Carlos Alvarez created the Sustainability Advisory Board to provide expertise and guidance from a practical and local perspective. In July 2006, the Board established the Miami-Dade County Climate Change Advisory Task Force (CCATF). It was charged with identifying potential future climate change impacts while providing recommendations regarding mitigation and adaptation measures to respond to climate change.

In March 2009, Miami-Dade County was selected as one of three communities nationwide to participate in GreenPrint, a sustainability planning toolkit pilot program through ICLEI. As part of this, WASD researched and assessed 13 areas linked to sustainability to help define environmental, economic and social equity baselines and challenges, and existing programs to address these issues.

Resilient Greater Miami & the Beaches (GM&B) is a unique collaboration among Miami-Dade County and the Cities of Miami and Miami Beach, created to respond to global trends major cities face: urbanization, globalization and climate change. In the spring of 2016, after a highly competitive process, GM&B was selected to join the Rockefeller Foundation sponsored 100 Resilient Cities.

WASD is now developing comprehensive energy and resilience strategies at the plant and process levels for water production and wastewater treatment.

Stakeholder involvement

Mayor Carlos Alvarez created the Sustainability Advisory Board to provide expertise and guidance from a practical and local perspective. In July 2006, the Board established the CCATF. It was charged with identifying potential future climate change impacts while providing recommendations regarding mitigation and adaptation measures to respond to climate change. It presented its recommendations in 2010 and concluded its work. The GreenPrint team also reached out to sustainability experts within the community such as Miami-Dade County Public Schools and the South Florida Water Management District.

Outcomes

The GreenPrint details 137 specific sustainability initiatives and is organized around 7 sustainability goals: strong leadership, connections, and commitment; water & energy efficiency; our environment; responsible land use & smart transportation; vibrant economy; healthy communities, and climate change action plan.

WASD is shifting to an integrated utility management approach that includes effectively managing utility costs, reducing environmental impacts, and performance-based decision making strategies intended to improve operational efficiencies and reduce energy usage. It has developed a 20-year, \$13.5 billion CIP to provide necessary upgrades to thousands of miles of pipes, pump stations, WTPs, and WWTPs. During the next two decades, WASD will complete the projects contained within the CIP. As of June 2017, 775 projects representing \$1.1 billion in department assets had been completed. Another 861 are in the planning or construction phase.

References (Links to Website Reports)

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<https://betterbuildingsinitiative.energy.gov/sites/default/files/attachments/Miami.pdf>

<https://www8.miamidade.gov/global/water/capital-improvement-program.page>

<https://www8.miamidade.gov/global/water/home.page>

2.4.2 City Water Resilience Framework Utility Interview

Drivers

As the CCATF was nearing completion of its work, the Southeast Florida Regional Climate Change Compact (Compact) formed. The Compact is among the 4 counties (Broward, Miami-Dade, Monroe, and Palm Beach) – it had its 10- year anniversary last year. From the Compact perspective, the driver is purely climate change. For example, one outcome was the adoption of a unified sea level rise projection that is now applied uniformly across the 4 counties and used in development of new design standards. The Compact holds an annual conference.

[\(http://southeastfloridaclimatecompact.org/about-us/what-is-the-compact/\)](http://southeastfloridaclimatecompact.org/about-us/what-is-the-compact/)

Process

Resiliency is the mechanism by which this translates down to WASD. In a regional conversation like this, it is not just about sea level rise and climate change. It should be about **shocks and stressors** across the entire utility – cybersecurity, emerging contaminants, aging infrastructure,

aging workforce, etc. These are different for each utility. Shocks and stressors need to be integrated into the thought process and decisions made on this basis. An integrated approach is necessary to deal with these shocks and stressors. There is a gap here.

When this concept is tied further into asset management and prioritizing projects based on risk, then the gap is more prevalent. A plan must be robust enough to overcome political cycle changes. The onus is on a utility to

1. Make sure the framework is scalable from one utility to another, e.g. AWWA J-100. Even with this, there is need to tie all of what is done together and tell a very consistent story to all stakeholders, e. g. customers, board, politicians. Instead it is typical to put forth a master plan, a water master plan, an integrated water master plan, a one water plan - call it whatever you want - but there is no unified framework. To overcome this, the community must be engaged broadly – for example within the framework of the triple bottom line – and also risk. This is a conscious effort in bringing all of the stakeholders together. By taking this approach, it is not just the utility making the decisions, but it is the community as a whole and the decision in itself becomes more resilient. This creates connections across the lifecycle of the water business.
2. Not enough time is spent educating various levels of people about water. Planning documents are very technical, disconnected, and not sustainable. The conversations with public and stakeholders happen in layers, but the layers are not connected. For example, at Miami-Dade, not enough time is spent prepping the younger workforce coming into the utility about how what they do fits in to the bigger picture. Neither are the various layers of professional staff well connected. This is important because they are the ones managing the utility’s risks on a daily basis in the field – there is never the opportunity of getting out ahead. Think of it this way, WASD is the first responder to the first responders. For example, if there is no water there is no firefighting.

How to advance and accelerate the knowledge piece of one water must be considered. It must be systematic and sustainable. This is why the One Water Academy (OWA) was founded. There should be a lessons learned about our actual “Day without water” (Ft. Lauderdale, July 18-19, 2019). Without lessons learned, then the only outcome will be that Ft. Lauderdale dealt with the crisis and that will be the end of it. Formal launch the OWA is planned at WEFTEC by teaming up with Melissa Meeker at the Innovation Lounge. OWA is also looking for seeding platform partners. Please spread the word and invite Honolulu.

Outcomes

The Compact was very generic. While it has been instrumental in elevating the urgency of the sea level rise conversation in the region, the Compact’s mandate was not to go about operationalizing resilience – getting things funded and getting them done.

There is a whole resiliency conversation about even getting projects funded. Utilities have to be adaptable with regard to funding projects. Things change over time and this must be recognized. For example, something dramatic with shocks and stressors could happen tomorrow and change whatever the current capital plans are.

In order to operationalize the Compact, the Resilient Utility Coalition (RUC) was started about 2.5 year ago. RUC provides leadership in assessing and adapting utility operations to address the potential effects of climate change and promote resilience. The group seeks to enhance the usefulness of climate science by developing adaptation strategies and improving water management decision-making in the face of climate uncertainty.

Stormwater is managed in a different department from WASD. If stormwater is not being managed in the first place, this results in upsizing other infrastructure to deal with it. So, when one starts peeling the onion back, how do they really get started down this path of resiliency? The change agent is conversations all across the spectrum – including work force development, education, etc.

Some concrete things that are present now that were not prior to One Water include:

- Hardening evaluations of facilities,
- New staff positions. Created a resiliency group within the utility. We also hired an energy manager. In one year's time, we demonstrated an energy savings of 5-6%.
- Thinking about new large infrastructure holistically. For example, for a new WWTP, can we carve out a new educational center also? Can we make it beautiful, provide hiking trails, tell the water story, incorporate academia for research, etc.? LEED doesn't really do this for you. Envision comes closer. We did a training cohort for Envision, and the County then passed a resolution requiring Envision. The Envision standard was used in the design of our new West Plant. This is a big thing.

Follow-through

External to the organization, it became evident that folks in WASD could not do this all by themselves. This is how the RUC came about, with the intent of operationalizing the Compact. Consultants are among the stakeholders in the process because they also have to know where the utility is going, what is desired.

Because all of us are limited to 24 hours per day, we must find ways to leverage what we do. This is what the One Water Academy is about - this needs to become a movement.

A better job of celebrating successes, in simple English, and getting it out to all stakeholders need to be done. The story needs to be told before it is needed, e.g. before public/stakeholder/Board support is needed.

There is still much work to do. For example, even with the threat of flooding and sea level rise that being faced, Chapter 24 of the Miami-Dade Code of Ordinances that covers environmental protection, including stormwater, does not contain the word "resilience" in it. So, while WASD can incentivize a developer to include green infrastructure, e.g. on-site recycling, green roofs, stormwater retention, bioswales, etc., they still lack an ordinance to require it and so it will otherwise be about the developer's bottom line. Without ordinances, the broad implementation that is needed will not occur.

Final thoughts

Whatever the various types of water, e.g. drinking water, waste water, stormwater, are called, they are just names and over time these different types of water have all been managed differently. Institutions and governance have been developed around each of them individually. These ecosystems of governance have become more and more complex. As a drop of water goes through the water cycle, it takes on different shapes and colors and forms. It needs to be managed as it gets fragmented through the various processes and as its quality changes. Thought should also be given to how that water drop interacts with things along the way, e.g. impacts on marine life, disease clusters, the human food chain, etc. The quality of water in a canal is improved by managing runoff, and that is improved through governance, then this impacts human health. The One Water approach forces this conversation.

Loosely using the term One Water risks it being abused. It is already getting tired. It runs the risk of creating another fragmented name for some trend. Instead, the conversation needs to be made so granular in people's understanding of it that it doesn't get lost. WASD is overtly conscious of NOT using One Water as a term. There are 3 words in the industry (sustainability, big data, and resiliency) that are very abused and have lost their impact. One Water risks being the fourth.

At the end of the day, resilience must be OPERATIONALIZED. Yes, projects are important and need to be done, but the planning and logic and shared understanding behind them is even more important.

Honolulu should take the City Water Resilience Framework and build from it as my framework. Without a framework like this, there is risk of having disconnected/overlooked stakeholders, disconnected and inefficient/ineffective data collection efforts, and poor outcomes. Instead, the City Water Resilience Framework looks at water from a governance standpoint and through a single lens – the watershed standpoint.

Find a mentor utility to accelerate the learning curve and the conversations. There is no need to reinvent things.

Suppose that you are the utility director and you have to go to the mayor every year to get your budget approved, and every year it keeps going up and up, and you aren't telling your story all along the way. Then one day you get asked the question "How is your resiliency improving each year?" You'll probably have no answer and it shouldn't be that way. Being an engineer, one has to convert the word resilience into one metric. There need to be all of the indicators behind it, but it should distill down to one metric. This is where everyone needs to go. Otherwise it is all just talk talk talk. And because this conversation is currently fragmented, elected officials are allowed to be unaccountable.

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Section 3

Lessons Learned from One Water Programs

3.1 Comparison of One Water Programs

Based on the background research and interviews conducted for each of the 4 One Water programs, this section compares those programs across a number of attributes. The intention of this comparison is to gain insights into similarities and differences across these programs that may be useful to Honolulu as they consider their own unique circumstances. A discussion of each of these attributes follows and a comparative summary table is presented below.

- **Governance** – This attribute describes the governance structure for each of the four cities/counties. They fall into two categories: mayor-council/commission or council-manager. Mayor-council structures are commonly described as either strong mayor or weak mayor structures, depending on the powers granted to the mayor in the charter. Each mayor-council structure in this study was considered a strong mayor system.
- **Population Density** – Both the retail service area population and service area itself are documented in Section 2. This attribute is population density calculated as population per square mile. The population densities vary from a low to 1,000 people per square mile for Miami-Dade to nearly 19,000 people per square mile for San Francisco.
- **Sphere of Responsibility** – This attribute describes the sphere of responsibility for the lead organization of each of the 4 One Water programs: water, wastewater, stormwater, and power. For Los Angeles, LASAN and LADWP are considered co-leads. It is worth noting that San Francisco is unique among the study participants with all four areas under the direct responsibility of the General Manager of the San Francisco Public Utilities Commission. Organization charts for each of the study participants are included in **Appendix B**.
- **Drivers** – The study evaluated three potential drivers for the initial formation of One Water programs: resiliency, resource limitations, and regulatory. An indication of primary or secondary is provided for each driver. In instances where a particular driver did not appear to be significant to the initial formation of the program, it was left blank. A blank does not mean that the driver is not an important element of a given program, e.g. regulatory. In fact, regulatory compliance is an essential element of all of the One Water programs. Rather, a blank is an indication that a given driver did not appear to be at the inspirational forefront of a program’s formation.
- **Program Maturity** – The maturity of each program is qualitatively described as either low, medium or high. In the case of both Los Angeles and Miami-Dade, these programs were initiated over a decade ago and underpinned by significant planning efforts. Each program has demonstrated significant success in implementation and achievement of objectives, such as establishment of design standards, development of new funding sources, construction of capital projects, and making operational improvements to enhance

resiliency. Despite having been initiated relatively recently in 2015, the effectiveness of San Francisco's program is advancing multi-benefit projects and complimenting various regulatory efforts such as its stormwater ordinance are particularly notable. Austin is the youngest of the programs and appears on-track toward successful implementation.

- **Formation Catalyst** – Despite differing governance structures, and especially different organizational structures and spheres of influence across the programs studied, the formation catalyst for each of the programs can be generalized as “top down.” In the case of Austin, a critical drought event generated a top down directive from the City Council. Each of the other three programs resulted from a recognition of the need to more effectively address the identified drivers than was being accomplished with the status quo. However, what is different among each of the programs are the approaches taken following the formation catalyst and the actions taken to bridge organizational divides. San Francisco has found success in a relatively informal and organic approach involving collaboration among key stakeholders. Los Angeles undertook a more formal process involving the consensus-based development of guiding principles involving each of the organizational stakeholders. Miami-Dade has recognized that they can be more effective in a regional collaboration and has established formal compact among four neighboring counties in addition to a regional coalition of utilities. Austin has established a transparent reporting process to its City Council to foster accountability.
- **Passionate Advocate** – An overarching commonality of each One Water program is the leadership of a passionate advocate. The passionate advocate is a senior leader (not necessarily the top of the organization chart) within the lead organization who deeply believes in the need for the program and is personally committed to its success. The passionate advocate communicates the program's vision to the team, works with internal and external stakeholders to establish program objectives, finds ways to work across organizational boundaries, and is often the primary public spokesperson for the program. The success of each of the four programs studied is clearly dependent upon the active engagement of a passionate advocate.

Attribute	Los Angeles	San Francisco	Austin	Miami-Dade	Honolulu
Governance	Mayor-Council	Mayor-Council	Council-Manager	Mayor-Commission	Mayor-Council
Population Density (per square mile)	8,457	18,872	1,852	1,000	1,641
Sphere of Responsibility					
Water	Yes	Yes	Yes	Yes	TBD
Wastewater	Yes	Yes	Yes	Yes	TBD
Stormwater	Yes	Yes	--	--	TBD
Power	Yes	Yes	--	--	--
Program Maturity	High	Moderate	Low	High	NA
Drivers					
Resiliency	Secondary	Primary	Secondary	Primary	Primary
Resource Limitations	Primary	Secondary	Primary	--	--
Regulatory	Primary	--	--	Secondary	--
Formation Catalyst	Manager/Mayoral Directive*	Manager Directive	Council/Critical Event	Mayoral Directive	NA
Passionate Advocate	Yes	Yes	Yes	Yes	NA

* The initial IRP was driven by Manager Directive; subsequent One Water LA was Mayoral Directive.

3.2 Lessons Learned

The term “One Water” has come into common usage across the spectrum of water, wastewater, and stormwater planning and management, and also utilities, academia and the professional communities. Despite the common usage of this singular term, the primary finding of this study is that the successful implementation of a One Water program is far from uniform. In fact, as documented in the background research and interviews, each of the study participants has developed their programs using very different approaches that take into account their differing drivers, formation catalysts, and nuances of their organizational structures and cultures. For each of the four participants, a summary of their individual lessons that may be applicable to Honolulu follows.

Los Angeles

- Los Angeles is similar to Honolulu in terms of organizational structure, where responsibility for water resources elements resides in many different departments. Strategies to work across these boundaries include LASAN and LADWP serving as co-leads for One Water LA, the development of a guiding principles by key internal stakeholders, and the Mayor’s formation of a “Water Cabinet”.
- Los Angeles’s recent “top-down” initiatives in climate resilience and sustainability are similar to Honolulu’s. The durability of these initiatives from one administration to the next is not yet demonstrated.

- The development of MOA/MOU between departments is utilized for “joint” projects
- Demonstration and communication of clear needs and benefits, coupled with extensive public engagement, lead to the successful \$500 million Proposition O bond measure and rate increases.
- A small public stakeholder task force can help to build support with elected officials, e.g. City Council.

Austin

- When dealing with climate change and resiliency, take the long view. While still not prevalent, 100-year strategic plans/ programs are starting to take hold (other examples: Metro Vancouver, JEA-Florida, Singapore).
- Lot- and community-scale solutions can be part of the solution. Rainwater harvesting and stormwater capture are ideal in climates where it rains throughout the year and demand for irrigation water is high.
- Similar to the experience of Los Angeles, an appointed small public advisory group can help with to build support with elected officials, e.g. City Council.

San Francisco

- San Francisco found success by starting small and building on plans already in place.
- One Water been good for building “excitement” from within when dealing with water management.
- By focusing on multi-benefit projects as a basis for collaboration, staff have been able to successfully bridge organizational divisions.
- Strong “external” marketing and outreach have brought visibility to the program and eased public acceptance of new ordinances, e.g. stormwater.
- SFPUC has been purposeful in keeping its program simple and not creating work that otherwise did not exist. This provides motivation and also realizes the organization’s resource limitations.

Miami-Dade

- Don’t let the term “One Water” get overused, it must be backed up with meaning.
- Make sure new investments focus on operations as well capital projects. Resilience must be operationalized.
- Extreme events are going to happen, so it is imperative to focus on resiliency (bounce back) after an extreme event. The shock of a disruptive change can be a catalyst for change the requires major shift in plans, e.g. CIP, land use, etc.
- Stakeholder communications and understanding, both internal and external, are imperative.

Appendix A

One Water Case Studies: Interview Guide

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One Water Utility Survey Interview Guide

Drivers

1. What are your water resources/utility challenges that drive a One Water approach?
 - a. Resiliency (Sea level rise, hurricanes, extreme flooding, droughts, climate change)
 - b. Resource limits (water rights, ESA, competition in water supply, groundwater overdraft, source water quality)
 - c. Regulations (TMDLs, MS4 Permits, wastewater discharges, Clean Water Act, consent decrees)
2. Were there other reasons that drive a One Water approach not listed above?
 - a. Political pressure, stakeholder pressure, lawsuits, NGOs

Process/Planning

1. What agency/utility/department initiated the process?
2. Was process staff initiated or by elected/appointed officials (e.g., Mayor, Council, Board)?
3. How were other agency/utility/departments engaged?
 - a. Formal agreements, part of internal working group, etc.
4. Were public stakeholders engaged, and if so, by what process and how often?
 - a. Was there a formal stakeholder advisory group? How was it set up?
 - b. Were there public-at-large workshops/meetings? How many and how frequently?

Outcomes/Recommendations

1. What were the major programmatic outcomes from the process?
 - a. Plan, set of initiatives, CIP, other
2. What were the major recommendations from the process?
 - a. Water supply
 - b. Wastewater
 - c. Stormwater
 - d. Resiliency related
 - e. Ordinances
 - f. Institutional changes
3. What reliance did decentralized options have in achieving objectives? And what were/are the challenges in implementation?
 - a. Lot-scale greywater, blackwater, stormwater capture/rainwater harvesting

Follow-Through

1. Is there a formal process to implementing projects and monitoring success?
 - a. One utility/agency in charge
 - b. Informal agreement between multiple agencies, reporting to elected officials
 - c. MOU between multiple agencies
 - d. Consolidation of multiple agencies into one agency
2. Is there a formal stakeholder reporting of success on periodic/ongoing basis?
3. Are their funding challenges to implementation?

4. Can existing sources of funding (including grants) be accessed with greater success as result of the process?
5. Have new sources of funding been developed as result of process?
 - a. New development requirements from new ordinances
 - b. Existing development responsibilities (retrofits for resiliency)
 - c. Public Private Partnerships
 - d. Voter approved initiatives/propositions
 - e. New taxes/fees
 - f. Annual federal appropriations (e.g.WRDA)

Final Thoughts

1. Would you recommend a One Water approach to other agencies facing similar challenges? If so, why? If no, why?
2. Any other final thoughts on process, challenges or other?

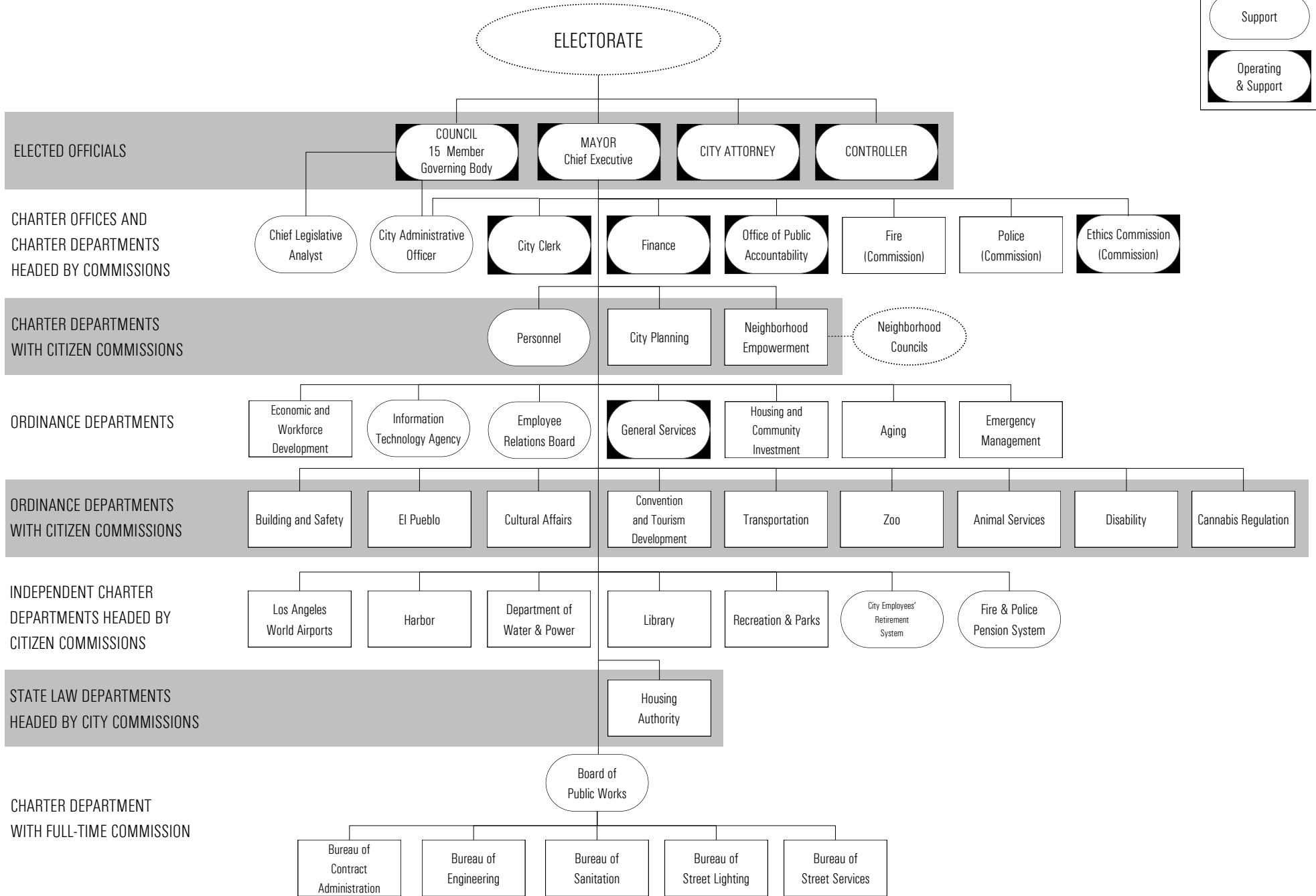
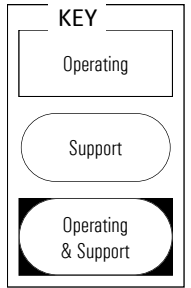
Appendix B

Organization Charts

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ORGANIZATION OF THE CITY OF LOS ANGELES

As of July 1, 2018



ELECTED OFFICIALS

CHARTER OFFICES AND
CHARTER DEPARTMENTS
HEADED BY COMMISSIONS

CHARTER DEPARTMENTS
WITH CITIZEN COMMISSIONS

ORDINANCE DEPARTMENTS

ORDINANCE DEPARTMENTS
WITH CITIZEN COMMISSIONS

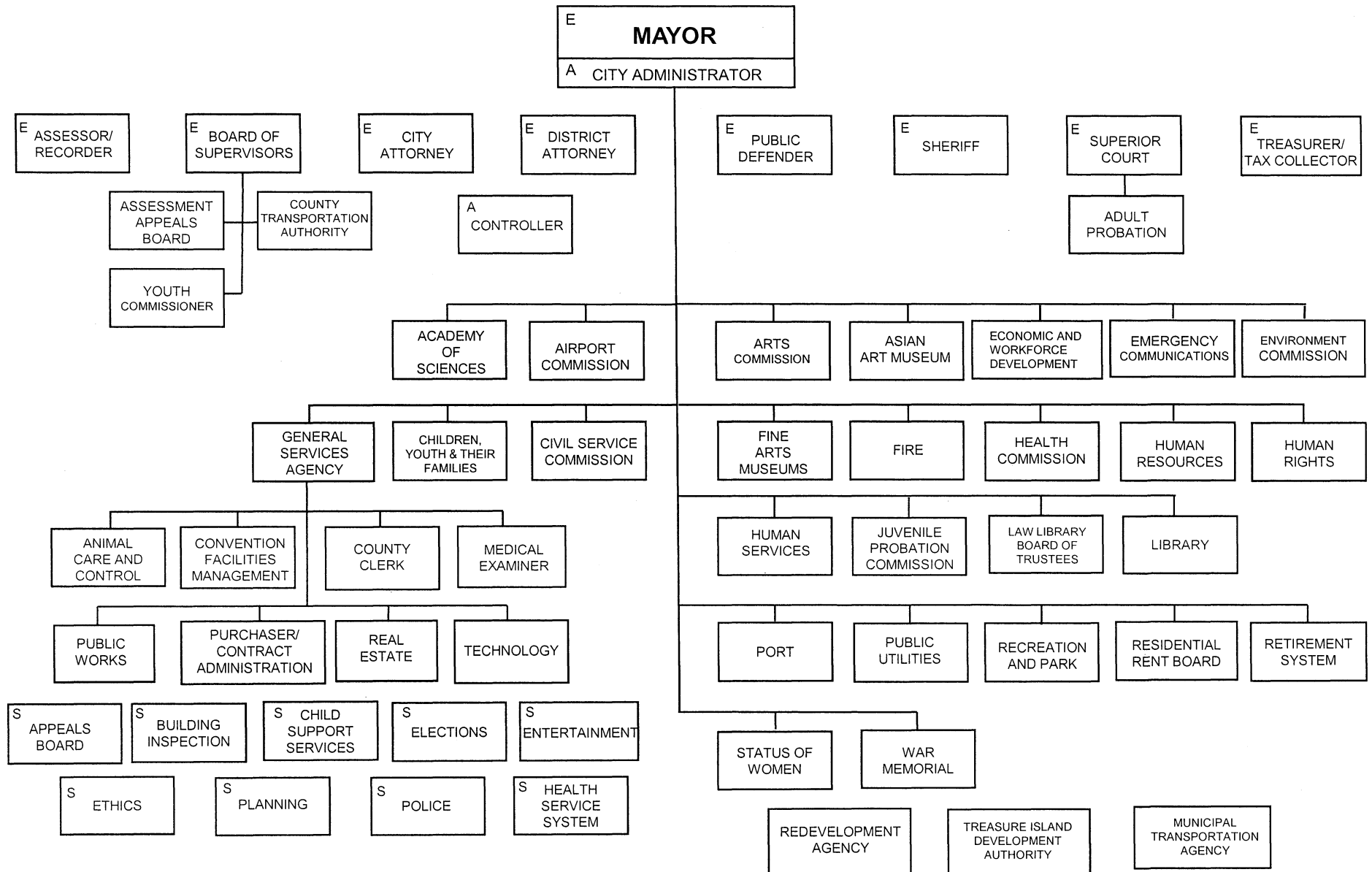
INDEPENDENT CHARTER
DEPARTMENTS HEADED BY
CITIZEN COMMISSIONS

STATE LAW DEPARTMENTS
HEADED BY CITY COMMISSIONS

CHARTER DEPARTMENT
WITH FULL-TIME COMMISSION

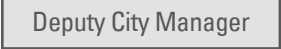
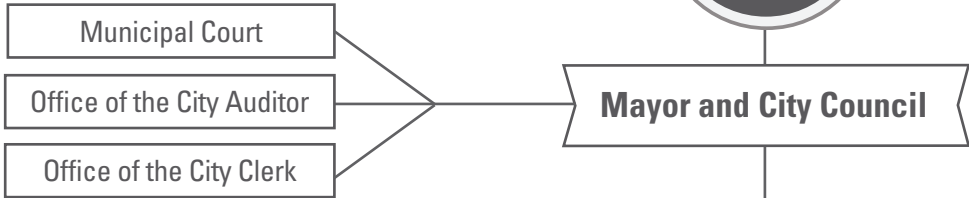
City and County of San Francisco Organization Chart

(As of June 30, 2010)



ix

A = Appointed by Mayor and confirmed by Board of Supervisors / E = Elected / S = Shared – appointed by various elected officials.



- Assistant City Manager
- Parks and Recreation
- Austin Public Health
- Austin Resource and Recovery
- Animal Services
- Austin Public Library

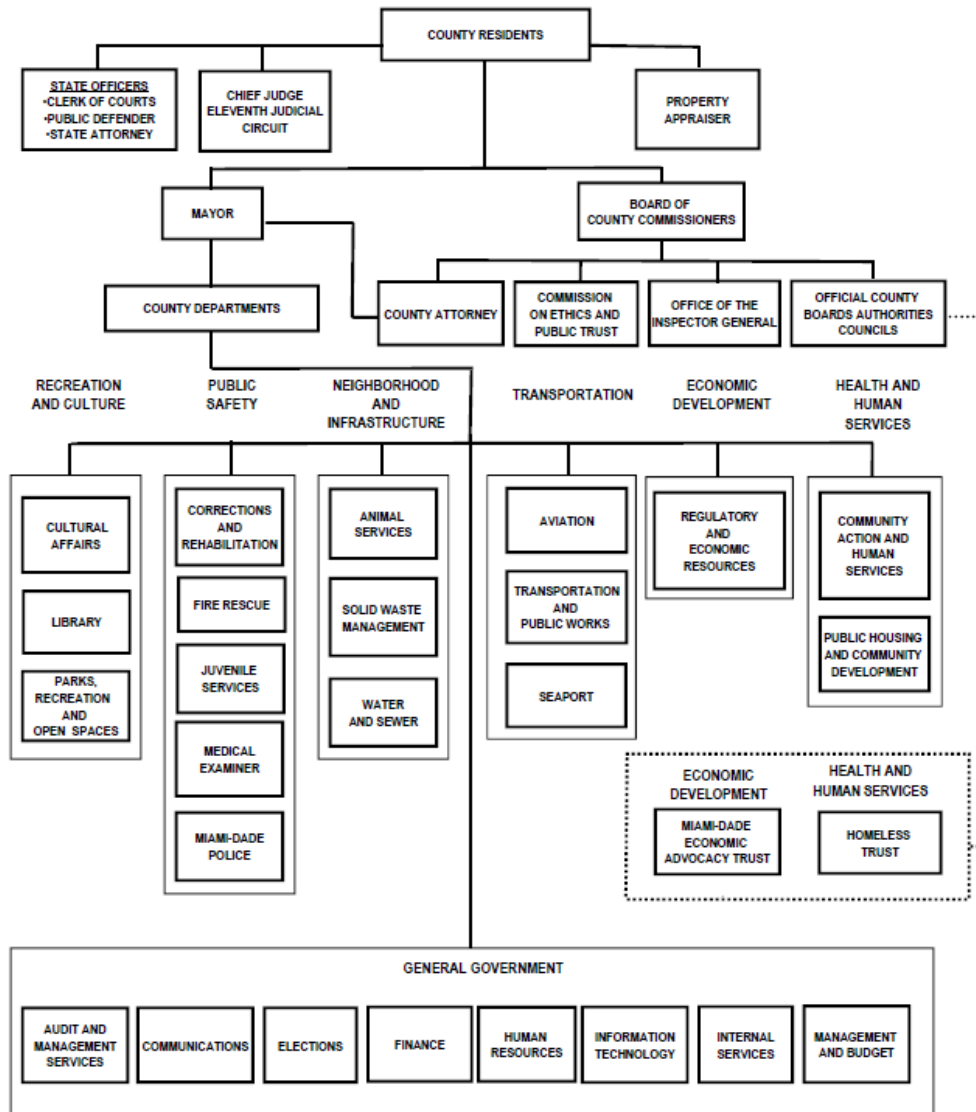
- Police
- Fire
- Emergency Medical Services
- Austin Code
- Watershed Protection

- Management Services
- Human Resources
- Financial Services
- Communications & Technology Management
- Communications & Public Information
- Building Services

- Economic Development
- Development Services
- Planning and Zoning
- Neighborhood Housing & Community Development
- Small & Minority Business Resources
- Telecommunications & Regulatory Affairs
- Real Estate Services
- Austin Convention Center

- Public Works
- Austin Transportation
- Aviation
- Fleet

MIAMI-DADE COUNTY
TABLE OF ORGANIZATION
 by STRATEGIC AREA
 2018-19



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