

REPORT

Long Range Financial Plan

Honolulu Board of Water
Supply

February 2018



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Abbreviations and Acronyms

Board	BWS Board of Directors
BWS	Board of Water Supply
CCI	Construction Cost Index
CIP	Capital Improvement Program
City	City and County of Honolulu
CoF	Consequence of Failure
DSCR	Debt Service Coverage Ratio
ENV	City Department of Environmental Services
ESPC	Energy Savings Performance Contract
Fitch	Fitch Ratings
FY	Fiscal Year
GDP	Gross Domestic Product
GFOA	Government Finance Officers Association
gpcd	gallons per capita per day
JABSOM	John A. Burns School of Medicine
LoF	Likelihood of Failure
M	Million
mgd	million gallons per day
Moody's	Moody's Investor Services
O&M	operation and maintenance
P3	Public-Private Partnerships
R&D	research and development
R&R	renewal and replacement
S&P's	Standard & Poor's Global Ratings
SCADA	Supervisory Control and Data Acquisition
SRF	State Revolving Fund
TOD	Transit-oriented Development
UHERO	University of Hawaii Economic Research Organization
WIFIA	Water Infrastructure Finance and Innovation Act
WMP	Water Master Plan
WSFC	Water System Facilities Charges

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Section 1

Introduction and Overview

The City and County of Honolulu Board of Water Supply (BWS) for the City and County of Honolulu (City) provides approximately 145 million gallons per day (mgd) of potable water and 10 mgd of non-potable water to roughly one million customers on O’ahu. The municipal potable water system provides dependable service through a complex system of 2,100 miles of pipe, 386 source and booster pumps, 212 water sources (wells, tunnels, and shafts), and 171 water storage reservoirs. The BWS provides non-potable water for irrigation and industrial uses through a water recycling facility and several separate brackish sources. Groundwater is the only source for the BWS potable water supply, coming from naturally filtered aquifers that can withstand periods of drought. The BWS water system delivers high quality water at quantities to provide for the health and safety of the community and has built-in redundancies and resiliency; but, as is typical with water systems of this size, some of the infrastructure is aging and needs attention. In October of 2016, the Board of Directors (Board) adopted the Water Master Plan (WMP), giving the BWS a roadmap to meet future needs, establish priorities, and adopt sustainable financing strategies. This Long Range Financial Plan is the policy document that establishes those financing strategies, helping the BWS to effectively implement its WMP.

1.1 BWS Guidance Documents

1.1.1 Vision

The BWS’s vision is Ka Wai Ola, Water for Life. This vision, the motivating force behind the BWS planning policies and actions, captures the critical need of water – that water is the basis for life. With this vision comes the responsibility of the BWS’s stewardship of, and the duty to manage, our natural water resources for both present and future generations. The ancient Hawaiians valued water as one of nature’s greatest gifts and they lived in harmony with water. Land divisions (ahupua’a) mirrored the natural ecosystem – land was divided according to watershed boundaries, spanning from the mountain tops through upland forests to flatlands and the shore. Formal rules governed the use of water and regulations were established and enforced in order to cultivate the resources in each ahupua’a, to conserve as much as possible to lower the stress on the resources, and to ensure that a pure supply was available to everyone whether they lived in the mountains or close to the sea.

1.1.2 Mission

In Hawai’i, water is a public trust and the BWS serves its customers with this trust in mind. The mission of the BWS is to provide a safe, dependable, and affordable water supply now and into the future.

Safe addresses the multiple areas of individual and community needs. Water must meet all statutory and regulatory compliance standards in providing water for consumption and other uses. Water must provide for public health and safety such as firefighting and sanitation needs.

Dependable relies upon three factors:

- Sources of water must be sufficient and available now and into the future. The BWS ensures this through management of the watershed and groundwater supply, long range planning, and possible development of alternative sources of water.
- A water system that is designed, constructed, and operated with redundancy that continues delivery of water even with disruptions in the system.
- Employees of the BWS who are committed to providing their customers with high quality water and excellent service.

Affordable water delivery is primary. The BWS establishes programs for efficiency in water use through conservation, infrastructure installation, and water system operations and maintenance. The BWS continually implements changes to its systems to deliver water at the most responsible cost to the customer.

1.1.3 Strategic Plan

To continue to efficiently and effectively fulfill this important mission, the BWS updated its 5-year Strategic Plan¹ for 2018 through 2022 and the Board adopted the plan in April 2017. The Strategic Plan provides an internal and external perspective of the commitment of the BWS employees to deliver its mission through focus on three strategic goals – resource, operational, and financial sustainability. These three strategic goals are interrelated and coordinated with the three main points of the BWS’s mission. The WMP’s evaluations and recommendations are direct efforts to support the BWS’s goals of resource sustainability and operational sustainability and to inform sustainable financial planning.

Resource Sustainability

Protect, conserve, and manage O’ahu’s water supplies and watersheds now and into the future through adaptive and integrated strategies.

Operational Sustainability

Build an effective organization that continuously works to provide dependable service.

Financial Sustainability

Implement sound fiscal strategies to provide safe, dependable, and affordable water service.

For each goal, the Strategic Plan established the specific objectives presented in Table 1-1, each of which is relevant to and informs the WMP.

¹ BWS. Strategic Plan 2018 – 2022. Available at: <https://www.boardofwatersupply.com/about-us/bws-strategic-plan>. April 2017.

Table 1-1. BWS Strategic Plan Goals and Objectives

Strategic Goals	Category	Strategic Objectives
Resource Sustainability	Climate Change	We will increase our understanding and adapt to climate change to manage O’ahu’s water resources and protect the limited water supply.
	Water Quality	We will protect, preserve, and collaborate to ensure the safety and quality of O’ahu’s fresh water resource.
	Watershed Management	We will ensure healthy forests, recognizing the essential role of watersheds for sustainable water supply (capture and recharge).
	Water Conservation	We will conserve supply and system capacity by reducing per capita demand and increasing water efficiency.
Operational Sustainability	Organization	We will ensure the necessary workforce, competencies, tools and resources to support current and future needs.
	Infrastructure	We will renew and improve the water system to ensure water system adequacy, dependable service, and operational efficiency.
	Customer Service	We will proactively and consistently provide a quality experience in every customer interaction.
	Technology	We will ensure that our technology systems are current and leverage opportunities in technology to effectively support current and future BWS needs.
Financial Sustainability	Financial Opportunities	We will pursue and leverage financial opportunities.
	Financial Planning	We will develop and implement short- and long-term financial plans and policies.

To achieve these objectives, a variety of initiatives are underway that align with the Strategic Plan. Among them are the WMP, development of Watershed Management Plans, the Water Conservation Plan, the Energy Savings Program, and this Long Range Financial Plan, as depicted in Figure 1-1.



Figure 1-1. BWS Plans and Programs

1.1.4 Water Master Plan

The BWS engaged in a rigorous three-year process to develop the WMP. The work effort integrated multiple elements in formulating the plan 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. The analysis included performing a thorough condition assessment of the BWS infrastructure, developing hydraulic models for the entire BWS system, performing hydraulic evaluations of the water systems, and assessing necessary system improvements. The WMP provides the basis for identifying and prioritizing capital improvement program (CIP) projects and a sustainable financial program. The Board adopted the WMP by resolution in October 2016² “institutionalizing its findings and direction and embedding them into the Organization, institutionalizing its guidance for decades to come.” The Board further resolved that BWS proceed with implementation of the WMP, and empowered the Manager with flexibility for non-substantive adjustments. The Board requires that the Manager report any updates to the WMP, as well as the Health of the Water System Scorecard, annually.

1.2 Financial Planning Process

The recommendations from the WMP provided the basis for the CIP, and the CIP provides the basis for the capital requirements in this Financial Plan. To provide both a near-term detailed assessment and a long-term trajectory, the long range financial planning process evaluates two time horizons – short term and long term. Short term refers to the current budget year plus planning years 1-10, covering the period of fiscal year (FY) 2018 – FY 2028. Long term refers to the subsequent period of FY 2029 – FY 2047. A ten-year financial model was developed for the short-term period. This model will be used to determine the revenue requirement for the 5-year rate study to be completed in FY 2018. Qualitative analyses of various planning scenarios were applied for the long-term period to help evaluate uncertainties, identify strategies, inform customers and other stakeholders, and guide decision-makers as they continue to plan for O’ahu’s water future. The relationships of these planning horizons are depicted in Figure 1-2.

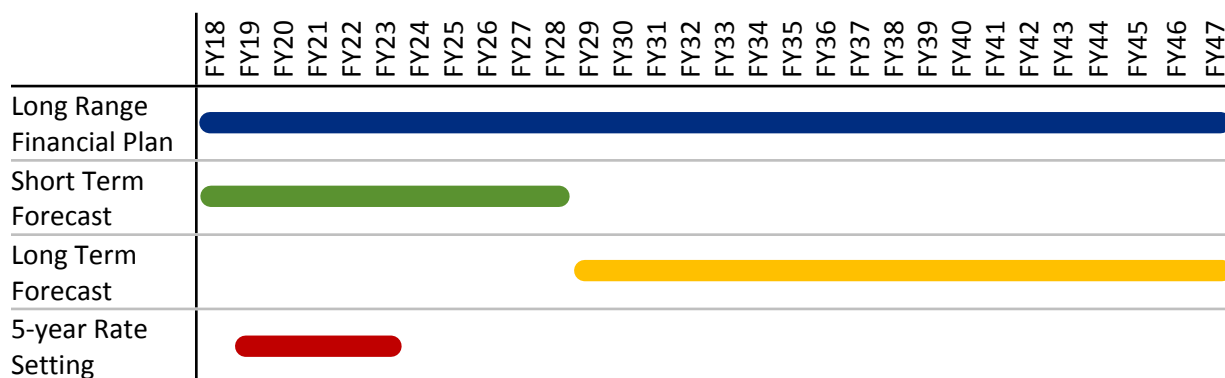


Figure 1-2. Financial Planning Time Horizons

² BWS. 2016 Water Master Plan. Available at: <https://www.boardofwatersupply.com/water-resources/water-master-plan>. October 2016.

1.3 Public Participation and Outreach

Public participation included monthly meetings with a Stakeholder Advisory Group. This group was established during the WMP development process and is continuing through the financial planning, costs of service, and rate study, which includes this Long Range Financial Plan.

The BWS not only values the input of the Stakeholder Advisory Group, but feels it is an important part of an open and transparent process for setting rates. The group is comprised of individual stakeholders representing the following interests:

- | | |
|---------------------------|----------------------------|
| ▪ Agriculture | ▪ Homeowner associations |
| ▪ Community organizations | ▪ General contractors |
| ▪ Developers | ▪ Large water users |
| ▪ Environmental | ▪ Realtors |
| ▪ Every council district | ▪ Seniors/ low income |
| ▪ Financial | ▪ Travel/ tourism industry |
| ▪ Golf | ▪ Small business |
| ▪ Hawaiian culture | ▪ Utilities |

Through the group's on-going participation, the BWS seeks to learn more about the water related perspectives and concerns of varied constituencies. Through the group's links with organizations and communities of interest, the BWS seeks to strengthen the public's understanding of O'ahu's complex water issues and enhance public confidence of the BWS's commitment and ability to provide safe, dependable, and affordable water now and into the future. As the BWS moved forward with the capital improvement program, financial plan, costs-of-service, and rate study, the members played a pivotal role by providing recommendations to the BWS on best options to achieve the critical and delicate balance between water service adequacy and dependability, and infrastructure costs and rate affordability, as well as recommendations regarding key financial policies and pipeline replacement targets.

WMP public outreach included City Administration and Legislature presentations, City Council briefings, neighborhood board meeting presentations, customer feedback surveys, focus groups, bill mailings, website and social media posting, traditional media outlets, and a public comment period.

Public outreach to the larger community related to the Long Range Financial Plan and rate study is being conducted in conjunction with the BWS's comprehensive communications related to capital programs and associated rate adjustments. Components of this effort include presentations to neighborhood boards, community-based organizations, business, interest groups, and BWS employees. It also includes feedback surveys, focus groups, website and social media posting, and traditional media outlets, including press releases, feature articles, radio interview placements, and televising Board meetings and workshops. In addition, there are briefings to and feedback from elected officials and other representatives of County, City, and State governments. Public feedback and comments are being sought through most of these outreach activities. Public hearings will be held in four regions across O'ahu prior to the Board's consideration of adopting rates.

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Section 2

Capital Expenditures

2.1 CIP Development

The BWS develops, manages, and prioritizes its capital project investments. The WMP describes the process of looking ahead 30 years, identifying and prioritizing system needs based on risk, and developing a 30-year CIP. The 30-year CIP represents the BWS's best look into the future based on currently available information. As time goes on, conditions will undoubtedly change and the influence of uncertainties may impact the accuracy of the plan in its later years. For these reasons, the BWS uses a multi-tiered CIP process, with each tier representing a different time period. Those tiers are illustrated in Figure 2-1. The multi-tiered CIP planning process provides the ability to continually reevaluate conditions and needs impacting the water system and adjust the timing and scope of planned projects to balance system dependability and affordability for customers. The 6-year CIP is used during the rate setting process so that rates are set using the most detailed information available.

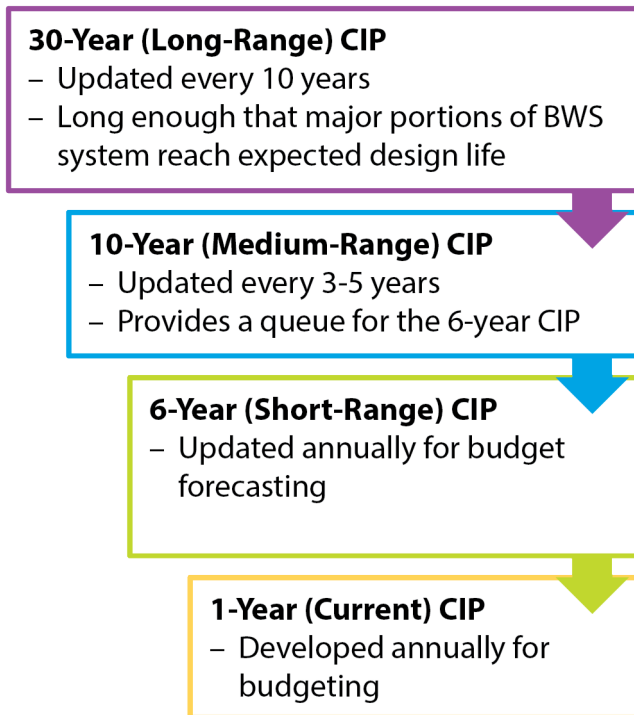


Figure 2-1. Multi-Tiered CIP Planning Process

Each tier of the CIP process feeds into the tier below it. As major needs on the horizon are identified, general placeholders are added into the 10- to 30-year time frame. As these needs approach, increased definition is added to projects. When a project enters the 10-year CIP, a more defined project description is developed and the project is scored for risk. When a project enters

the 6-year CIP, a complete scope for the project is developed by the BWS and the project is prepared for planning and design. The 1-year CIP contains the projects anticipated to be contracted in the upcoming fiscal year.

2.1.1 Project Types

The BWS categorizes capital projects in three general categories: capacity expansion projects; renewal and replacement (R&R) projects; and research and development (R&D) projects. Each of these is described further in this section.

Capacity Expansion Projects

Projects that are needed to meet growing water demand are considered capacity projects. Capacity projects most commonly result from a projected increase in water demand related to population growth or changing population distribution. A benefit of some capacity projects is an increase in system reliability due to the provision of redundant or parallel facilities.

Facilities associated with capacity projects can include wells, tunnels, treatment, pipelines, pump stations, and reservoirs. Upsizing an existing facility (e.g., a pump station or pipeline) to meet demands or fire flow requirements is also considered a capacity project, even though this need is not necessarily due to population growth.

Renewal and Replacement Projects

Projects that are needed to renew or replace worn or aging infrastructure are R&R projects. Examples of R&R projects are repairs of an existing well, improvements to existing pump stations, structural repairs or upgrades to reservoirs and replacing aged pipelines.

Research and Development Projects

Examples of R&D projects include planning and engineering studies such as:

- Feasibility studies;
- Exploratory and/or monitoring wells;
- Special monitoring;
- Condition assessment (reservoirs, pipelines, pump stations, etc.), and;
- Planning updates.

Other Projects

The BWS also has other types of projects that technically are not classified as CIP projects because they are funded under the operating budget, rather than the capital budget. These types of projects might include items such as watershed management work and water conservation programs.

2.1.2 Prioritization

CIP projects are prioritized to help the BWS most efficiently provide safe and dependable service at affordable rates. Capacity expansion projects and R&R projects are prioritized based on risk;

however, R&D projects are normally prioritized based on schedule (e.g., time elapsed since last plan update) or by a management decision.

Capacity projects are prioritized such that they can be planned, designed, constructed, tested, and operational by the time they are needed to meet the associated demand (risk increases as demand approaches). As such, they are placed in the CIP based on when the system demands are anticipated to require the expansion. For this reason, the date that capacity expansion projects are needed may be moved earlier or later, or if demands grow much more slowly than anticipated, they may never be needed.

The R&R projects contained in the 30-year CIP are prioritized based on risk. For the purposes of this prioritization, risk is the likelihood of failure multiplied by the consequence of failure. The risk-based methodology provides for the highest degree of overall system reliability at the most affordable cost. Table 2-1 summarizes how each asset was prioritized for the WMP. Future analyses will use similar prioritization.

Table 2-1. Asset Risk Prioritization Method

Asset Type	Prioritization Method
Pipelines	Statistical main break analysis to determine Likelihood of Failure (LoF), geospatial analysis based Consequence of Failure (CoF) scoring in collaboration with the BWS, decision framework for action based on LoF and CoF scores.
Pump Stations (inc. ancillary equipment)	Risk-based prioritization using criteria developed with the BWS.
Sources	Criteria scoring for LoF and CoF.
Reservoirs	Condition Assessment.
Treatment Facilities	Condition assessment.
Supervisory Control and Data Acquisition (SCADA)	Criteria scoring for LoF and CoF.
Security	Criteria scoring for LoF and CoF.
Offices and Base Yards	Criteria scoring for LoF and CoF.

2.2 Capital Cost Estimates Developed

As part of the development of the 30-year CIP, estimated capital costs were developed for each project. The capital cost of a project seeks to account for all capital costs to the BWS that the specific project will incur. Capital costs therefore include the total of the following: Construction Bid Cost, Unplanned/ Undeveloped Detail Allowance (contingency), Project Implementation Allowance (planning and design), and Other Project-related Costs (if applicable).

- **Construction Bid Cost.** This is a planning level cost expected for a well-designed project (usually indicated by tight bid grouping) that is competitively bid in a public works market.
- **Undefined/ Undeveloped Detail.** An additional markup (30 percent) is added to the Construction Bid Cost, to account for additional project work that is currently undefined/ undeveloped and uncertainties in the future bidding climate.

- **Project Implementation Allowance.** These BWS project-related costs are assumed to be 44 percent of the construction bid cost, as follows:
 - Feasibility and siting studies (13 percent),
 - Preliminary and final design engineering, preparation of construction plans and specifications, and permitting (16 percent),
 - Design engineering support during construction, construction surveying, start-up services and as-built drawings (5 percent), and
 - Change order allowance (10 percent).

The default Construction Cost to Capital Cost multipliers shown above total 1.74. However, these multipliers were modified where additional information about specific projects was known.

Cost estimates for each project were obtained from one of several different sources. For upcoming projects that have finished design, the design engineer's opinion of probable construction cost was used. For near-term projects that have already had detailed cost estimates completed, those estimates were used. For new planning level projects that were added to the CIP, new planning level estimates were developed.

Historical trends in BWS construction costs were also evaluated. It was found that the rate of change in construction costs in Hawaii has increased at a significantly higher rate than on the mainland. From 2013 to 2016 construction costs increased ~25 percent, likely due to Honolulu Authority for Rapid Transportation rail and transit-oriented development (TOD) construction. The rate of construction cost increases is expected to be lower once rail and TOD are completed. Additionally, the University of Hawaii Economic Research Organization (UHERO) forecasts slowing construction activity in 2018. Variable construction costs have significant implications for long-term capital improvement funding and rate planning.

2.3 Capital Improvement Program Alternatives

Various CIP financial planning scenarios were developed as the BWS worked towards defining the long-term CIP and establishing a Financial Plan to support this CIP. The projects included in the CIP were developed from the 30-year WMP. Several assumptions and notes are included across all scenarios:

1. The scenarios only vary R&R pipeline replacement rates. All other CIP categories are fixed across the scenarios. This is because pipelines make up by far the largest portion (nearly 70 percent) of the CIP, and is also the asset class that can most easily be deferred with manageable consequences.
2. The projects are completed in the order of the CIP. Once all defined projects are completed, the model assumes pipelines are replaced in order of risk.
3. The main break projection uses the BWS's break records and statistical analysis to predict the number of breaks in each scenario. Note that these predictions are less certain the further into the future the prediction is made. Additionally, the prediction represents a

likely value and the actual number of main breaks each year can vary by 15 percent or more from the 5-year average.

4. The 30-year WMP recommends replacement of approximately 1 percent of pipelines per year. This recommendation allows the entire system to be replaced at about the life expectancy of buried pipelines (100 years). References to 1 percent or 21 miles/yr meet this recommendation.
5. The main break rate increases in the next several years for all scenarios, peaking between FY 2023 and FY 2030 depending on scenario. This is because the first year's pipe replacement is less than ~18 miles/yr, which is needed to lower the break rate. Main break reductions, where seen, are after an initial increase.
6. Costs shown in this section are in FY 2017 dollars, and are not escalated for annual increases in construction costs. The rest of the Long Range Financial Plan will present escalated costs (anticipated cost in the future year).

2.3.1 Scenario Descriptions

The scenarios presented for consideration in the Financial Plan are described below. Each scenario is given a number and short descriptor.

Do Nothing

The Do Nothing scenario eliminates R&R pipeline replacement. Under this scenario main breaks increase quickly as pipelines age. This scenario is included to provide an upper limit on the main break projections.

PL1 – Status Quo

The Status Quo scenario maintains the FY 2006-FY 2016 average pipeline replacement rate of 6 miles/yr. This rate of pipeline replacement can be completed within the current CIP spending of \$80 M/yr. This scenario is included to illustrate the rate of main breaks assuming no change in pipeline replacement rate.

PL2 – Ramp Up to 1 percent

The Ramp Up to 1 percent scenario increases the rate of pipeline replacement at 15 percent per year to reach just over 21 miles/yr of pipeline replacement in FY 2027. This scenario is included to provide a ramp up of pipeline replacement while considering that implementing rapid increases in replacement rate may not be feasible due to the BWS staffing capacity, contractor capacity, and other considerations. This scenario reaches the target 1 percent of pipelines contracted in 10 years (constructed in 13 years).

Under this scenario, main breaks increase to nearly 350 breaks/yr before decreasing to less than 300 breaks/yr by FY 2032.

PL3 – Reduce Main Breaks

The Reduce Main Breaks scenario increases pipeline replacement aggressively at 25 percent per year to a maximum of over 28 miles/yr for 5 years before returning to a 1 percent replacement rate of 21 miles/yr. When this scenario was named, it appeared that this high level of

replacement would be required to reduce main breaks in the long term. After modelling was refined, several other scenarios were also able to reduce main breaks below 300 breaks/yr in the medium to long term. This scenario is included to provide an upper limit of the rate of pipeline replacement to drive down main breaks as soon, and as low, as possible, and invest early in the pipeline assets.

PL4 – Target 300

The Target 300 scenario follows PL2 – Ramp Up to 1 percent for the first several years, increasing the pipeline replacement rate to 15 percent per year but stops increasing at 16 miles/yr in FY 2026. The replacement rate is then varied over the rest of the CIP to maintain 300 main breaks/yr. This scenario is included to show the necessary rate of pipeline replacement to maintain a status quo level of service with respect to main breaks.

PL5 – Slow Ramp-up

The Slow Ramp-up scenario increases the rate of pipeline replacement by 0.61 miles/yr to arrive at an annual pipeline replacement of 22.5 miles/yr by the end of the CIP. This scenario is included to show the effect of dampening the varying rate of pipeline replacement in PL4 – Target 300, to a slow and steady increase.

PL6 – Step-wise Increase

The Step-wise Increase scenario defines total CIP costs stepping up every 3 years by about \$25 million instead of defining pipeline replacement miles. This scenario is included to show the impact of a dollar cost management of the CIP. The steps are intended to allow time for the BWS to determine if the goals of the CIP are being met before each increase, so that increases can be delayed or eliminated if needed.

PL7 – 21 mi/yr installed in 10 yrs

The “21 in 10” scenario increases the rate of pipeline replacement at 31 percent per year to reach 21 miles/yr of pipeline installed within 10 years. This is similar to PL2 – Ramp Up to 1 percent, except it reaches the target rate 3 years earlier to account for construction duration. This scenario is included to show the rate of pipeline replacement increase and the resultant main break rate to meet the WMP target in 10 years.

2.3.2 Main Break Forecasting

The previously discussed scenarios were applied to a main break model to determine how the projected main break rate could be affected for each. The total number of pipeline replacement miles is shown in Figure 2-2.

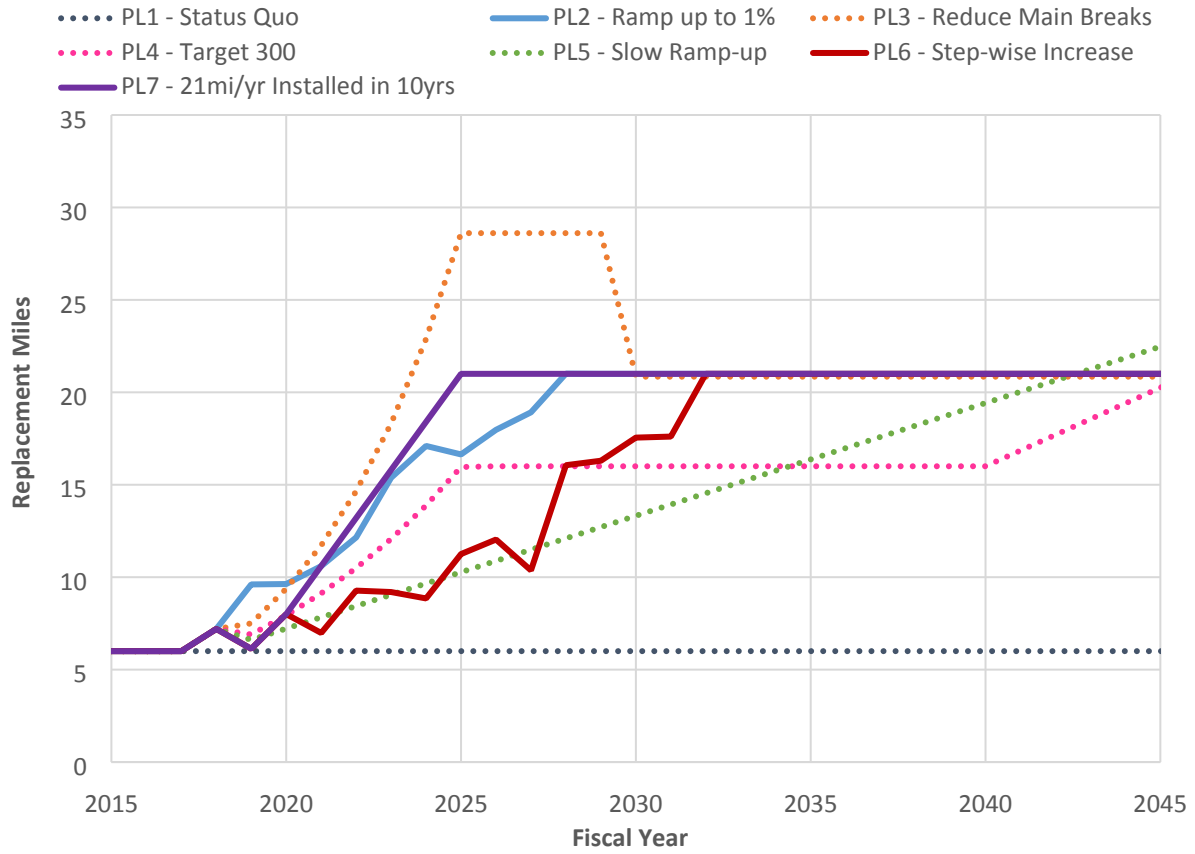


Figure 2-2. Rate of Pipeline Replacement Over Time for Each Scenario

However, as the R&R pipeline replacement is only a portion of the total CIP, Figure 2-3 shows the total CIP costs associated with each scenario.

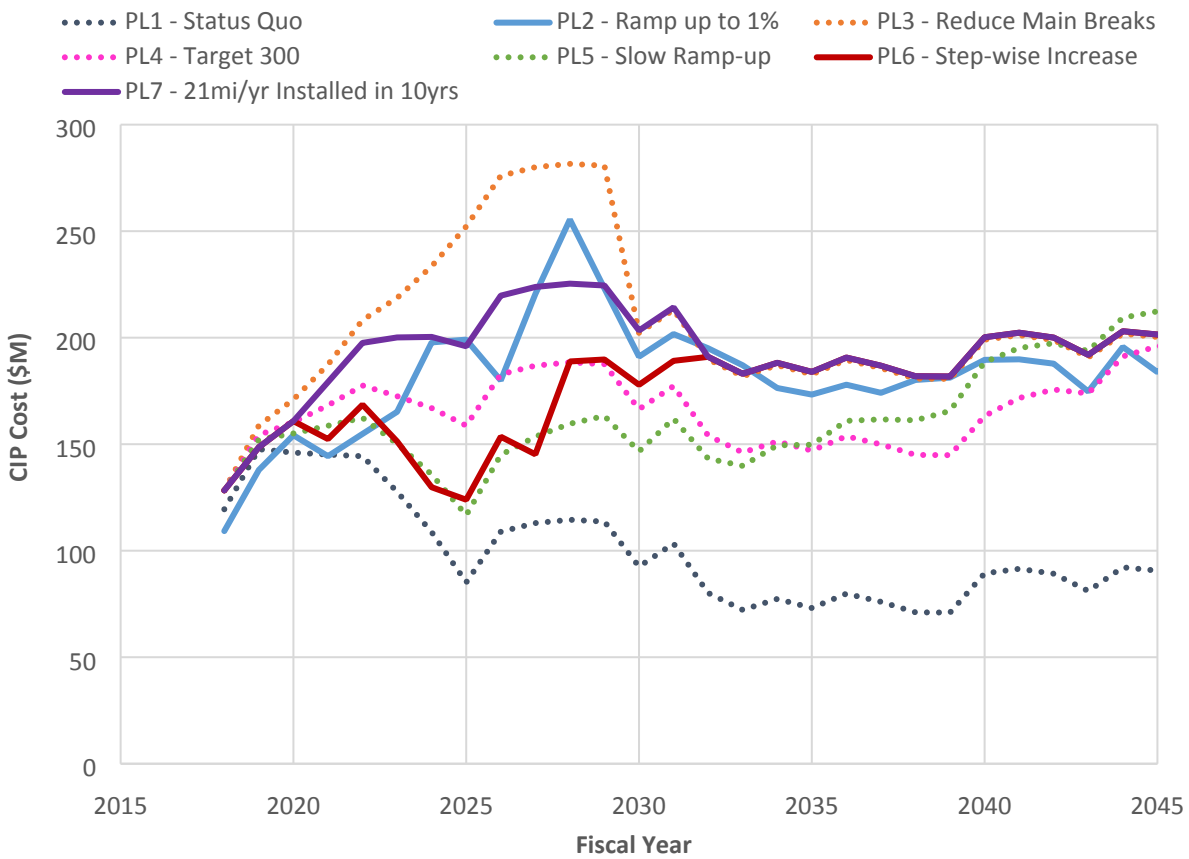


Figure 2-3. Total CIP Cost for Each Scenario

Finally, Figure 2-4 illustrates the main break rates for each scenario. Note that the main break rate increased for every scenario, as several years are needed for the impact of increased pipeline replacement to be realized. Also, note that the main break rate falls nearly to, or below, 300 in every scenario other than Do Nothing and PL1 – Status Quo.

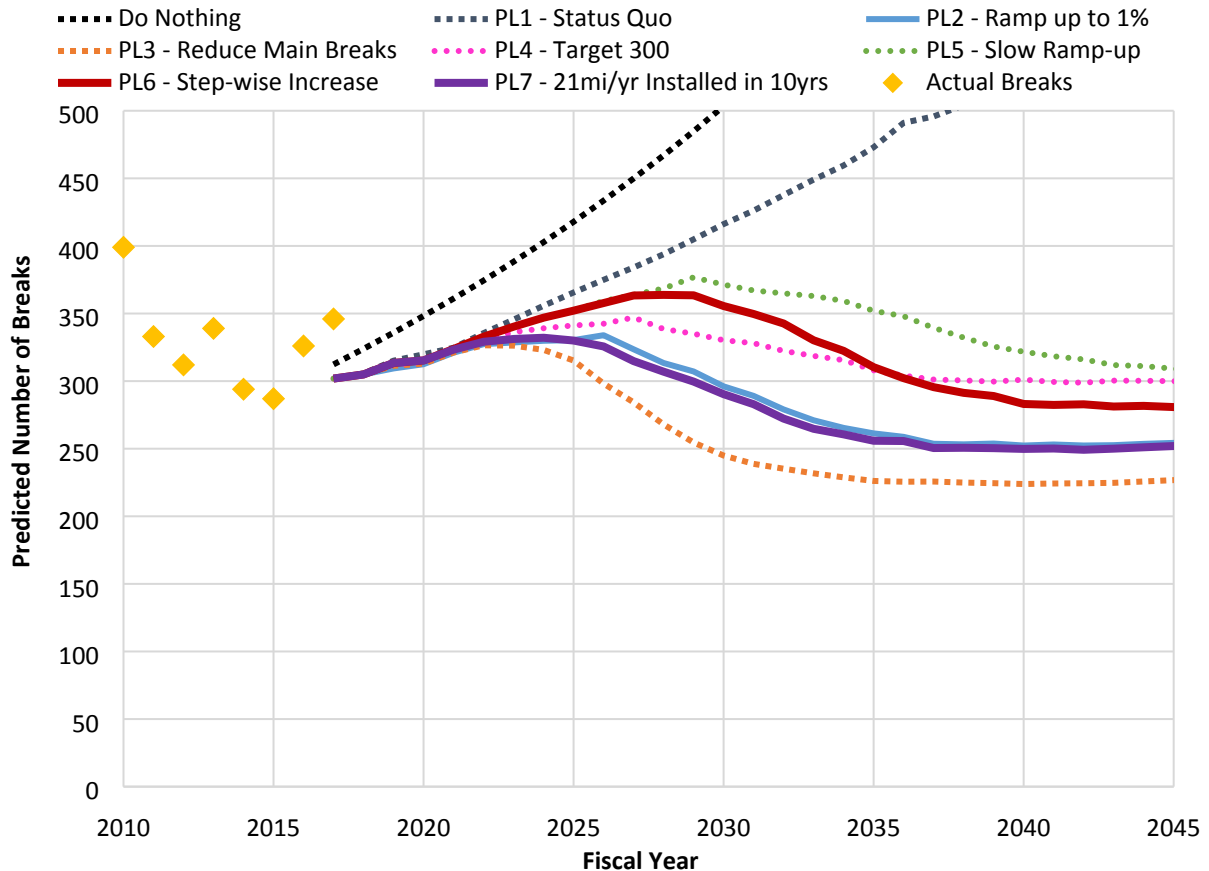


Figure 2-4. Main Break Projections for Each Scenario

2.4 Capital Improvement Program Alternatives Evaluation

The alternatives and results reported in Section 2.3 were presented to the Stakeholder Advisory Group over several meetings from November 2016 through August 2017. Each step of alternative development was conducted with Stakeholder input, from identification of which alternatives to consider, to how results are presented and understood and what conclusions should be drawn from the analysis.

At the first presentation in November 2016, only alternatives PL1, PL2, and PL3 were presented. Stakeholders requested more detail in the regions between PL1 and PL3, and so additional scenarios were developed.

Both quantitative and qualitative factors were considered in the alternatives evaluation, and included:

- Quantitative:

- Number of pipeline miles replaced
- CIP cost
- Number of main breaks prevented
- Changes in cumulative revenue requirement
- Amount of bonds issued
- Alignment with WMP goals
 - *Target 300 main breaks per year*
 - *Increase pipeline replacement to 21 miles per year*
- Qualitative
 - Feasibility of Implementation
 - *Internal resources/ hiring/ training limitations*
 - *Consultant/ contractor/ material supply capacities*
 - *Traffic/ roadway/ business disruptions*
 - Shifting burden to future generations
 - *Lower costs for us today*
 - *Increasing number of main breaks in the future*
 - *Higher costs for our children and their children*

After the main break modeling was completed, results were presented to Stakeholders in July and August 2017. Stakeholders worked in small groups to discuss the merits of each alternative and develop recommendations for the Board to consider, which included the reasoning for their scenario preferences. In general, items that were important to the Stakeholders included:

- Not shifting the burden of main replacement to future generations
- Does not cause unacceptable and sudden increases in rates
- Does not increase so fast that the BWS would struggle to keep up with implementation
- Recognizes that increased pipe replacement means more roads under construction and more inconvenience for drivers
- Alignment with the WMP

In the end, the Stakeholders preferred PL2 and PL6. This preference and the underlying reasoning were presented to the Board in August 2017, where a similar presentation of the alternatives was given.

2.5 Preferred Capital Improvement Program Alternative

The Board, after receiving input from the Stakeholder Advisory Group and the BWS staff, provided guidance that scenario PL2 should be carried forward in the Long Range Financial Plan. While the Board agreed with the Stakeholders that PL6 met many of the objectives, they felt that PL2 was more aggressive in reducing main breaks and more closely aligned with the goals of the WMP. The Board also recognized the challenges in implementing a more aggressive pipeline replacement scenario and will review progress annually and make adjustments if necessary.

Table 2-2 summarizes the annual projected costs of CIP Scenario PL2 by asset category through FY 2028 and Table 2-3 shows the 30-year CIP in five-year increments. Figure 2-5 illustrates the scenario in terms of miles of pipeline projected to be replaced, cost of capital projects in FY 2017 dollars, and forecasted main breaks.

Table 2-2. PL2 CIP Scenario Costs Through FY 2028, \$M

	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Non-potable	\$0.0	\$0.0	\$2.5	\$7.5	\$0.0	\$12.1	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Tools & Resources	\$3.0	\$3.7	\$5.8	\$2.3	\$2.3	\$2.7	\$0.3	\$0.3	\$6.1	\$0.3	\$0.3
Treatment	\$2.1	\$11.3	\$11.9	\$7.7	\$33.5	\$10.6	\$0.8	\$0.8	\$0.6	\$0.4	\$6.3
Sources	\$10.1	\$3.2	\$0.7	\$27.6	\$23.0	\$0.7	\$9.2	\$3.8	\$4.0	\$19.0	\$30.4
Facilities	\$40.1	\$51.3	\$34.0	\$26.3	\$14.7	\$8.1	\$8.4	\$9.0	\$11.4	\$11.4	\$7.4
Storage	\$0.7	\$18.5	\$24.6	\$8.8	\$22.8	\$35.3	\$32.2	\$17.5	\$26.0	\$7.8	\$10.0
Pumps	\$43.5	\$15.3	\$22.4	\$15.6	\$8.8	\$13.9	\$13.2	\$9.4	\$16.4	\$29.8	\$15.9
Pipelines	\$44.9	\$34.6	\$58.4	\$44.8	\$77.8	\$76.0	\$123.2	\$156.6	\$115.4	\$147.1	\$185.3
TOTAL	\$144.3	\$137.9	\$160.2	\$140.6	\$182.8	\$159.3	\$187.2	\$197.4	\$179.9	\$215.7	\$255.4

Costs in Table 2-2 are shown in FY 2017 dollars (except for FY 2018, which is budgeted FY 2018\$).

Table 2-3. PL2 CIP Scenario Costs Through FY 2047, Five Year Increments, \$M

	FY 2018 – FY 2022	FY 2023 – FY 2027	FY 2028 – FY 2032	FY 2033 – FY 2037	FY 2038 – FY 2042	FY 2043 – FY 2047
Non-potable	\$10.0	\$12.1	\$0.0	\$0.0	\$4.6	\$39.0
Tools & Resources	\$17.2	\$9.7	\$1.5	\$7.3	\$1.5	\$13.5
Treatment	\$66.4	\$13.2	\$27.2	\$31.7	\$30.1	\$30.0
Sources	\$64.5	\$36.7	\$84.1	\$8.0	\$51.4	\$3.5
Facilities	\$166.3	\$48.3	\$36.9	\$9.5	\$9.5	\$9.6
Storage	\$75.4	\$118.7	\$53.7	\$54.8	\$47.1	\$46.8
Pumps	\$105.6	\$82.7	\$79.2	\$45.4	\$46.2	\$74.2
Pipelines	\$260.5	\$618.2	\$783.8	\$731.9	\$738.2	\$736.0
Total	\$765.8	\$939.6	\$1,066.3	\$888.7	\$928.6	\$952.6

Costs in Table 2-3 are shown in 2017 dollars (except for FY 2018, which is budgeted FY 2018\$).

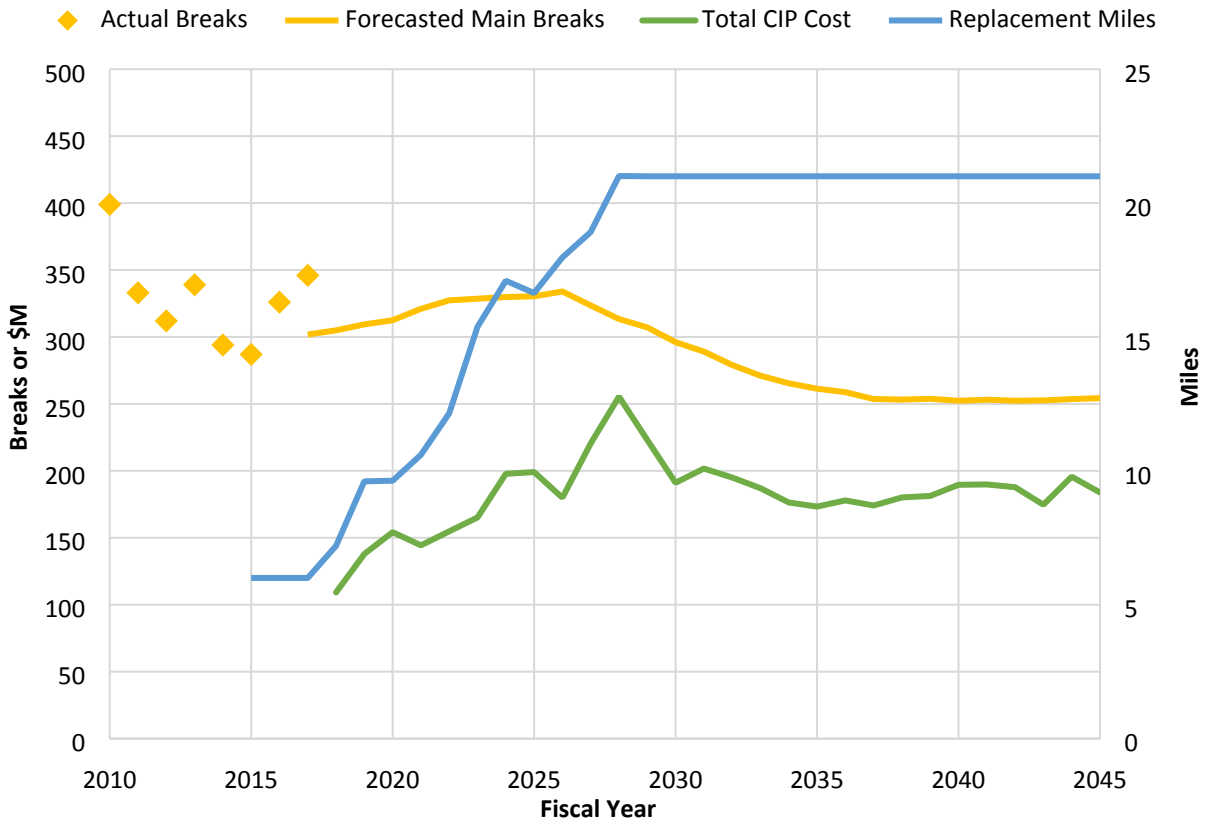


Figure 2-5. CIP Scenario PL2

Section 3

Operating Expenditures

3.1 Overview of Operating and Maintenance Costs

The BWS staff develops an annual budget of its operating and maintenance (O&M) costs, which is approved by its Board. To support the 30-year planning effort, the BWS staff developed an O&M forecast covering FY 2019 through FY 2027, in addition to its FY 2018 budget. As discussed below, this forecast was adjusted to future year dollars (where not already done so) and to reflect historical differences between actual and budgeted O&M.

3.2 BWS O&M Forecast

Table 3-1 summarizes the budgeted FY 2018 and forecasted FY 2019 – FY 2027 O&M costs provided by the BWS. Future debt service budgeted by the BWS is not shown in this table as that is modeled as a separate part of the revenue requirements.

Table 3-1. Budgeted and Forecasted O&M Developed by the BWS, \$M

Division & Staff Office	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027
Office of the Manager & Chief Engineer	\$0.9	\$0.9	\$1.0	\$1.0	\$1.0	\$1.0	\$1.1	\$1.1	\$1.1	\$1.1
Executive Support Office	\$9.0	\$8.8	\$8.9	\$9.3	\$9.4	\$9.6	\$9.7	\$9.8	\$10.0	\$10.1
Communications Office	\$1.2	\$1.2	\$1.2	\$1.2	\$1.4	\$1.4	\$1.4	\$1.5	\$1.6	\$1.7
Ocean Cooling	\$0.6	\$0.6	\$0.6	\$0.6	\$0.6	\$0.6	\$0.6	\$0.6	\$0.0	\$0.0
Human Resources Office	\$0.7	\$0.8	\$0.8	\$0.7	\$0.8	\$0.8	\$0.8	\$0.8	\$0.8	\$0.8
Water Quality Division	\$5.7	\$5.4	\$5.1	\$5.5	\$5.6	\$5.7	\$5.9	\$6.0	\$6.2	\$6.4
Customer Care Division	\$6.2	\$6.6	\$6.8	\$7.1	\$7.4	\$7.8	\$8.1	\$8.5	\$8.8	\$9.2
Land	\$0.7	\$0.7	\$0.8	\$0.8	\$0.8	\$0.9	\$0.9	\$0.9	\$0.9	\$0.9
Water Resources Division	\$11.8	\$10.9	\$11.3	\$11.5	\$11.7	\$11.9	\$12.1	\$12.2	\$12.4	\$12.4
Field Operations	\$31.6	\$32.8	\$34.1	\$35.5	\$37.0	\$38.6	\$40.3	\$42.0	\$43.9	\$46.0
Capital Projects	\$6.6	\$7.2	\$7.7	\$7.9	\$8.3	\$8.5	\$8.7	\$8.9	\$8.9	\$9.1
Water Systems Operation Division	\$19.0	\$16.9	\$17.2	\$17.8	\$17.9	\$18.7	\$18.8	\$18.8	\$18.9	\$20.0
IT Division	\$13.2	\$13.2	\$13.0	\$12.8	\$13.8	\$15.1	\$14.4	\$15.2	\$16.4	\$16.0
Finance Division	\$5.1	\$5.4	\$5.4	\$5.5	\$6.1	\$5.9	\$5.9	\$5.8	\$5.8	\$6.0
Fixed Charges	\$48.2	\$49.2	\$50.5	\$51.8	\$53.1	\$54.5	\$56.0	\$57.5	\$59.0	\$60.6
Total (1)	\$160	\$161	\$164	\$169	\$175	\$181	\$185	\$190	\$195	\$200

(1) Does not include future debt service as that is modeled as a separate part of the revenue requirements.

The projections reflect that parts of the O&M are driven by the increased capital improvement program and focus on watershed management, conservation, and recycled water operations per the WMP. Some goals from the WMP that would increase O&M costs include the following:

- A goal of 4 percent of CIP has been set for watershed management O&M activities,
- A goal of 4 percent of CIP for conservation-related O&M activities,
- Increase the percent of pipeline leak detection from 18 percent to 25 percent, as well as additional planning to identify and prioritize high-risk pipes,
- Increased maintenance costs to increase the availability of pump stations from 82 percent to greater than 90 percent, and
- Increased effort to investigate, identify, and plan remedies for water loss.
- Have 100 percent of sources, pump stations, water treatment plants, and reservoirs utilizing microwave backbone for control data by FY 2023; which increases SCADA costs.

The costs provided include a mix of FY 2018 dollars and future year dollars. Therefore, the forecast was adjusted to bring all costs to future year dollars, as well as other adjustments as discussed in the following section.

3.3 Adjusted O&M Forecast

The forecast shown in Table 3-1 was adjusted in three ways to determine O&M related revenue requirements for the financial plan. First, those costs provided in FY 2018 dollars were converted to future year dollars using a factor of 2.5 percent per year, as shown in Table 3-2. The 2.5 percent factor was chosen based on input from the BWS and that the 30-year Hawaii Consumer Price Index annual average change in costs has been 3.0 percent per year.

Table 3-2. Summary of Escalation to Future Year Dollars of the BWS's Forecasted O&M

Cost Category	Year Dollars	BWS Escalation Method (if any)	Escalation to Future Year (if needed)
Salary	Future Year	Real changes in costs (e.g., additional staff) plus: 2 percent per year increase through FY 2023, then 1 percent per year increase from FY 2024 through FY 2027 to bring dollars to future year dollars.	No further adjustment. Annual average change in costs between FY 2018 – FY 2028 is 2.7 percent per year.
Fixed Charges (Total)	Future Year		No further adjustment. Annual average change in costs between FY 2018 – FY 2028 is 2.5 percent per year.
Employee Retirement System		5 percent per year escalation	
Central Administration Services		Fixed fee	
Remaining Fixed Charges Items		2 percent per year escalation	
Materials, Supplies, and Services	Current Year	Includes real changes in costs (e.g., process changes that require more supplies). Average annual change in real costs between FY 2018 and FY 2027 is 2.5 percent per year.	Additional 2.5 percent per year. Annual average change in costs between FY 2018 – FY 2028 is 5.1 percent per year.
Equipment	Current Year	Includes real changes in costs (e.g., process changes that require more supplies). Average annual real change in costs between FY 2018 and FY 2027 is - 0.9 percent per year.	Additional 2.5 percent per year. Annual average change in costs between FY 2018 – FY 2028 is 1.7 percent per year.

Second, the O&M forecast was then adjusted downward to reflect historical spending. This reduction was done to ensure that future costs were not overstated, as O&M costs are an important part of the annual revenue requirement. An analysis of the historical actual and budgeted O&M shows that, on average, the BWS spends 81 percent of its O&M budget, as shown in Table 3-3. To address this, the BWS applied a more rigorous budgeting process for FY 2018. Therefore, an adjustment factor of 85 percent is applied to the forecasted O&M to calculate O&M related revenue requirements.

Table 3-3. Historical O&M Budgets and Actuals, \$M

	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	Average
Budget	\$143	\$147	\$156	\$164	\$172	\$156
Actual	\$123	\$120	\$131	\$130	\$130 (1)	\$127
Percent of Budget	86%	81%	84%	80%	76%	81%

(1) Preliminary FY2017 actual O&M.

The third adjustment was to include a capital improvement program implementation allowance as an estimate of the cost of program/ project management services to administer the capital improvement program, either through internal resources or via consulting resources. The allowance is estimated at 1 percent of total construction costs based on discussions with the BWS.

The annual average increase in adjusted O&M costs between FY 2018 and FY 2027 is 3.6 percent per year. Therefore, to estimate FY 2028 and beyond, a rounded value of 3.5 percent per year has been used. The resulting O&M forecast shown in Table 3-4 grows from \$137 million in FY 2018 to \$197 million in FY 2028.

Table 3-4. Adjusted Forecasted O&M, \$M

Division & Staff Office	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Office of the Manager & Chief Engineer	\$0.8	\$0.8	\$0.8	\$0.9	\$0.9	\$0.9	\$0.9	\$1.0	\$1.0	\$1.0	\$1.0
Executive Support Office	\$7.6	\$7.7	\$7.9	\$8.4	\$8.7	\$9.0	\$9.3	\$9.7	\$10.0	\$10.4	\$10.9
Communications Office	\$1.0	\$1.0	\$1.0	\$1.1	\$1.2	\$1.2	\$1.3	\$1.4	\$1.5	\$1.6	\$1.7
Ocean Cooling	\$0.5	\$0.5	\$0.6	\$0.6	\$0.6	\$0.6	\$0.6	\$0.6	\$0.6	\$0.0	\$0.0
Human Resources Office	\$0.6	\$0.7	\$0.7	\$0.6	\$0.6	\$0.7	\$0.7	\$0.7	\$0.7	\$0.7	\$0.7
Water Quality Division	\$4.9	\$4.7	\$4.5	\$5.0	\$5.1	\$5.2	\$5.6	\$5.8	\$6.0	\$6.3	\$6.6
Customer Care Division	\$5.2	\$5.6	\$5.9	\$6.2	\$6.5	\$6.9	\$7.2	\$7.6	\$8.0	\$8.5	\$8.8
Land	\$0.6	\$0.6	\$0.7	\$0.7	\$0.7	\$0.8	\$0.8	\$0.8	\$0.8	\$0.9	\$0.9
Water Resources Division	\$10.0	\$9.4	\$10.0	\$10.3	\$10.7	\$11.1	\$11.4	\$11.7	\$12.1	\$12.5	\$13.0
Field Operations	\$26.8	\$28.2	\$29.7	\$31.4	\$33.2	\$35.2	\$37.3	\$39.6	\$42.2	\$45.0	\$46.9
Capital Projects	\$5.6	\$6.1	\$6.6	\$6.8	\$7.1	\$7.3	\$7.5	\$7.7	\$7.8	\$7.9	\$8.1
Water Systems Operation Division	\$16.2	\$14.5	\$15.1	\$15.8	\$16.2	\$17.1	\$17.4	\$17.8	\$18.2	\$19.6	\$20.3
IT Division	\$11.2	\$11.4	\$11.5	\$11.4	\$12.6	\$14.1	\$13.6	\$14.6	\$16.1	\$16.0	\$16.7
Finance Division	\$4.3	\$4.6	\$4.6	\$4.8	\$5.4	\$5.3	\$5.3	\$5.3	\$5.4	\$5.7	\$5.9
Fixed Charges	\$41.4	\$42.3	\$43.4	\$44.5	\$45.7	\$46.8	\$48.1	\$49.3	\$50.6	\$52.0	\$53.2
CIP Implementation Allowance	\$0.0	\$0.8	\$1.0	\$0.9	\$1.2	\$1.1	\$1.3	\$1.4	\$1.3	\$1.6	\$2.0
Total (1)	\$137	\$139	\$144	\$149	\$156	\$163	\$168	\$175	\$182	\$190	\$197
BWS (Table 3-1)	\$160	\$161	\$164	\$169	\$175	\$181	\$185	\$190	\$195	\$200	--

(1) Does not include future debt service as that is modeled as a separate part of the revenue requirements.

The costs shown by division and staff office above can also be shown by cost type such as labor, materials or equipment. This breakdown is shown below.

3.3.1 Personnel Services

Personnel services covers direct salaries and wages, including overtime, as well as miscellaneous payroll costs for labor related to operations and capital projects. Direct salaries and wages are driven by collective bargaining. The category does not include benefits, which are included in fixed charges. The FY 2018 budget is based on 805 full time equivalents (permanent and contract), and the number of full time equivalents is expected to grow by 46 over the period. According to the BWS, the forecast over the planning horizon includes the creation of 21 new positions, which are fully offset by eliminating existing positions that will no longer be needed. The forecast, before converting to future year dollars, included real increases in salary of less than 1 percent per year. Costs for personnel services are expected to be \$39.2 million in FY 2018, growing to \$51.4 million by FY 2028, or 2.7 percent per year.

Table 3-5. Personnel Services by FY, \$M

Line Item	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Full Time Equivalent Positions (1)	805	826	831	834	839	843	848	849	850	851	851
Adjusted Forecast	\$39.2	\$42.4	\$43.8	\$45.1	\$46.3	\$47.5	\$48.3	\$48.9	\$49.2	\$50.0	\$51.4

(1) Permanent and contract.

3.3.2 Materials, Supplies & Services

Materials, supplies and services covers costs related to items such as contractual services¹, printing, professional services², supplies (e.g., office supplies, chemicals, tires, etc.), repair and maintenance related equipment (e.g., spare parts), equipment less than \$5,000, travel and training expenses, software licenses and miscellaneous fees. The adjusted forecast estimates \$51.6 million for these expenses in FY 2018, growing to \$84.7 million in FY 2028, or 5.1 percent per year.

Table 3-6. Materials, Supplies, and Services by FY, \$M

Line Item	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Adjusted Forecast	\$51.6	\$50.9	\$53.0	\$55.8	\$59.9	\$64.3	\$67.0	\$71.7	\$76.5	\$80.6	\$84.7

3.3.3 Equipment

The equipment category covers costs related to vehicles and other equipment such as construction equipment that costs more than \$5,000. The adjusted forecast grows from \$4.6 million for these costs in FY 2018 to \$5.5 million in FY 2028, or 1.7 percent per year.

¹ Contractual services include services such as janitorial, security guards and landscaping.

² Professional services include services such as engineering, financial advisors, rate consultants, and lawyers.

Table 3-7. Equipment by FY, \$M

Line Item	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Adjusted Forecast	\$4.6	\$2.7	\$2.7	\$2.9	\$3.3	\$3.6	\$3.8	\$3.7	\$4.0	\$5.3	\$5.5

3.3.4 Fixed Charges

The BWS includes certain major operating costs in the category of fixed charges. These categories include utility costs for electric energy to pump water, operate wells and reservoirs, and to power the various buildings occupied by the BWS, as well as for wastewater charges. The BWS contributions to central administrative service expenses³ are included in this category as well as employee benefits and charges such as contributions to the employee retirement system, Federal Insurance Contributions Act contributions, health benefits for current employees and retirees, other post-employment benefits, and unemployment insurance benefits. The forecast shown in Table 3-8 projects fixed charges to be \$41.4 million in FY 2018, growing to \$53.2 million in FY 2028, or 2.5 percent per year.

Table 3-8. Fixed Charges by FY, \$M

Line Item	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Utilities	\$18.7	\$19.1	\$19.5	\$19.8	\$20.2	\$20.6	\$21.1	\$21.5	\$21.9	\$22.3	\$22.7
Central Administration Services	\$3.3	\$3.3	\$3.3	\$3.3	\$3.3	\$3.3	\$3.3	\$3.3	\$3.3	\$3.3	\$3.3
Employee Benefits	\$19.4	\$20.0	\$20.7	\$21.4	\$22.1	\$22.9	\$23.7	\$24.6	\$25.4	\$26.4	\$27.2
Total (1)	\$41.4	\$42.3	\$43.4	\$44.5	\$45.7	\$46.8	\$48.1	\$49.3	\$50.6	\$52.0	\$53.2

(1) Does not include future debt service as that is modeled as a separate part of the revenue requirements.

3.4 Ten-year Operating Cost Projections

Table 3-9 summarizes the forecasted adjusted annual operating costs through FY 2028. By FY 2028, operating expenses are expected to be \$197 million.

³ The central administrative services expense is a fee paid by the BWS to the City of Honolulu via an agreement for treasury, personnel, purchasing and other services that the city provides to the BWS on an on-going basis.

Table 3-9. Forecasted Operating Expenses through FY 2028, \$M

Line Item	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Personnel Services	\$39.2	\$42.4	\$43.8	\$45.1	\$46.3	\$47.5	\$48.3	\$48.9	\$49.2	\$50.0	\$51.4
Materials, Supplies & Services	\$51.6	\$50.9	\$53.0	\$55.8	\$59.9	\$64.3	\$67.0	\$71.7	\$76.5	\$80.6	\$84.7
Equipment	\$4.6	\$2.7	\$2.7	\$2.9	\$3.3	\$3.6	\$3.8	\$3.7	\$4.0	\$5.3	\$5.5
Fixed Charges	\$41.4	\$42.3	\$43.4	\$44.5	\$45.7	\$46.8	\$48.1	\$49.3	\$50.6	\$52.0	\$53.2
CIP Implementation Allowance	\$0.0	\$0.8	\$1.0	\$0.9	\$1.2	\$1.1	\$1.3	\$1.4	\$1.3	\$1.6	\$2.0
Total (1)	\$137	\$139	\$144	\$149	\$156	\$163	\$168	\$175	\$182	\$190	\$197

(1) Does not include future debt service as that is modeled as a separate part of the revenue requirements.

3.5 Long Range Operating Cost Projections

The long range operating cost projections take a high level look at what O&M costs might be over a 30-year horizon, based on anticipated escalation rates. These forecasts are used in the long range financial forecast included in Section 6.

3.5.1 Escalation

As discussed Section 3.3, the annual average increase in adjusted O&M costs between FY 2018 and FY 2027 is 3.6 percent per year. Therefore, to estimate FY 2028 and beyond, a rounded value of 3.5 percent per year has been used.

3.5.2 O&M Projections

The long range O&M projection is summarized in Table 3-10 below. This table shows the total costs over each of the five-year periods shown. These are for planning purposes only and are intended to provide a base case against which to measure future results as well as sensitivity to different assumptions. As shown below, the forecasted O&M costs could more than double over the long range planning horizon.

Table 3-10. Projected Operating Expenses through FY 2047, Five-Year Increments, \$M

O&M	FY 2018 – FY 2022	FY 2023 – FY 2027	FY 2028 – FY 2032	FY 2033 – FY 2037	FY 2038 – FY 2042	FY 2043 – FY 2047
Personnel Services	\$217	\$244	\$275	\$327	\$389	\$462
Materials, Supplies & Services	\$271	\$360	\$454	\$540	\$641	\$761
Equipment	\$16	\$20	\$29	\$35	\$41	\$49
Fixed Charges	\$217	\$247	\$285	\$339	\$403	\$478
CIP Implementation Allowance	\$4	\$7	\$9	\$8	\$10	\$12
Total (1)	\$726	\$878	\$1,053	\$1,249	\$1,483	\$1,762

(1) Does not include future debt service as that is modeled as a separate part of the revenue requirements.

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Section 4

Financial Policies

4.1 Key Financial Metrics

While each of the major credit rating agencies (Moody's Investor Services (Moody's), Standard & Poor's Global Ratings (S&P), Fitch Ratings (Fitch)) use different metrics and methodologies to evaluate the financial strength of municipal water utilities, critical financial metrics include 1) liquidity as measured by available days cash on hand (working capital), 2) ability to fund annual principal and interest payments (as measured by debt service coverage ratio), and 3) capitalization levels (as measured by debt to asset (or equity) ratio). The BWS financial policies utilize these metrics, among other factors, to help define financial goals. This subsection describes these three key metrics and how they are viewed by the credit rating agencies. Subsequent subsections describe the BWS's financial policies specifically.

Working Capital: Working capital is the amount of cash on hand that can be used to meet the needs of providing water service and to cover differences in timing between receipts and expenditures. Days cash on hand reflects the ability of an agency to continue operating even without additional revenues. For example, an agency with 90 days cash on hand has readily available funds to meet 90 days of operating expenditures. Generally, the higher the days of working capital, the higher the bond rating assigned (presuming no other major negative metrics). As noted above, each of the credit rating agencies has different methodologies and parameters for evaluating liquidity (or days cash on hand). Moody's criteria states that utilities in the Aa category should have at least 150 days of cash, with a typical range between 150 and 250 days. Fitch considers greater than 365 days of working capital a strong position and having at least 180 days of working capital a medium position. S&P's published rating criteria identifies at least 90 days of working capital for an AA rating. Bond rating agencies look at available funds (sometimes referred to as unrestricted funds or unrestricted fund balance), including encumbered (i.e., funds that have been identified for a specific capital project or other program) and unencumbered cash, in calculating days of working capital. Encumbered funds are included in the calculation of available funds, because the utility has the ability to cancel or delay projects and redirect these funds in the event of a financial crisis and fulfill payment obligations to investors.

Debt Service Coverage Ratio: The debt service coverage ratio is a measure of an agency's ability to pay its annual debt service (principal and interest) payments. This ratio is equal to the amount of revenue available after paying for O&M costs (excluding depreciation) divided by annual debt service. Bond covenants typically require borrowers to maintain debt service coverage ratios of at least 1.15. Credit rating agencies look for higher ratios, which provide a higher level of comfort to investors that debt service will be paid. Moody's rating guidance indicates a minimum of 1.71x for Aa ratings, with the range between 1.7 and 2 times coverage for this rating category. Fitch has approximately 1.5x for midrange strength utilities. S&P's has a minimum of 1.4x for AA rated water utilities (and a range of 1.4 to 1.6 times for "all-in" coverage, which includes all debt for which the utility is responsible – including off balance sheet and subordinate debt).

Debt to Net Asset Ratio: The policy regarding the debt to net asset ratio is used to manage financial leverage and maintain strong credit ratings. The ratio of debt to assets is a measure to limit the ability to borrow beyond the utility's ability to repay the loans. Like debt service coverage, favorable (lower) debt to asset ratios can result in lower borrowing costs.

The BWS currently has an AA+ rating from Fitch and Aa2 from Moody's. BWS has not used S&P's to rate its currently outstanding bonds.

4.2 Financial Policy Updates

Starting with the BWS' existing financial policies that were adopted in 2004, an evaluation was performed and a simplified/ consolidated framework for four policies was developed. The new framework was reviewed with the Stakeholder Advisory Group and their recommendations were incorporated. The policies are built around the items that financial institutions consider to be important, but they go further. They include the metrics described above, as well as the appropriate use of debt. The revised policies were reviewed with the Stakeholder Advisory Group and are designed to meet the desired objectives of maintaining the financial integrity of the BWS, supporting strong credit ratings, and reducing and mitigating future rate increases due to emergencies and natural disasters. The Stakeholder Advisory Group recommended that the Board consider adoption of the revised policies.

The revised policies were adopted by the Board on May 8, 2017 and are included in Appendix A. The former policies, from 2004, are included in Appendix B.

4.2.1 Fund Balance/ Working Capital

Working capital helps maintain the financial integrity of a utility in the following ways:

- Achieve or maintain high credit ratings, which reduce the cost of borrowing,
- Provide funding for emergencies and disaster recovery,
- Cover unanticipated operating or maintenance costs or timing issues that cannot be met with debt financing, and
- Reduce volatility of rates and charges by providing a buffer against changes in commodity prices like fuel and other expenses.

The Government Finance Officers Association's (GFOA) best practices encourages maintaining an adequate fund balance to cover revenue shortfalls and unexpected expenditures (e.g., emergency or unplanned renewal or replacement) as well as stabilize rates. The GFOA recommends 90 days of cash, with a minimum of 45 days. But, as noted above, the credit rating agencies have determined that utilities should have greater amounts of funds on hand due to the particular risks and demands that challenge utility operations. Further, GFOA also notes that the appropriate amount of unrestricted fund balance should be dictated by the individual agency circumstances. In other words, agencies in earthquake and flood prone areas should probably have more reserves than agencies in more stable climate and seismic areas.

Table 4-1 shows the funds and policies of comparable municipal water utilities, which was presented to the Stakeholder Advisory Group in January 2017. These utilities were chosen due to their similarities to the BWS. These are large utilities that are highly rated by bond rating agencies, face similar risks, and have high political visibility. While a wide range of days cash are shown, the lowest total days of cash is 75 days, which is higher than the BWS's policy regarding minimum levels of working capital. Table 4-2 shows similar information for Maui County and Hawaii County, which represent the counties as a whole (not only the water department), and was also presented to the Stakeholder Advisory Group in January 2017.

Table 4-1. Fund Balance Elements of Similar Municipal Utilities

Utility	Fund Balance Element	Policy
DC Water	Working Capital	60 days cash
	Operating Reserve	\$125 million or 120 days cash
	Renewal and Replacement Reserve	\$35 million
San Antonio Water System	Working Capital	60 days cash
	Total Operating Reserve	300 days cash
Las Vegas Valley Water District	Working Capital	180 days cash
	Capital Reserves	1 year of average CIP
	Unforeseen Events	1 percent of depreciable assets
San Diego Water Department	Minimum	30 days cash
	Target including Emergency Fund	45 days cash
Los Angeles Department of Water & Power	Operating Reserve	150 days cash

Table 4-2. Fund Balance Elements of Other Hawaiian Islands

County (1)	Fund Balance Elements	Policy
Maui County	Unrestricted Fund Balance	5-15 percent of reserves
	Emergency Reserves	20 percent of General Fund Revenue
	Debt Service/ Operating Expenditures	Less than or equal to 10 percent
	Net Debt per Capital	Less than or equal to \$2,500
Hawaii County	Disaster Emergency Fund	\$10 million target
	Open Space & Natural Resources Fund	2 percent of tax revenues
	Open Space & Natural Resources Maintenance Fund	0.25 percent to \$3 million annual maximum
	Budget Stabilization Fund	5-15 percent of general fund spend

(1) The policies shown refer to the counties as a whole and are not exclusive to the water departments.

The BWS and the Stakeholder Advisory Group worked to draft policy revisions that considered these credit rating issues, the impacts of emergencies (such as hurricanes, earthquakes, etc), and the impacts of an order-of-magnitude level increase to revenue requirements. The Stakeholder Advisory Group recommended targeting 180 days of working capital, but never letting the working capital drop below 60 days.

The Board revised its working capital policy¹ such that the working capital be calculated based on the unencumbered operating fund balance, that a minimum balance of 60 days of operating and

¹ This action revised the policy from maintaining the equivalent of 45 days cash, including annual debt

maintenance expenses be maintained, and that 180 days of operating and maintenance expenses be targeted to help with rate stabilization and unplanned events such as disaster recovery. Any monies over 180 days may be reprogrammed to fund capital projects.

4.2.2 Debt Service Coverage Ratio

The minimum debt service coverage requirements are defined in the Water System Revenue Bond Resolution adopted by the Board on April 26, 2001, as supplemented (the bond covenants), and discussed in Section 4.4.4. The BWS's prior policy defines debt service coverage for senior debt at 1.6x annual senior debt service and junior debt at 1.3x annual junior debt service. The State Revolving Fund loans of the BWS are considered junior debt, and are paid with available funds after annual operations and maintenance and senior debt service have been paid. As of January 1, 2018, the BWS has an overall debt service coverage ratio equal to almost 6 times total annual debt service as most of the recent capital needs have been funded with cash.

Table 4-3 presents debt service coverage ratio targets utilized by comparable municipal water utilities, which was presented to the Stakeholder Advisory Group in January 2017. The BWS's targets are comparable to other municipal utilities.

Table 4-3. Debt Service Coverage Target Ratios of Similar Municipal Utilities

Utility	Target
DC Water	Senior = 1.4x Total = 1.2x
San Antonio Water System	1.7x
Las Vegas Valley Water District	1.5x
San Diego Water Department	1.5x
Los Angeles Department of Water & Power	1.8x

Based on these considerations and discussions with the Stakeholder Advisory Group, the Board revised its debt service ratio target from a policy that set a 1.6 times ratio for senior debt coverage and a 1.3 times coverage for junior (or subordinate lien) coverage to one that sets a total all-in debt service coverage ratio of 1.6x and a senior debt coverage ratio of 1.7x.

4.2.3 Debt to Net Asset Ratio

The BWS's prior financial policies, adopted in 2004, specified a range between 40 and 50 percent for the Debt to Net Asset ratio. The Stakeholder Advisory Group, in discussion with BWS staff, recommended revision of the policy to cap the ratio at 50 percent and eliminate the lower bound. This change helps mitigate the potential to have too much debt and "leverage" the balance sheet to the point it would reduce financial flexibility in the future, and removes the previous lower bound, which would seem to require the use of debt regardless of situation. The Board adopted this policy, retaining the cap and eliminating the lower bound.

The debt to net asset ratio is incorporated in the financial plan as the debt to equity ratio for financing capital projects. Like the debt service coverage ratio, favorable (lower) debt to equity

service payments.

ratios can result in lower borrowing costs as lower ratios imply more financial flexibility (including the ability to issue debt in the future to meet capital needs).

4.2.4 Purpose and Use of Debt

The BWS also has a policy regarding the purpose and use of debt. The BWS policy describes the appropriate use of debt, noting that long-term debt should only be used to fund long-lived capital assets. The policy also recognizes that different forms of short-term debt, such as lines of credit may be used to help meet cash flow needs during emergencies or as the BWS prepares to issue long-term debt. The BWS has the ability to issue debt that has a fixed interest rate and a variable interest rate. The policy limits the amount of this variable rate debt, and its inherent exposure to interest rate fluctuations and risk to no more than 20 percent of outstanding debt.

4.3 Financing Options

As noted in the discussion of the financial policies in Section 4.2, the BWS has the ability to finance its ongoing capital improvement program with ongoing revenues and other funds or with debt or with a combination of debt and pay-as-you-go (also known as cash funded) resources. The BWS has access to a number of different options to consider when issuing debt.

As the BWS is planning on a significant investment in the pipeline infrastructure, leveraging debt will become more important. Debt financing provides multiple benefits, including the following:

- Allows system investments beyond available resources,
- Accommodates “spikes” in system needs,
- Spreads the cost of long-term improvements to include future rate payers,
- Better matches life of the asset, and
- Helps keep rates affordable for current rate payers.

4.3.1 Long-term Debt

Bonds are the typical form of long-term debt used by utilities to finance major capital projects. Bonds may have either a fixed or variable interest rate. Bonds are often used to finance new projects or refinance other existing debts. While bonds may have very short loan terms, they may also have terms of 20, 30 or more years. Pursuant to Hawaii Revised Statutes chapters 49 and 54, and the county charter, the BWS may issue revenue bonds to help fund infrastructure, including, but not limited to, design and construction costs, land acquisition and the cost of issuing debt.

Long-term debt allows the utility to spread capital costs, including design, construction, right of way, etc. that take place over periods as short as a year to ten years or longer over a longer period (20 to 30 years). These capital projects often are large “one-time” expenditures for facilities that will last for many decades. As such, spreading the costs over a longer period than the construction period makes sense. Long-term, fixed rate, tax-exempt bonds are a tool used by many government owned water and wastewater utilities as they carry low interest costs, provide a predictable annual debt service cost (which is easier to budget) and spread the cost of capital projects over the life of the project. Partial debt financing allows infrastructure costs to be paid by both current

and future customers who benefit from the project. Finally, such bond issues help moderate the need to increase rates while reducing the volatility of rate increases due to the timing of major capital investments.

As described above, the assumption for long-term financial planning is that borrowing would consist of long-term fixed rate bonds.

4.3.2 Short-term Debt

Short-term debt, in the form of tax-exempt commercial paper, bond anticipation notes, or other short and medium-term notes, can be utilized to fund construction in anticipation of a longer-term bond issuance or receipt of State Revolving Fund loans.

While the BWS has utilized short-term debt in the past, and can utilize it in the future, the financial model includes traditional long-term fixed rate bonds as the financing vehicle. Allowances have been made for a small percent of State Revolving Fund funding (described in the next section), but the use of fixed rate debt funding is a conservative assumption. In the future as the BWS enters the market to borrow funds, the BWS will work with its financing team (including municipal advisor, City and County of Honolulu Budget & Fiscal Services director, underwriters and bond counsel) to determine the appropriate financing terms.

4.3.3 State Revolving Fund Loans

Under the federal Safe Drinking Water Act, states may develop a Drinking Water State Revolving Fund program. The State of Hawaii's program began in 1997 and provides low interest loans for the construction of drinking water infrastructure projects. Terms may be as long as 20 years. Annual fees of 1 percent are paid on the outstanding principal balance. The interest rate through June 30, 2018 varies from 0.25 percent on loans over \$8 million to 1.25 percent on loans of less than \$4 million.

State Revolving Fund loans may be used for projects that support safe drinking water, expand and improve water pollution control infrastructure, non-point source projects, and energy efficiency projects. Funds made available can vary by year and in some years may not be available to the BWS. Funds are available to the four county water departments serving the State of Hawaii.

The BWS's projected use of State Revolving Fund loans is included in the Long Range Financial Plan and is tied to specific projects that qualify for these loans. These projects may also be eligible for funding under the Water Infrastructure Finance and Innovation Act (WIFIA) described below.

A similar Clean Water program exists for wastewater and reclaimed water projects like the Honouliuli Water Filtration Plant. The Long Range Financial Plan does not include any projected use of these funds.

4.3.4 Water Infrastructure Finance and Innovation Act

In addition to State Revolving Fund loans, the BWS could take advantage of a new Federal loan program, WIFIA. This loan program is financed by the federal government and can be used to finance up to 49 percent of eligible costs. WIFIA funding is available for projects that are at least \$20 million in cost. The amount of WIFIA loans are limited by Congressional appropriations. About \$3 billion of lending capacity is available in the federal FY 2018 budget, and it is expected

that a similar amount will be available next fiscal year (the federal fiscal year begins on October 1st of each year.) Future lending capacity may increase depending on the success of the program.

WIFIA has attractive loan terms, including long-term repayment of up to 35 years, deferred payments until one year after the completion of construction, and favorable interest rates based on the Treasury rates. Further, the interest rate on a WIFIA loan is determined at the time the loan is executed, eliminating future interest rate risk. The downside to WIFIA loans are the relatively lengthy application process and ongoing reporting to the federal government. In addition, all construction projects have to comply with federal regulations, including among others, prevailing wage provisions. Reporting requirements are similar to those required to qualify for federal grants.

4.3.5 Public-Private Partnerships

Public-Private Partnerships (P3s) are another form of capital project delivery. While there are a number of different types of P3s, the P3 can include a financing component whereby the private sector partner will provide equity and debt financing in exchange for a long-term supply contract. Such arrangements are complex, requiring larger up-front costs, more transaction fees (including engineers, lawyers and financial advisors), and often higher interest rates due to the need to attract equity capital. But, the motivations to pursue a P3 for a public agency include risk transfer or acquiring specialized/ unique skills or assets (e.g., permits, land, etc.). Finally, this type of delivery system can result in lower life-time costs because of efficiencies in design, construction and operation as well as encouraging the private sector providers to employ innovative technologies.

4.3.6 Fixed and Variable Rate Debt

Debt can be at either a fixed or variable rate. Fixed rate debt provides a known payment schedule over the term of the loan and protects against possible higher interest rates in the future. One disadvantage of fixed rate debt is that loans must be refinanced to take advantage of any lower interest rates in the future.

Variable rate debt can take many forms, such as variable rate demand obligations, floating rate notes, and auction rate securities. Variable rate debt allows the utility to take advantage of interest rates below the fixed rate at the time the debt was issued, but also subjects the utility to potentially higher interest rates over the loan term. Since rate-based revenue is used to make debt service payments, forecasting revenue needs becomes more uncertain with larger amounts of variable rate debt.

4.3.7 Pay-as-you-go

Pay-as-you-go, or “pay-go”, is an industry term that refers to cash financing of the capital program. Cash comes from rate-based revenues and from water system facilities charges (WSFC) revenue. WSFC is a special, one-time charges assessed on new water system customers for system capacity and on existing customers requiring increased system capacity. WSFC revenue may only be used towards growth-related capital projects. Rate-based revenue may be used for all capital projects.

Cash financing of capital projects is included in the Long Range Financial Plan for capital costs not paid with other financing, as described in Section 4.4 Financing Guidelines and Strategy.

4.3.8 Grants

If available, grants can be pursued. Typically grants cover a portion of a project's cost, and may be subject to conditional requirements, including matching funds.

Grants beyond those already received are not included in the Long Range Financial Plan due to the uncertainty in their availability. The BWS should, however, actively pursue grant funding to offset project costs when and where available and feasible.

4.4 Financing Guidelines and Strategy

4.4.1 Debt/ Equity Mix

The 30-year Long Range Financial Plan uses a mix of bonds, State Revolving Fund loans, and pay-as-you-go funding to finance the capital improvement program.

Project costs not covered by State Revolving Fund loans and WSFC, are assumed to be financed with a combination of bonds and rate-based revenues (pay-as-you-go or cash funded capital). Various bond financing alternatives are evaluated in Section 5. In general, the financial plan is structured to support the BWS meeting its financial policies as described in Section 4.1, as well as other bond covenants as summarized below. The financing alternatives described in Section 5 revolve around a strategy of using debt to smooth out rate increases and to spread costs over the life of facilities. But this strategy does not rely solely on revenue bonds to finance the Capital Improvement Plan. Instead, the financial plan uses a mix of revenue bonds, State Revolving Fund loans, available reserve funds, connection fees, WSFC, and revenues to pay for the capital projects needed over the next three decades. The fundamental strategy is to mitigate rate increases while minimizing the variance in rate increases on a year by year basis. As shown in Section 5, the judicious use of debt to help smooth out the revenue requirement helps limit rate increases to less than 6 percent in any given year.

4.4.2 Debt Service Coverage

Per Board Resolution No. 873, 2017, the financial plan supports the BWS maintaining at least a 1.7x debt service coverage ratio on senior debt and at least 1.6x on total, all-in debt. As noted in the discussion in Section 4.1 regarding the debt service coverage ratio, the rating agencies look for ratios of 1.7 times or greater for AA rated utilities. This safety margin has two benefits. First, it helps assure investors that there will always be enough revenue to pay debt service. Second, the additional revenue generated to provide such debt service coverage is used to fund the capital improvement program (and reduce the amount of debt that needs to be issued) or helps fund reserves, ensuring financial flexibility in the face of emergencies or other unplanned events.

4.4.3 Working Capital

Revenue requirements include targeting 180 days of unencumbered working capital while never having less than 60 days.

4.4.4 Bond Covenants

The BWS has issued \$664,985,000 of revenue bonds since 2001, of which approximately \$370 million are still outstanding. In addition, the BWS has utilized proceeds from State Revolving Fund loans and other debt to help finance its ongoing capital program. As a condition to issuing such debt, the BWS promises its bondholders (investors) to maintain certain financial covenants. These covenants include a rate covenant, which states that the BWS will set water rates and charges to maintain a debt service coverage ratio of at least 1.2 times. While the bond covenants set out the minimum requirements, the BWS has policy objectives that are greater to support strong credit ratings and financial flexibility. The BWS debt service ratio as of January 1, 2018 is almost six times. Other covenants include a continuing disclosure commitment in which the BWS promises to update certain financial information on a regular basis. Finally, the BWS has to meet certain conditions in order to issue additional debt on the same lien level as the outstanding debt. These conditions include a test to check that net revenues after the sale of the new debt will be at least 1.2 times the annual debt service, after the new debt is issued.

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Section 5

Ten-year Financial Forecast

5.1 Overview of Key Assumptions

The following lists the key assumptions and important cost drivers that support the 10-year financial plan (FY 2019-FY 2028).

5.1.1 Capital Program

The 10-year capital program is based on the WMP and the decision to move forward with financial planning based on the PL2 pipeline replacement scenario where the BWS will ramp up to 1 percent replacement a year in FY 2027, as discussed in Section 2. The BWS staff provided the 6-year capital improvement program (FY 2018-FY 2023) and CDM Smith, working with the BWS staff and within the WMP recommendations, projected the CIP for the remaining years of the study period. The budgeted FY 2018 CIP is in FY 2018 dollars. The planned CIP expenditures in FY 2019 and future years were developed in FY 2017 dollars. For purposes of the financial plan, capital costs are escalated at 3 percent per year to obtain future year dollars. The Honolulu Consumer Price Index's 30-year historical annual average change is 3.0 percent per year.

According to the BWS finance staff, the BWS has historically encumbered 82 percent of its annual capital program expenditure budget, on average, each year (in other words, the BWS has entered into contracts or other commitments equal to approximately 82 percent of the annual CIP every year). The financial forecast carries this assumption throughout the forecast period.

5.1.2 State Revolving Loan Financing Terms

Based on discussions with the BWS finance staff, the following terms are used for projected State Revolving Fund loans:

- State Revolving Fund term = 20 years,
- State Revolving Fund interest rate = 0.25 percent through FY 2021, 0.5 percent thereafter,
- State Revolving Fund Energy Savings Performance Contract = 0 percent interest, and
- State Revolving Fund fees = 1 percent of outstanding balance annually.

5.1.3 Operations and Maintenance

Operations and maintenance costs were provided by the BWS through FY 2027 and were adjusted as discussed in Section 3. Overall annual escalation on total O&M costs is 3.5 percent per year after FY 2027, as described in Section 3.

5.1.4 Water Demand and Usage

The WMP estimated growth in water demand to average 0.2 percent per year between FY 2012 and FY 2040. The estimated demands are based on island-wide Department of Planning and Permitting growth projections over the 30-year period. However, overestimating water usage in a

financial plan would result in underestimating the need for additional rate-based revenue. Therefore, to be conservative (i.e., to help safeguard that the revenue forecast is more likely to be lower than actuals), the base case presumes 0.1 percent per year growth in the number of customers.

5.2 Revenue Requirement

The revenue requirement comprises the annual costs to provide water to the customers of the BWS. These costs generally fall into operating expenses (discussed in Section 3, Table 3-4) and capital related expenditures (including debt service).

5.2.1 Operating Costs

Based on the operating cost budget and escalation assumptions presented in Section 3, Table 5-1 summarizes the annual operating expense through FY 2028. Operating costs are projected to grow to \$197 million by FY 2028. Operating costs are paid with rate-based revenues, miscellaneous revenues and available unencumbered cash.

Table 5-1. Forecasted Operating Expenses through FY 2028, \$M

Line Item	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Personnel Services	\$39	\$42	\$44	\$45	\$46	\$48	\$48	\$49	\$49	\$50	\$51
Materials, Supplies & Services	\$52	\$51	\$53	\$56	\$60	\$64	\$67	\$72	\$77	\$81	\$85
Equipment	\$5	\$3	\$3	\$3	\$3	\$4	\$4	\$4	\$4	\$5	\$5
Fixed Charges	\$41	\$42	\$43	\$45	\$46	\$47	\$48	\$49	\$51	\$52	\$53
Staffing Allowance	\$0	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$2	\$2
Total (1)	\$137	\$139	\$144	\$149	\$156	\$163	\$168	\$175	\$182	\$190	\$197

(1) Does not include future debt service as that is modeled as a separate part of the revenue requirements.

5.2.2 Capital-Related Costs

Capital related costs comprise the net capital needs (funded from rates and/ or available unencumbered cash) to complete the capital program and debt financing.

Net Capital Program Needs

The capital program was described in Section 2. Table 5-2 shows the projected total capital costs and the forecast of encumbered annual amounts. Historically, the BWS encumbers about 82 percent of its capital program reflecting that some projects get delayed or canceled. The BWS has several mechanisms for paying for the capital program including State Revolving Fund loans (including Energy Savings Performance Contracts (ESPC)), WSFC funds, cash and bond proceeds. Table 5-2 also shows the projected amount of capital covered by State Revolving Funds and WSFC funds. WSFC funding is estimated based on the percent of CIP project dollars in a given year that are growth-related. The remaining cost of CIP will have to come from unencumbered cash and/ or bond issues.

Table 5-2. Projected Capital Program to be Funded FY 2028, \$M

Name	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
CIP (Table 2-2)	\$144	\$138	\$160	\$141	\$183	\$159	\$187	\$197	\$180	\$216	\$255
CIP Future Year \$	\$144	\$146	\$175	\$158	\$212	\$190	\$230	\$250	\$235	\$290	\$354
Encumbered	\$118	\$120	\$144	\$130	\$174	\$156	\$189	\$205	\$193	\$238	\$290
State Revolving Loan	\$1	\$3	\$5	\$5	\$5	\$8	\$8	\$10	\$10	\$10	\$10
State Revolving Loan - ESPC	\$11	\$11	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
WSFC Funds	\$24	\$29	\$20	\$18	\$13	\$15	\$6	\$5	\$3	\$14	\$9
Remaining CIP to be Funded by Rates/ Bonds	\$83	\$77	\$119	\$107	\$156	\$133	\$174	\$191	\$180	\$213	\$271

5.2.3 Existing and Projected Debt Service

Table 5-3 projects the existing debt service and future debt service for known State Revolving Fund loans through FY 2028. Existing debt includes payments on existing bonds, State Revolving Fund loans and the John A. Burns School of Medicine (JABSOM) loan related to the ocean cooling project. The new State Revolving Fund loan issues will result in new debt service. Annual debt service is expected to increase from \$22 million in FY 2019 to \$27 million in FY 2028. The debt service amount in FY 2019 is \$9 million lower than in FY 2018 due to paying off several State Revolving Fund loans in FY 2018.

Table 5-3. Existing Debt Service and Proposed State Revolving Fund Projections Through FY 2028, \$M

Name	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Existing											
Bonds	\$17.7	\$17.7	\$17.7	\$17.7	\$17.7	\$17.9	\$18.1	\$18.1	\$18.1	\$18.1	\$18.1
State Revolving Fund & JABSOM	\$12.6	\$3.1	\$3.4	\$3.6	\$3.6	\$3.6	\$3.7	\$3.7	\$3.5	\$3.5	\$3.5
State Revolving Fund Fees	\$0.7	\$0.6	\$0.6	\$0.5	\$0.5	\$0.5	\$0.4	\$0.4	\$0.4	\$0.3	\$0.3
Proposed											
State Revolving Fund & ESPC Loans	\$0.0	\$0.6	\$1.3	\$1.6	\$1.8	\$2.1	\$2.5	\$2.9	\$3.5	\$4.0	\$4.5
State Revolving Fund Fees	\$0.1	\$0.3	\$0.3	\$0.3	\$0.4	\$0.4	\$0.5	\$0.5	\$0.6	\$0.7	\$0.7
Total Debt Service	\$31	\$22	\$23	\$24	\$24	\$25	\$25	\$26	\$26	\$27	\$27

5.2.4 Working Capital

Per the revised financial policy, the working capital target is 180 days of annual O&M costs (operating expenses not including debt service and cash financed capital) within ten years, never dropping below 60 days of O&M. To understand the impact to annual revenue requirements of meeting 180 days of O&M each year, independent of any other decisions such as the financing of the CIP, a theoretical working capital fund was calculated as shown in Table 5-4. This calculation presumes that \$67 million of the available operating fund balance in FY 2018 is already set aside for working capital. The additions line shows the annual addition to revenue requirements to

meet 180 days of working capital. To the extent that additional funds may be available in the operating fund, the additions would be reduced.

Table 5-4. Theoretical Working Capital Fund Targeting 180 Days of O&M, Through FY 2028, \$M

Line Item	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Target (180 days)	\$67	\$69	\$71	\$74	\$77	\$81	\$83	\$86	\$90	\$93	\$97
Beginning Balance	\$67	\$67	\$69	\$71	\$74	\$77	\$81	\$83	\$86	\$90	\$93
Additions	\$0	\$1	\$2	\$3	\$4	\$3	\$3	\$3	\$3	\$4	\$4
Ending Balance	\$67	\$69	\$71	\$74	\$77	\$81	\$83	\$86	\$90	\$93	\$97

Note: Totals may not add due to rounding.

5.3 Revenue Forecast

The revenue forecast presents the forecasted revenue under existing rates. Using existing rates makes it more apparent when deficiencies in funds exist. These deficiencies are generally met through a variety of means, including generating more rate-based revenue and issuing debt.

5.3.1 Water Demand Forecast

Growth is expected to occur in the single-family and multi-family residential customer classes and the non-residential customer class, which represent the majority of water use, as shown in Table 5-5. Table 5-5 shows the projected number of bills for those customers subject to the customer charge. But this growth in accounts is tempered by continued water conservation efforts.

Table 5-5. Annual Number of Bills Through FY 2028, thousands

Customer Classes	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Single-Family	1,759	1,761	1,763	1,764	1,766	1,768	1,770	1,771	1,773	1,775	1,777
Multi-Family	73	73	73	73	73	73	73	73	74	74	74
Non-Res.	101	101	101	101	101	101	101	101	102	102	102
Agricultural	6	6	6	6	6	6	6	6	6	6	6
Non-Potable	1	1	1	1	1	1	1	1	1	1	1
Total	1,939	1,941	1,943	1,945	1,947	1,949	1,951	1,953	1,955	1,957	1,959

The water demand forecast is calculated as the number of bills for each customer class times the average usage per bill for each customer class. Without further adjustment, this would result in a 0.1 percent per year increase in usage. However, the average use per bill has been adjusted based on the projected change in gallons per capita day (gpcd) from the WMP, as shown in Table 5-6.

Table 5-6. Change in GPCD

Name	FY 2015	FY 2020	FY 2025	FY 2030
gpcd	154	150	146	146
Annual Average Change		-0.5%	-0.5%	0%

Table 5-7 shows the water demand forecast for FY 2018 through FY 2028. Over the first ten years, the combination in growth in accounts and declining and/or leveling average usage per bill

results in a decrease in demand from 130.5 mgd to 127.2 mgd, or an annual average decrease in demand of 0.26 percent per year.

Table 5-7. Annual Water Demand Forecast Through FY 2028, mgd

Customer Classes	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Single-Family	46.3	46.1	45.9	45.7	45.5	45.3	45.2	45.0	45.0	45.1	45.1
Multi-Family	27.0	26.9	26.8	26.7	26.5	26.4	26.3	26.2	26.3	26.3	26.3
Non-Res.	44.2	44.0	43.8	43.6	43.5	43.3	43.1	43.0	43.0	43.0	43.0
Agricultural	3.1	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Non-Potable	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Recycled	8.3	8.2	8.2	8.2	8.1	8.1	8.0	8.0	8.0	8.0	8.0
Total	130.5	130.0	129.5	128.9	128.4	127.9	127.3	126.8	126.9	127.0	127.2

5.3.2 Projected Revenues Under Existing Rates

The BWS's current water rate structure for retail water sales includes a fixed monthly customer charge, a three-tiered commodity charge for residential customers, a two-tiered commodity charge for agricultural customers and uniform commodity rates for non-residential, automatic fire sprinkler and non-potable customers. Table 5-8 summarizes the current rate schedule.

Table 5-8. Water Rate Structure

Item	\$/unit	Tier
Customer Charge, \$/mo	\$9.26	--
Single Family		
Tier 1, \$/k-gal	\$4.42	0 – 13 k-gal/DU
Tier 2, \$/k-gal	\$5.33	13 – 30 k-gal/DU
Tier 3, \$/k-gal	\$7.94	Over 30 k-gal/DU
Multi Family		
Tier 1, \$/k-gal	\$4.42	0 – 9 k-gal/DU
Tier 2, \$/k-gal	\$5.33	9 – 22 k-gal/DU
Tier 3, \$/k-gal	\$7.94	Over 22 k-gal/DU
Agricultural		
Tier 1, \$/k-gal	\$4.42	0 – 13 k-gal
Tier 2, \$/k-gal	\$1.89	Over 13 k-gal
Non-Residential	\$4.96	All usage
Automatic Fire Sprinkler	\$4.96	All usage
Non-Potable	\$2.47	All usage
Note: DU = dwelling unit		

To calculate revenue under existing rates for those customer classes with tiered rates, the billing data was used to determine the percent of usage that falls within each tier. Table 5-9 shows the percent usage that falls within each tier for those customer classes. These percentages are multiplied by the total projected water usage in each year for the class to determine the projected amount of usage in the tier.

Table 5-9. Percent Usage and Bills in Tiers

Item	Tier	Percent Usage in Tier	Percent of Bills in Tier
Single Family			
Tier 1, \$/k-gal	0 – 13 k-gal/DU	80 %	83%
Tier 2, \$/k-gal	13 – 30 k-gal/DU	14 %	15%
Tier 3, \$/k-gal	Over 30 k-gal/DU	6 %	3%
Multi Family			
Tier 1, \$/k-gal	0 – 9 k-gal/DU	92 %	88%
Tier 2, \$/k-gal	9 – 22 k-gal/DU	7 %	11%
Tier 3, \$/k-gal	Over 22 k-gal/DU	1 %	1%
Agricultural			
Tier 1, \$/k-gal	0 – 13 k-gal	6 %	18%
Tier 2, \$/k-gal	Over 13 k-gal	94 %	82%

Table 5-10 shows projected rate-based revenue under existing rates for FY 2018-FY 2028. Under existing rates, revenues are projected to decrease slightly through FY 2028 because of minimal growth assumptions in customers and slight decreases in water demand.

Table 5-10. Estimated Water Sales Revenue Through FY 2028, \$M

Category	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Single Family	\$96.6	\$96.3	\$96.0	\$95.7	\$95.4	\$95.1	\$94.8	\$94.5	\$94.6	\$94.7	\$94.8
Multi Family	\$45.3	\$45.1	\$44.9	\$44.7	\$44.6	\$44.4	\$44.2	\$44.0	\$44.1	\$44.1	\$44.2
Non-Res.	\$80.9	\$80.6	\$80.3	\$80.0	\$79.6	\$79.3	\$79.0	\$78.7	\$78.8	\$78.9	\$78.9
Agricultural	\$2.4	\$2.4	\$2.3	\$2.3	\$2.3	\$2.3	\$2.3	\$2.3	\$2.3	\$2.3	\$2.3
Automatic	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1
Fire Sprinkler											
Non-Potable	\$1.6	\$1.5	\$1.5	\$1.5	\$1.5	\$1.5	\$1.5	\$1.5	\$1.5	\$1.5	\$1.5
Total	\$227	\$226	\$225	\$224	\$224	\$223	\$222	\$221	\$221	\$222	\$222

5.3.3 Other Sources of Revenue

While water sales are the largest source of revenue for the BWS, the BWS derives revenue from non-rate based sources such as miscellaneous revenue, fees, contractual water sales revenue, and interest income. Other revenues include the City Department of Environmental Services' (ENV's) reimbursement of costs the BWS incurs for performing the sewer billing on ENV's behalf and other smaller revenue streams such as miscellaneous fees and rental income. Contract revenues come from seven reverse osmosis water contracts, 37 recycled water contracts, and one ocean cooling contract. Interest income is derived from interest earned on fund balances. The return on investments used over the forecast period is 1 percent, reflecting today's short-term interest rates. This projection is conservative, but consistent with returns on investment portfolios over the past few years. Other revenues are decreased by the amount of bad debt expense, reflecting the amount of bills that are written off in any given year due to failure to pay. The BWS's historical bad debt expense is 0.2 percent of revenues. Table 5-11 summarizes the projected other revenue sources through FY 2028.

Table 5-11. Projected Other Revenues Through FY 2028, \$M

Source	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Other Revenue											
ENV Billing	\$2.9	\$2.9	\$2.9	\$2.9	\$2.9	\$2.9	\$2.9	\$2.9	\$2.9	\$2.9	\$2.9
Miscellaneous	\$2.2	\$2.2	\$2.2	\$2.2	\$2.2	\$2.2	\$2.2	\$2.2	\$2.2	\$2.2	\$2.2
Contract Water Sales	\$7.1	\$7.3	\$7.4	\$7.5	\$7.6	\$7.8	\$7.9	\$8.0	\$6.6	\$6.8	\$6.9
Interest Income	\$2.8	\$3.2	\$3.4	\$3.1	\$2.8	\$2.7	\$2.6	\$2.7	\$2.6	\$2.6	\$2.7
Less Bad Debt Expense	(\$0.5)	(\$0.5)	(\$0.5)	(\$0.4)	(\$0.4)	(\$0.4)	(\$0.4)	(\$0.4)	(\$0.4)	(\$0.4)	(\$0.4)
Total Other Revenue	\$15	\$15	\$15	\$15	\$15	\$15	\$15	\$15	\$14	\$14	\$14

5.4 Net Revenue Requirement

As annual costs to operate, maintain, and repair/ replace/ upgrade the BWS's potable, non-potable and recycled/ reverse osmosis water systems rise, revenues under existing rates, as well as other revenues will not be sufficient to cover annual costs. Table 5-12 shows the projected net revenue requirements (the additional amount of revenue that would be needed to meet all expenditures and maintain adequate working capital balances) through FY 2028.

Table 5-12. Projected Net Revenue Requirements Through FY 2028, \$M

Source	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Operating Expenditures (Table 5-1)	\$137	\$139	\$144	\$149	\$156	\$163	\$168	\$175	\$182	\$190	\$197
To be Funded CIP (Table 5-2)	\$83	\$77	\$119	\$107	\$156	\$133	\$174	\$191	\$180	\$213	\$271
Debt Expense (Table 5-3)	\$31	\$22	\$23	\$24	\$24	\$25	\$25	\$26	\$26	\$27	\$27
Working Capital Additions (Table 5-4)	\$0	\$1	\$2	\$3	\$4	\$3	\$3	\$3	\$3	\$4	\$4
Revenue Requirements	\$251	\$239	\$288	\$283	\$340	\$324	\$370	\$394	\$391	\$433	\$499
Less Revenue Under Existing Rates (Table 5-10)	\$227	\$226	\$225	\$224	\$224	\$223	\$222	\$221	\$221	\$222	\$222
Less Other Revenue (Table 5-11)	\$15	\$15	\$15	\$15	\$15	\$15	\$15	\$15	\$14	\$14	\$14
Net Revenue Requirements	\$9	(\$2)	\$48	\$43	\$102	\$86	\$133	\$158	\$155	\$198	\$263

O&M costs are projected to account for 58 percent of revenue requirements in FY 2019, lowering to 39 percent by FY 2028. Conversely, capital-related expenses are projected to account for 41 percent of revenue requirements in FY 2019, growing to 60 percent by FY 2028.

The net revenue requirements represent the total amount of projected additional money needed over the ten-year period to operate and maintain the system as well as execute the capital

program. Projected net revenue requirements are anticipated to grow from essentially zero in FY 2019 to \$263 million by FY 2028.

The net revenue requirement may be met from a variety of revenue sources such as available operating funds, new revenue streams such as from leased property, and from increased rate-based revenues. Net revenue requirements may also be decreased by funding some capital needs with debt. If additional money were not raised (e.g., through higher rates, additional non-rate revenue streams, and/or bond issues), the BWS would have to curtail the capital program.

Figure 5-1 shows the operating fund balance for the do nothing case, where no additional revenue is generated and capital-related costs are funded solely with revenues and existing working capital balances. By FY 2021, the minimum days working capital is no longer met and by FY 2022, the working capital balance is \$0. Whatever revenue is generated is used to meet operating expenses and the balance is used to fund capital expenditures. But as operating expenses increase over time, the amount of revenue left for capital will decline. As can be seen in the cashflow shown in Table 5-13, by FY 2028 only \$12 million of the \$354 million in planned capital for that year could be executed. Also, by FY 2028 the “all-in” Debt Service Coverage Ratio (DSCR) has dropped to 1.45, which is above that required under the BWS bond covenants, but below financial policies.

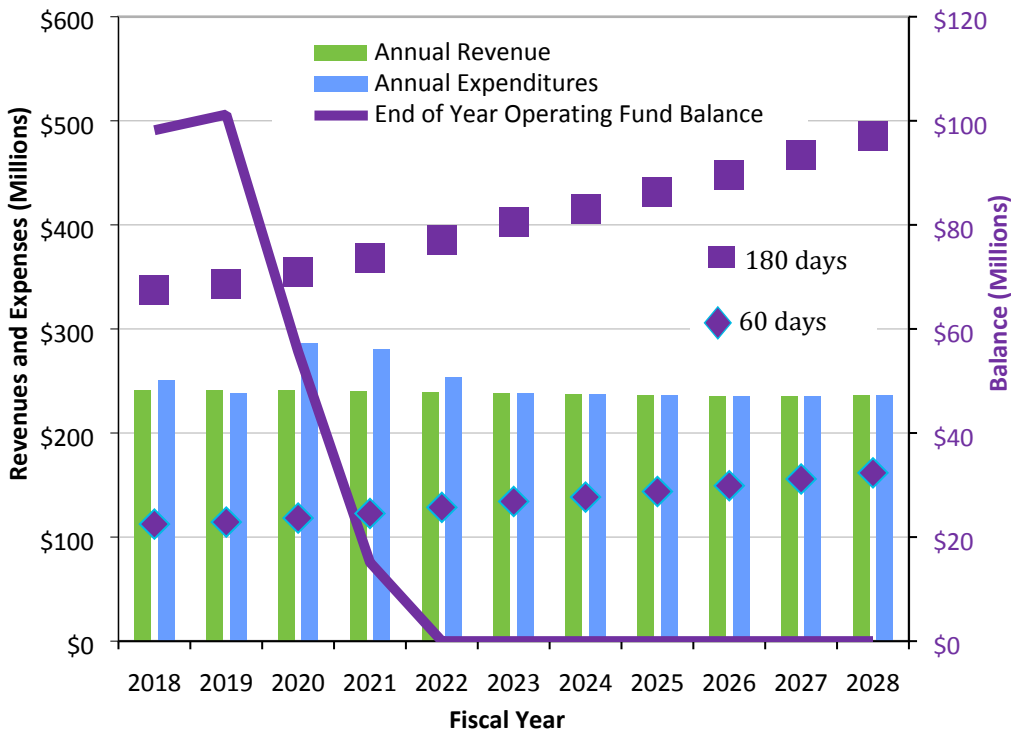


Figure 5-1. Do Nothing Operating Fund Balance

Table 5-13. Do Nothing Cash Flow, \$M

	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Billed Wtr User Charges Under Approved Rates [1]											
Single Family	\$97	\$96	\$96	\$96	\$95	\$95	\$95	\$95	\$95	\$95	\$95
Multi-Family	\$45	\$45	\$45	\$45	\$45	\$44	\$44	\$44	\$44	\$44	\$44
Non-Residential	\$81	\$81	\$80	\$80	\$80	\$79	\$79	\$79	\$79	\$79	\$79
Agricultural	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2
Automatic Fire Sprinkler	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Non-Potable	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2
Total Water Billed Charges	\$227	\$226	\$225	\$224	\$224	\$223	\$222	\$221	\$221	\$222	\$222
User Charge Revenue Adjustment:											
	Year	Adjustment	First Year Effective								
	2019	0.0%	6	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	2020	0.0%	12	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	2021	0.0%	12	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	2022	0.0%	12	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	2023	0.0%	12	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	2024	0.0%	12	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	2025	0.0%	12	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	2026	0.0%	12	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	2027	0.0%	12	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	2028	0.0%	12	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Water User Charge Revenue Adjustment	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total Billed Water User Charge Revenue	\$227	\$226	\$225	\$224	\$224	\$223	\$222	\$221	\$221	\$222	\$222
Contractual Water Revenue [2]	\$7	\$7	\$7	\$8	\$8	\$8	\$8	\$8	\$7	\$7	\$7
Miscellaneous Income [3]	\$5	\$5	\$5	\$5	\$5	\$5	\$5	\$5	\$5	\$5	\$5
Bad Debt Expense	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)
Interest Income	\$3	\$3	\$3	\$3	\$3	\$3	\$3	\$3	\$3	\$3	\$3
Total Revenue	\$241	\$241	\$241	\$240	\$239	\$238	\$237	\$236	\$235	\$236	\$236
Annual Expenditures											
Operation and Maintenance Expense	\$137	\$139	\$144	\$149	\$156	\$163	\$168	\$175	\$182	\$190	\$197
Debt Service											
Existing Debt - Bonds	\$18	\$18	\$18	\$18	\$18	\$18	\$18	\$18	\$18	\$18	\$18
Existing Debt - SRF & JABSOM	\$13	\$3	\$3	\$4	\$4	\$4	\$4	\$4	\$3	\$3	\$4
SRF Fees - Existing Loans	\$1	\$1	\$1	\$1	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Proposed Debt - Bonds	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Proposed Debt - SRF	\$0	\$1	\$1	\$2	\$2	\$2	\$3	\$3	\$3	\$4	\$5
SRF Fees - Proposed Loans	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$1	\$1	\$1	\$1
Subtotal Debt Service	\$31	\$22	\$23	\$24	\$24	\$25	\$25	\$26	\$26	\$27	\$27
Transfers to:											
Cash Funded Capital	\$83	\$77	\$119	\$107	\$73	\$50	\$43	\$36	\$28	\$19	\$12
Total Annual Expenditures	\$251	\$238	\$286	\$280	\$254	\$238	\$237	\$236	\$235	\$236	\$236
Beginning of Year Balance	\$107	\$98	\$101	\$56	\$15	\$0	\$0	\$0	\$0	\$0	\$0
Annual Increase (Decrease)	(\$9)	\$3	(\$46)	(\$41)	(\$15)	\$0	\$0	(\$0)	(\$0)	\$0	\$0
End of Year Operating Fund Balance	\$98	\$101	\$56	\$15	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Target 180 Days of O&M [4]	\$67	\$69	\$71	\$74	\$77	\$81	\$83	\$86	\$90	\$93	\$97
Minimum 60 Days of O&M [4]	\$22	\$23	\$24	\$25	\$26	\$27	\$28	\$29	\$30	\$31	\$32
Debt Service Coverage on Bonds [5]	5.90	5.75	5.45	5.10	4.64	4.16	3.79	3.40	2.96	2.54	2.17
"All-in" Debt Service Coverage	3.36	4.57	4.15	3.80	3.42	3.04	2.73	2.40	2.06	1.73	1.45
Estimated Days Working Capital [6]	262	265	141	37	0	0	0	0	0	0	0

[1] Calculated using the approved water rates.

[2] Revenue from R-1, RO and Ocean Cooling contracts.

[3] Includes fire protection installations, billing services for ENV and other misc income.

[4] 180 Days of O&M within 10 years of FY2018, minimum of 60 days.

[5] Bond covenant requirement is 1.2, BWS policy is 1.7 on senior debt.

[6] The end of year balance divided by the daily operating expenses.

5.5 Meeting Net Revenue Requirement Scenarios

The following discussion steps through a few scenarios for meeting net revenue requirements, including cash financing all capital expenditures.

The first scenario looks at increasing rate-based revenue on an as-needed basis to cover revenue requirements. Table 5-14 summarizes key metrics including the annual revenue adjustments. The first revenue adjustment of 26 percent occurs on July 1, 2020 (FY 2021). Revenue adjustments vary between 0 and 26 percent between FY 2021 and FY 2028.

Table 5-14. Cash Financing Summary

	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Revenue Adjustment	0.0%	0.0%	0.0%	26.0%	15.0%	0.0%	6.0%	11.0%	0.0%	11.0%	15.0%
Cash Funded Capital	\$83	\$77	\$119	\$107	\$156	\$133	\$174	\$191	\$180	\$213	\$271
Bond Issues	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
“All-in” DSCR	3.36	4.57	4.15	6.26	7.61	7.14	7.47	8.49	8.07	9.18	11.07
Days Working Capital	262	265	141	180	178	212	181	178	180	181	178

Figure 5-2 graphically displays the annual operating fund balance compared to the days working capital targets, as well as the annual revenues and expenditures. After an initial drawdown in available cash, the fund balance is brought back to near the 180 days of working capital target. Table 5-15 presents the detailed cashflow for the cash financing scenario.

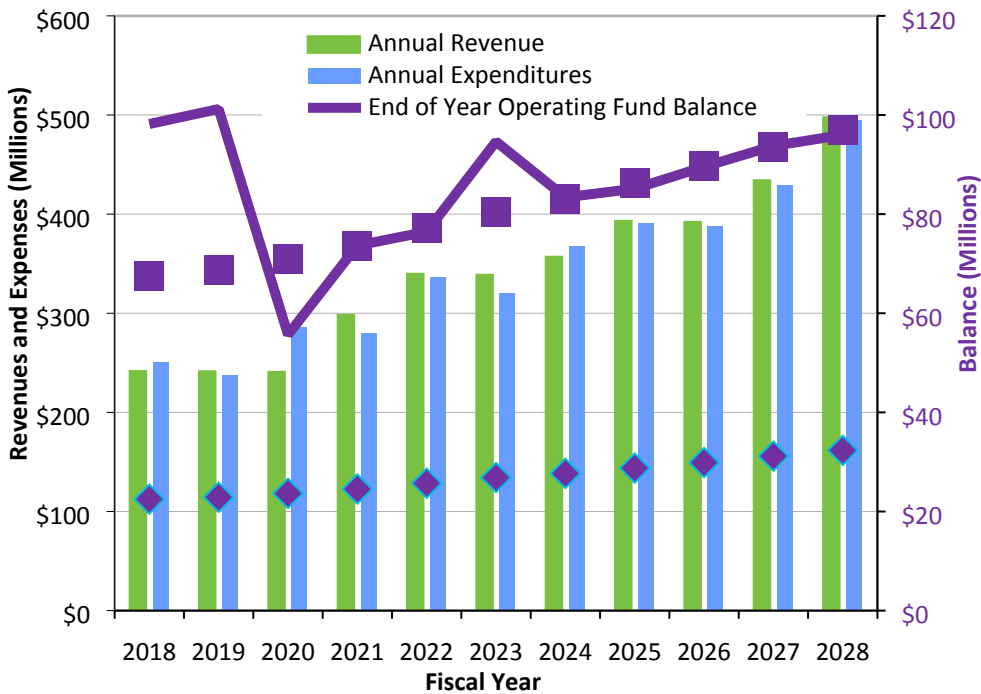


Figure 5-2. Cash Financing – Operating Fund Balance

Table 5-15. Cash Financing Cashflow, \$M

	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Billed Wtr User Charges Under Approved Rates [1]											
Single Family	\$97	\$96	\$96	\$96	\$95	\$95	\$95	\$95	\$95	\$95	\$95
Multi-Family	\$45	\$45	\$45	\$45	\$45	\$44	\$44	\$44	\$44	\$44	\$44
Non-Residential	\$81	\$81	\$80	\$80	\$80	\$79	\$79	\$79	\$79	\$79	\$79
Agricultural	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2
Automatic Fire Sprinkler	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Non-Potable	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2
Total Water Billed Charges	\$227	\$226	\$225	\$224	\$224	\$223	\$222	\$221	\$221	\$222	\$222
User Charge Revenue Adjustment:											
	Year	Adjustment	First Year Effective								
	2019	0.0%	6	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	2020	0.0%	12	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	2021	26.0%	12	\$58	\$58	\$58	\$58	\$57	\$58	\$58	\$58
	2022	15.0%	12	\$42	\$42	\$42	\$42	\$42	\$42	\$42	\$42
	2023	0.0%	12	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	2024	6.0%	12	\$19	\$19	\$19	\$19	\$19	\$19	\$19	\$19
	2025	11.0%	12	\$37	\$37	\$37	\$37	\$37	\$37	\$37	\$37
	2026	0.0%	12	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	2027	11.0%	12	\$42	\$42	\$42	\$42	\$42	\$42	\$42	\$42
	2028	15.0%	12	\$63	\$63	\$63	\$63	\$63	\$63	\$63	\$63
Water User Charge Revenue Adjustment	\$0	\$0	\$0	\$58	\$100	\$100	\$119	\$156	\$156	\$198	\$261
Total Billed Water User Charge Revenue	\$227	\$226	\$225	\$283	\$324	\$323	\$341	\$377	\$377	\$419	\$483
Contractual Water Revenue [2]	\$7	\$7	\$7	\$8	\$8	\$8	\$8	\$8	\$7	\$7	\$7
Miscellaneous Income [3]	\$5	\$5	\$5	\$5	\$5	\$5	\$5	\$5	\$5	\$5	\$5
Bad Debt Expense	(\$0)	(\$0)	(\$0)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)
Interest Income	\$3	\$3	\$3	\$3	\$4	\$4	\$4	\$4	\$4	\$3	\$4
Total Revenue	\$241	\$241	\$241	\$298	\$340	\$339	\$357	\$393	\$392	\$434	\$497
Annual Expenditures											
Operation and Maintenance Expense	\$137	\$139	\$144	\$149	\$156	\$163	\$168	\$175	\$182	\$190	\$197
Debt Service											
Existing Debt - Bonds	\$18	\$18	\$18	\$18	\$18	\$18	\$18	\$18	\$18	\$18	\$18
Existing Debt - SRF & JABSOM	\$13	\$3	\$3	\$4	\$4	\$4	\$4	\$4	\$3	\$3	\$4
SRF Fees - Existing Loans	\$1	\$1	\$1	\$1	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Proposed Debt - Bonds	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Proposed Debt - SRF	\$0	\$1	\$1	\$2	\$2	\$2	\$3	\$3	\$3	\$4	\$5
SRF Fees - Proposed Loans	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$1	\$1	\$1	\$1
Subtotal Debt Service	\$31	\$22	\$23	\$24	\$24	\$25	\$25	\$26	\$26	\$27	\$27
Transfers to:											
Cash Funded Capital	\$83	\$77	\$119	\$107	\$156	\$133	\$174	\$191	\$180	\$213	\$271
Total Annual Expenditures	\$251	\$238	\$286	\$280	\$337	\$320	\$368	\$391	\$387	\$430	\$495
Beginning of Year Balance	\$107	\$98	\$101	\$56	\$74	\$76	\$95	\$83	\$85	\$90	\$94
Annual Increase (Decrease)	(\$9)	\$3	(\$46)	\$18	\$3	\$18	(\$11)	\$2	\$4	\$4	\$2
End of Year Operating Fund Balance	\$98	\$101	\$56	\$74	\$76	\$95	\$83	\$85	\$90	\$94	\$96
Target 180 Days of O&M [4]	\$67	\$69	\$71	\$74	\$77	\$81	\$83	\$86	\$90	\$93	\$97
Minimum 60 Days of O&M [4]	\$22	\$23	\$24	\$25	\$26	\$27	\$28	\$29	\$30	\$31	\$32
Debt Service Coverage on Bonds [5]	5.90	5.75	5.45	8.40	10.33	9.78	10.39	12.03	11.61	13.49	16.61
"All-in" Debt Service Coverage	3.36	4.57	4.15	6.26	7.61	7.14	7.47	8.49	8.07	9.18	11.07
Estimated Days Working Capital [6]	262	265	141	180	178	212	181	178	180	181	178

[1] Calculated using the approved water rates.

[2] Revenue from R-1, RO and Ocean Cooling contracts.

[3] Includes fire protection installations, billing services for ENV and other misc income.

[4] 180 Days of O&M within 10 years of FY2018, minimum of 60 days.

[5] Bond covenant requirement is 1.2, BWS policy is 1.7 on senior debt.

[6] The end of year balance divided by the daily operating expenses.

The second scenario recognizes that wildly varying annual revenue adjustments and significant annual increases (like in the first scenario) are generally not palatable to customers. This scenario looks at utilizing bond financing to lower needed annual revenue adjustments.

Based on discussions with the BWS finance staff, the following terms are used for projected bond issues during the planning period:

- Bond term = 30 years
- Bond interest rate = 4.0 percent through FY 2021, 4.5 percent thereafter, reflecting projected increases in interest rates over the planning horizon. This interest rate is based on the BWS maintaining its current credit ratings, consistent with the actions in this Long Range Financial Plan.
- Bond issuance costs = 0.5 percent of bond issue (to cover all transaction costs associated with completing the sale of the debt. These costs include legal costs, marketing and underwriting fees (i.e., underwriter’s discount), financial advisory fees, rating agency fees, and other expenses such as trustee fees, advertising, printing, etc.).

Table 5-16 shows that under this scenario, the available cash is drawn down through FY 2020 and then a combination of revenue adjustments and bond issues are used to meet operating and capital expenditures without double-digit revenue adjustments. Bond issues vary between covering 50 percent and 75 percent of annual unfunded capital needs. The remaining unfunded capital expenditures are covered by rate-based revenues.

Table 5-16. Adding Bonds Summary

	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Revenue Adjustment	0.0%	0.0%	0.0%	2.0%	3.0%	6.5%	6.5%	7.5%	0.0%	9.0%	5.0%
Cash Funded Capital	\$83	\$77	\$119	\$54	\$63	\$66	\$70	\$76	\$63	\$69	\$68
Bond Issues	\$0	\$0	\$0	\$54	\$94	\$66	\$105	\$115	\$117	\$145	\$204
“All-in” DSCR	3.36	4.57	4.15	4.00	3.47	3.05	2.93	2.76	2.22	2.23	2.06
Days Working Capital	262	265	141	179	181	178	181	180	175	178	182

Figure 5-3 shows the operating fund balance versus the working capital targets, as well as the annual operating revenues and expenditures for the additional bonds scenario. Once again the funds balance is initially drawn down and then returned to approximately 180 days. Table 5-17 presents the detailed cashflow for the adding bonds scenario.

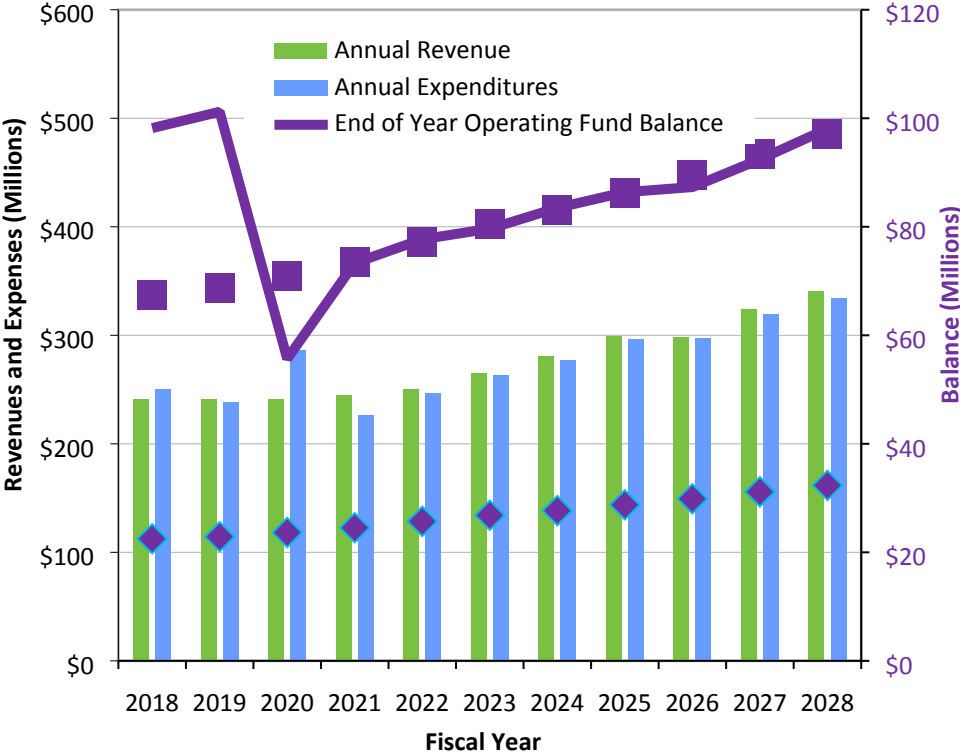


Figure 5-3. Adding Bonds – Operating Fund Balance

Table 5-17. Adding Bonds Cashflow, \$M

	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Billed Wtr User Charges Under Approved Rates [1]											
Single Family	\$97	\$96	\$96	\$96	\$95	\$95	\$95	\$95	\$95	\$95	\$95
Multi-Family	\$45	\$45	\$45	\$45	\$45	\$44	\$44	\$44	\$44	\$44	\$44
Non-Residential	\$81	\$81	\$80	\$80	\$80	\$79	\$79	\$79	\$79	\$79	\$79
Agricultural	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2
Automatic Fire Sprinkler	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Non-Potable	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2
Total Water Billed Charges	\$227	\$226	\$225	\$224	\$224	\$223	\$222	\$221	\$221	\$222	\$222
User Charge Revenue Adjustment:											
	<u>Year</u>	<u>Adjustment</u>	<u>First Year Effective</u>								
	2019	0.0%	6	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	2020	0.0%	12	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	2021	2.0%	12	\$4	\$4	\$4	\$4	\$4	\$4	\$4	\$4
	2022	3.0%	12	\$7	\$7	\$7	\$7	\$7	\$7	\$7	\$7
	2023	6.5%	12	\$15	\$15	\$15	\$15	\$15	\$15	\$15	\$15
	2024	6.5%	12	\$16	\$16	\$16	\$16	\$16	\$16	\$16	\$16
	2025	7.5%	12	\$20	\$20	\$20	\$20	\$20	\$20	\$20	\$20
	2026	0.0%	12	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	2027	9.0%	12	\$26	\$26	\$26	\$26	\$26	\$26	\$26	\$26
	2028	5.0%	12	\$15	\$15	\$15	\$15	\$15	\$15	\$15	\$15
Water User Charge Revenue Adjustment	\$0	\$0	\$0	\$4	\$11	\$26	\$43	\$62	\$62	\$88	\$103
Total Billed Water User Charge Revenue	\$227	\$226	\$225	\$229	\$235	\$249	\$264	\$283	\$284	\$309	\$325
Contractual Water Revenue [2]	\$7	\$7	\$7	\$8	\$8	\$8	\$8	\$8	\$7	\$7	\$7
Miscellaneous Income [3]	\$5	\$5	\$5	\$5	\$5	\$5	\$5	\$5	\$5	\$5	\$5
Bad Debt Expense	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)
Interest Income	\$3	\$3	\$3	\$3	\$4	\$4	\$3	\$4	\$4	\$3	\$4
Total Revenue	\$241	\$241	\$241	\$244	\$251	\$265	\$280	\$299	\$298	\$324	\$340
Annual Expenditures											
Operation and Maintenance Expense	\$137	\$139	\$144	\$149	\$156	\$163	\$168	\$175	\$182	\$190	\$197
Debt Service											
Existing Debt - Bonds	\$18	\$18	\$18	\$18	\$18	\$18	\$18	\$18	\$18	\$18	\$18
Existing Debt - SRF & JABSOM	\$13	\$3	\$3	\$4	\$4	\$4	\$4	\$4	\$3	\$3	\$4
SRF Fees - Existing Loans	\$1	\$1	\$1	\$1	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Proposed Debt - Bonds	\$0	\$0	\$0	\$0	\$3	\$9	\$13	\$19	\$26	\$34	\$43
Proposed Debt - SRF	\$0	\$1	\$1	\$2	\$2	\$2	\$3	\$3	\$3	\$4	\$5
SRF Fees - Proposed Loans	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$1	\$1	\$1	\$1
Subtotal Debt Service	\$31	\$22	\$23	\$24	\$27	\$33	\$38	\$45	\$52	\$60	\$70
Transfers to:											
Cash Funded Capital	\$83	\$77	\$119	\$54	\$63	\$66	\$70	\$76	\$63	\$69	\$68
Total Annual Expenditures	\$251	\$238	\$286	\$227	\$246	\$263	\$277	\$296	\$297	\$319	\$334
Beginning of Year Balance	\$107	\$98	\$101	\$56	\$73	\$78	\$80	\$83	\$86	\$87	\$92
Annual Increase (Decrease)	(\$9)	\$3	(\$46)	\$18	\$4	\$2	\$4	\$3	\$1	\$5	\$6
End of Year Operating Fund Balance	\$98	\$101	\$56	\$73	\$78	\$80	\$83	\$86	\$87	\$92	\$98
Target 180 Days of O&M [4]	\$67	\$69	\$71	\$74	\$77	\$81	\$83	\$86	\$90	\$93	\$97
Minimum 60 Days of O&M [4]	\$22	\$23	\$24	\$25	\$26	\$27	\$28	\$29	\$30	\$31	\$32
Debt Service Coverage on Bonds [5]	5.90	5.75	5.45	5.37	4.52	3.80	3.60	3.32	2.62	2.60	2.36
"All-in" Debt Service Coverage	3.36	4.57	4.15	4.00	3.47	3.05	2.93	2.76	2.22	2.23	2.06
Estimated Days Working Capital [6]	262	265	141	179	181	178	181	180	175	178	182

[1] Calculated using the approved water rates.

[2] Revenue from R-1, RO and Ocean Cooling contracts.

[3] Includes fire protection installations, billing services for ENV and other misc income.

[4] 180 Days of O&M within 10 years of FY2018, minimum of 60 days.

[5] Bond covenant requirement is 1.2, BWS policy is 1.7 on senior debt.

[6] The end of year balance divided by the daily operating expenses.

The third scenario smooths the revenue adjustments further and combines the first two bond issues into one, larger issue in FY 2021, as shown in Table 5-18. Bond issues vary between 50 and 76 percent of unfunded capital. Revenue adjustments start in FY 2021 at 2 percent and increase to 5.5 percent by FY 2027. The “all-in” DSCR remains above the financial policy threshold.

Table 5-18. Smooth Summary

	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Revenue Adjustment	0.0%	0.0%	2.0%	2.0%	4.0%	4.0%	4.5%	5.0%	5.0%	5.5%	5.5%
Cash Funded Capital	\$83	\$77	\$119	\$64	\$65	\$66	\$70	\$66	\$66	\$63	\$66
Bond Issues	\$0	\$0	\$0	\$135	\$0	\$66	\$105	\$125	\$114	\$152	\$206
“All-in” DSCR	3.36	4.57	4.35	4.19	3.18	3.19	2.92	2.60	2.30	2.15	1.99
Days Working Capital	262	265	153	177	179	181	179	181	177	182	179

Once again, available funds are drawn down through FY 2020, then build back to about 180 days and stay around that number through FY 2028, as shown in Figure 5-4. Table 5-19 shows the detailed cashflow for the smooth scenario.

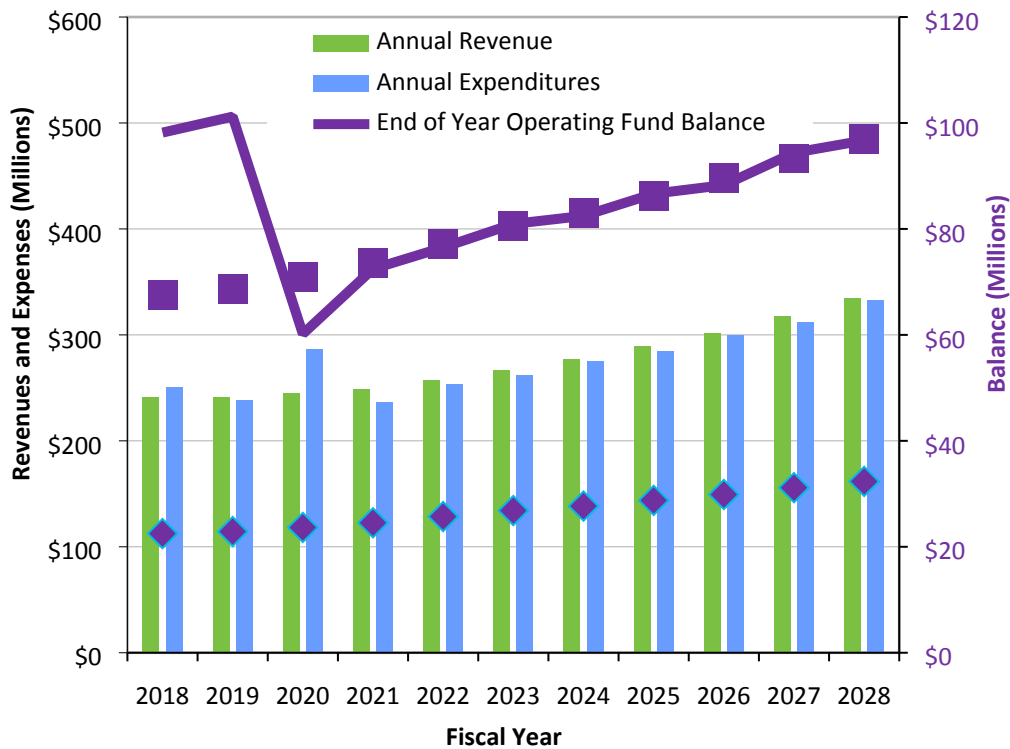


Figure 5-4. Smooth – Operating Fund Balance

Table 5-19. Smooth Cashflow, \$M

	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Billed Wtr User Charges Under Approved Rates [1]											
Single Family	\$97	\$96	\$96	\$96	\$95	\$95	\$95	\$95	\$95	\$95	\$95
Multi-Family	\$45	\$45	\$45	\$45	\$45	\$44	\$44	\$44	\$44	\$44	\$44
Non-Residential	\$81	\$81	\$80	\$80	\$80	\$79	\$79	\$79	\$79	\$79	\$79
Agricultural	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2
Automatic Fire Sprinkler	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Non-Potable	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2
Total Water Billed Charges	\$227	\$226	\$225	\$224	\$224	\$223	\$222	\$221	\$221	\$222	\$222
User Charge Revenue Adjustment:											
	<u>Year</u>	<u>Adjustment</u>	<u>First Year Effective</u>								
	2019	0.0%	6	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	2020	2.0%	12	\$5	\$4	\$4	\$4	\$4	\$4	\$4	\$4
	2021	2.0%	12		\$5	\$5	\$5	\$5	\$5	\$5	\$5
	2022	4.0%	12			\$9	\$9	\$9	\$9	\$9	\$9
	2023	4.0%	12				\$10	\$10	\$10	\$10	\$10
	2024	4.5%	12					\$11	\$11	\$11	\$11
	2025	5.0%	12						\$13	\$13	\$13
	2026	5.0%	12							\$14	\$14
	2027	5.5%	12								\$16
	2028	5.5%	12								\$17
Water User Charge Revenue Adjustment	\$0	\$0	\$5	\$9	\$18	\$28	\$39	\$52	\$66	\$81	\$98
Total Billed Water User Charge Revenue	\$227	\$226	\$230	\$233	\$242	\$251	\$261	\$273	\$287	\$303	\$320
Contractual Water Revenue [2]	\$7	\$7	\$7	\$8	\$8	\$8	\$8	\$8	\$7	\$7	\$7
Miscellaneous Income [3]	\$5	\$5	\$5	\$5	\$5	\$5	\$5	\$5	\$5	\$5	\$5
Bad Debt Expense	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)
Interest Income	\$3	\$3	\$3	\$3	\$4	\$4	\$3	\$4	\$4	\$3	\$4
Total Revenue	\$241	\$241	\$245	\$249	\$258	\$266	\$277	\$289	\$302	\$318	\$335
Annual Expenditures											
Operation and Maintenance Expense	\$137	\$139	\$144	\$149	\$156	\$163	\$168	\$175	\$182	\$190	\$197
Debt Service											
Existing Debt - Bonds	\$18	\$18	\$18	\$18	\$18	\$18	\$18	\$18	\$18	\$18	\$18
Existing Debt - SRF & JABSOM	\$13	\$3	\$3	\$4	\$4	\$4	\$4	\$4	\$3	\$3	\$4
SRF Fees - Existing Loans	\$1	\$1	\$1	\$1	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Proposed Debt - Bonds	\$0	\$0	\$0	\$0	\$8	\$8	\$12	\$18	\$26	\$33	\$42
Proposed Debt - SRF	\$0	\$1	\$1	\$2	\$2	\$2	\$3	\$3	\$3	\$4	\$5
SRF Fees - Proposed Loans	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$1	\$1	\$1	\$1
Subtotal Debt Service	\$31	\$22	\$23	\$24	\$32	\$32	\$37	\$44	\$52	\$60	\$69
Transfers to:											
Cash Funded Capital	\$83	\$77	\$119	\$64	\$65	\$66	\$70	\$66	\$66	\$63	\$66
Total Annual Expenditures	\$251	\$238	\$286	\$237	\$254	\$262	\$275	\$285	\$300	\$312	\$333
Beginning of Year Balance	\$107	\$98	\$101	\$60	\$72	\$77	\$81	\$82	\$87	\$88	\$94
Annual Increase (Decrease)	(\$9)	\$3	(\$41)	\$12	\$4	\$4	\$2	\$4	\$2	\$6	\$2
End of Year Operating Fund Balance	\$98	\$101	\$60	\$72	\$77	\$81	\$82	\$87	\$88	\$94	\$97
Target 180 Days of O&M [4]	\$67	\$69	\$71	\$74	\$77	\$81	\$83	\$86	\$90	\$93	\$97
Minimum 60 Days of O&M [4]	\$22	\$23	\$24	\$25	\$26	\$27	\$28	\$29	\$30	\$31	\$32
Debt Service Coverage on Bonds [5]	5.90	5.75	5.71	5.62	3.96	4.01	3.61	3.13	2.72	2.51	2.29
"All-in" Debt Service Coverage	3.36	4.57	4.35	4.19	3.18	3.19	2.92	2.60	2.30	2.15	1.99
Estimated Days Working Capital [6]	262	265	153	177	179	181	179	181	177	182	179

[1] Calculated using the approved water rates.

[2] Revenue from R-1, RO and Ocean Cooling contracts.

[3] Includes fire protection installations, billing services for ENV and other misc income.

[4] 180 Days of O&M within 10 years of FY2018, minimum of 60 days.

[5] Bond covenant requirement is 1.2, BWS policy is 1.7 on senior debt.

[6] The end of year balance divided by the daily operating expenses.

5.6 Summary

By utilizing a mix of cash and debt financing, the BWS can meet its anticipated revenue requirements, as demonstrated in Section 5.5. Comparing the scenarios across a few key metrics assists in identifying a recommended path forward.

Figure 5-5 compares the revenue adjustments across the three scenarios: cash financing, adding bonds, and smooth. The smooth scenario adjusts the timing and amount of bond issues to smooth out the revenue adjustments while meeting the BWS’s financial objectives as it builds up its capital program.

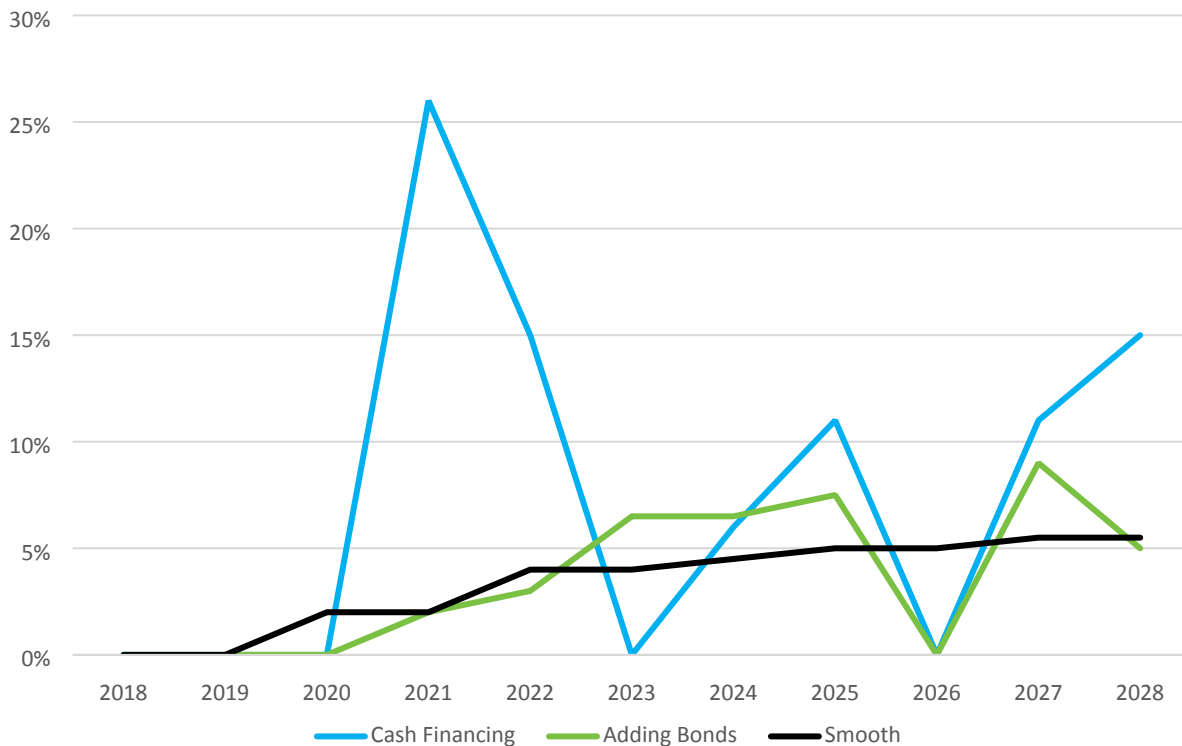


Figure 5-5. Comparison of Revenue Adjustments

Table 5-20 shows the cumulative revenue adjustment, cumulative cash financed capital, and cumulative bond issues of the three scenarios. By managing both bond issues and revenue adjustments, the BWS should be able to meet revenue requirements without double-digit revenue adjustments.

Table 5-20. Cumulative Impact of Scenarios

Scenario	5-Year Cumulative Revenue Adjustment	10-Year Cumulative Revenue Adjustment	10-Year Cumulative Cash Financing	10-Year Cumulative Bond Issues
Cash Financing	44.9%	117.6%	\$1,703	\$0
Adding Bonds	11.9%	46.6%	\$808	\$900
Smooth	12.5%	44.3%	\$804	\$903

The smooth scenario is brought forward to Section 6 for the base case trend analysis.

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Section 6

Long Range Financial Trends and Sensitivity Analysis

6.1 Long Range Financial Trends

Section 5 presented the revenue requirement for the short-term, 10-year forecast period. As the forecast period increases, the degree of uncertainty of the forecast also increases. The degree of uncertainty beyond 10 years is substantial and, as a result, the use of a financial model to forecast annual changes over a 30-year planning horizon has less value for rate setting and budget purposes. However, it is both reasonable and instructive to identify and evaluate longer-term financial trends that result from the needs identified in the WMP, the resulting capital improvement program, and the BWS's O&M projections. To evaluate these trends, a base case trend projection was developed using the 10-year revenue requirement forecast developed in Section 5 for the smooth scenario plus additional assumptions beyond year 10. Then six alternative scenarios were evaluated in the context of this base case trend projection. Assumptions used over the entire 30-year planning horizon are summarized in Table 6-1. The results are shown graphically to illustrate the trends rather than in tabular format with specific numbers.

Table 6-1. Key Assumptions for Long-Term Planning Horizon

Item	Key Assumptions for Planning Horizon
Pipeline Replacement	Ramp up to 1 percent in 10 years
State Revolving Fund Loan Amounts	Per Schedule D provided by BWS on 12/08/16 FY 2018 = \$1M, FY 2019 = \$3M FY 2025 - FY 2029 = \$10M/year FY 2020 – FY 2022 = \$5M/year FY 2030 - FY 2035 = \$12M/year FY 2023 – FY 2024 = \$8M/year FY 2030 – FY 2040 = \$15M/year
State Revolving Fund Loan Terms	FY 2018 – FY 2021 = 0% interest FY 2022 – FY 2047 = 0.5% interest Energy Savings Performance Contract = 0% interest Annual fees of 1% of outstanding balance
Bond Issues	Varies year-to-year, overall 50/50 debt/cash (1)
Bond Terms	FY 2018 – FY 2021 = 4% interest FY 2022 – FY 2047 = 4.5% interest Issuance cost = 0.5 % 30 years
O&M Escalation	3.5 percent per year
Days of Working Capital	Minimum of 60 days, target of 180 days
Water Demand	0.1% per year growth in customers 5-year gpcd reduction from WMP

(1) For purposes of the 30-year forecast, the overall debt funding of the CIP is 50 percent. But as described in this section, both the percent of debt and the frequency of debt issued can be adjusted as needed to meet different market and economic conditions.

Figure 6-1 projects the base case revenue requirements over the near and long terms compared to revenue under existing rates plus other revenue. Years 1 – 10 are shown as solid lines and are based on the smooth scenario presented in Section 5. Years 11 – 30 are the trend analysis per the assumptions presented in Table 6-1 and are shown as dashed lines. Under existing rates, revenues are projected to remain flat over the long term since water demands are not projected to increase. However, the long-term expense trend upward is due to an increased capital program, an increase in staffing to support that program, and escalation.

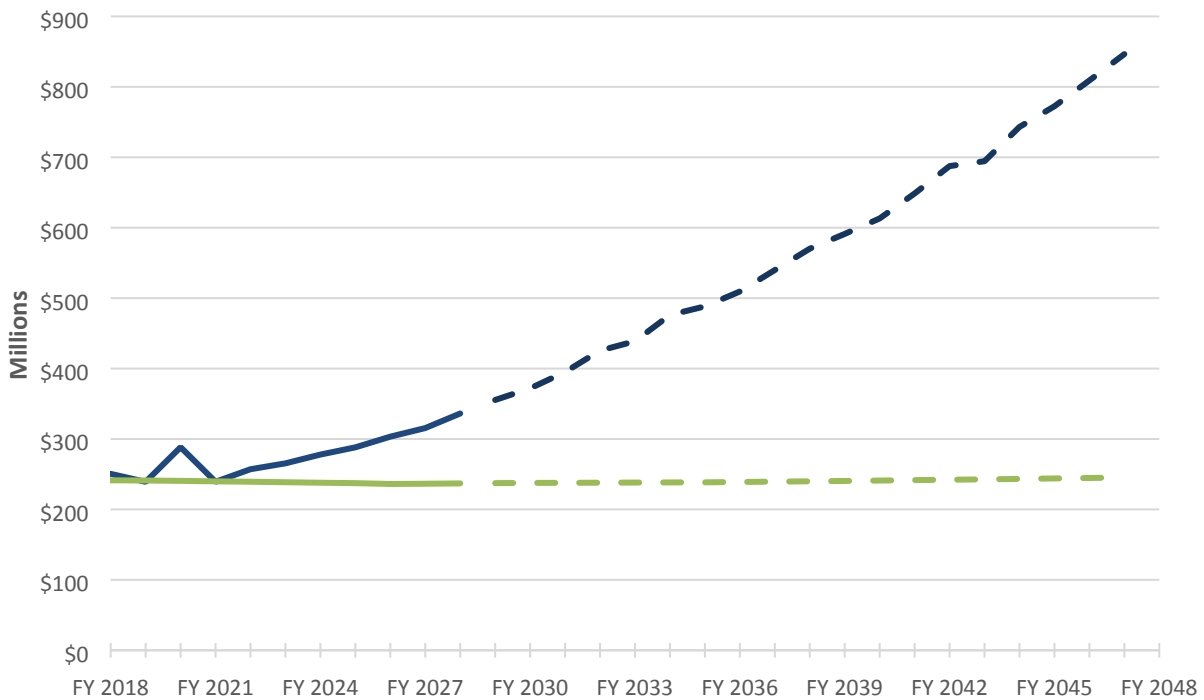


Figure 6-1. Long-Term Revenue and Revenue Requirements Trends Under Existing Rates

Figure 6-2 presents the projected additional revenue needs expressed as a percent of rate-based revenue. Base case projections show additional revenue needs varying between 2 and 6 percent per year. Additional revenue requirements initially increase corresponding to the ramp up in the capital program. In the mid- and long-terms, the year-to-year need for additional revenues remains relatively flat as a mix of drawdowns upon the days of working capital and revenue increases corresponding to the escalation-driven changes in costs are used to meet revenue requirements including maintaining the senior debt coverage of 1.7x per Board policy (note: the bond covenants require 1.2x). To the extent that additional miscellaneous revenue sources are added to those already projected, the rate-based revenue increases would be lower.

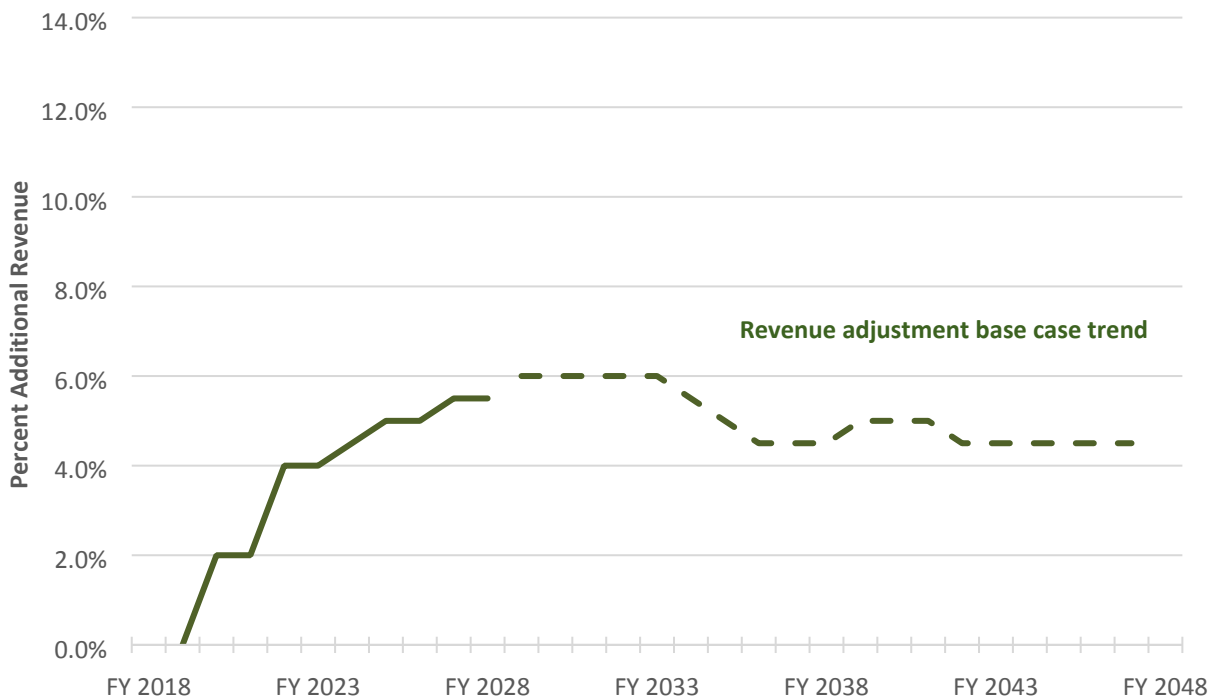


Figure 6-2. Additional Revenue Needs Trend as a Percent of Existing Rate-Based Revenue

6.2 Sensitivity Analysis

6.2.1 Alternative Planning Parameters

Every forecast of future events is subject to uncertainties. Therefore, planning processes are inexact because it is not possible to accurately predict the future. These uncertainties result in risks in the effectiveness of plans at meeting desired outcomes. These risks can be mitigated by identifying their potential cause(s), evaluating potential impacts, developing mitigation strategies, and identifying and monitoring leading indicators of their potential occurrence.

For the BWS, with respect to this Long Range Financial Plan, uncertainties fall into several categories including regulatory requirements, climate change, water quality, water demands, economic factors, and legislative and/ or political issues. The purpose of this section is to consider these types of uncertainties and identify a suite of reasonably foreseeable alternative planning scenarios. Based on these scenarios, potential financial impacts and mitigation measures are identified. While the timing of the potential occurrence and timing of any of these scenarios is highly uncertain, leading indicators provide important information about the ever-changing likelihood of their occurrence.

Scenarios

The scenarios identified for evaluation are shown in Table 6-2, along with the uncertainties that they incorporate. Given the fact that political and legislative changes, including changes in financial policies and regulations (e.g., fiscal and monetary policies) are difficult to predict and highly variable, this set of risk factors have not been evaluated in the context of the Long Range Financial Plan. Instead, the other scenarios listed in Table 6-2, reflecting longer term trends that

could be presented over the next thirty years (e.g., water demands and the impact of conservation by BWS customers) have been modeled and analyzed.

Table 6-2. Scenarios

Scenario	Uncertainties Considered
Aggressive conservation	Water demands
Aggressive growth	Water demands, water quality
Major natural disaster	Water demands, water quality, economic factors
Major source water contamination	Regulatory requirements, water quality
Climate change	Climate change, water demands, water quality, economic factors
Economic cycle	Economic factors

Mitigation Strategies

A suite of strategies is available to mitigate potential financial impacts resulting from risks associated with various scenarios. The major strategies identified are summarized below.

- Access working capital. One of the BWS's financial policies is to target a working capital balance equal to 180 days of operating expenses, and to never have less than a 60 days balance. Anticipated uses of this working capital include rate stabilization during short-term expense fluctuations, such as short-term spikes in the prices of commodities like electricity; offsetting short-term fluctuations in revenues, such as seasonal changes in water use; and disaster recovery such as following a major hurricane. Use of working capital is appropriate to respond to immediate, one-time, or cyclic events and working capital balances should be replenished in a timely fashion after the withdrawal of funds to meet these one-time events.
- Defer expenses. Beyond the expectation that the BWS is conducting its operations efficiently and serving as a strong steward of the public funds entrusted to it by its customers, there may be short- to medium-term options to reduce both operating and capital expenses, primarily through the deferral of maintenance activities and/ or capital projects. It should be noted that deferral of maintenance, and deferral of repair and replacement projects does not alleviate the need for those projects. Rather, it results in increased risks to overall system reliability and also increased costs to perform the work at a later time. Depending on the duration of an event that stresses the BWS's financial conditions, deferring projects and other activities may be required for a limited time period.
- Raise/ restructure rates. One option to close potential revenue gaps due to external factors is to raise water rates. Changes to rates could involve an increase in the commodity rate, that is the cost per thousand gallons, or an increase in fixed monthly charges, or both. Increases in the commodity rate would be expected to result in increased revenues but are subject to on-going volatility resulting from changes in customers' usage. Increases in monthly fixed charges would provide the benefit of stabilizing a portion of revenues, but decrease the extent to which individual customers

could control their water bills through their conservation efforts. Raising rates should be evaluated in the context of both the timing and magnitude of any revenue gap.

- **Issue debt.** Use of debt to finance capital programs is permitted by the BWS's Financial Policies and is a fundamental strategy in maintaining affordability for customers. Although long-term debt would not be used to cover operating expenses, the use of debt is a viable strategy to mitigate unanticipated capital costs. Short-term borrowings can also be used to bridge temporary cashflow needs during emergencies. It should be noted that such "working capital" or cashflow borrowings need to be repaid with interest, and should be used with caution. Debt issuances should always be in conformance with the BWS's adopted Financial Policies, which provide substantial flexibility and also important constraints to support the long range financial health of the utility.
- **Public-Private Partnerships.** In the United States, using P3s to achieve efficiencies in utility operations can be very controversial. There has been much debate about whether water agencies that operate in an open public forum or private companies that are subject to full market forces are better suited to provide efficient, high quality, and equitable water service. Concerns involve cutting corners on long-term investments to either enhance short-term profits or keep rates low, ignoring water conservation programs in favor of increasing revenue, or tolerating lower water quality in favor of the financial bottom line¹. However, rather than a large concession model where an entire utility's operations and capital program are involved, recent trends in P3s are more focused, to manage a specific subset of activities or challenges such as increasing energy efficiency, reducing non-revenue water, or updating information technology². Examples of this form of P3 currently being used by the BWS include its Energy Savings Performance Contract and the operations of its Honouliuli Water Recycling Facility. A design-build-operate project delivery model is also being evaluated for the Kalaeloa Seawater Desalination Plant. These types of P3 agreements allow the BWS to focus on its core strengths while, at the same time, realizing savings or operational efficiencies through performance-based contracts. In addition, such delivery/ procurement models may prove useful in responding to large resource needs due to events such as climate change or weather driven catastrophes.

Monitoring Indicators

For each alternative planning scenario, monitoring indicators have been identified that may give early indication that a particular long-term scenario may be developing. The source of these indicators varies, but may include the WMP performance metrics, annual water system monitoring metrics, business cycle evaluations, coordination with other government entities, or the BWS in-house research.

¹ Chapter 4 Models of Water Service Provision. (2002). In *Privatization of Water Services in the United States: An Assessment of Issues and Experience*. The National Academies of Sciences, Engineering, and Medicine

² Delmon, V. R. (2015, November 12). 5 trends in public-private partnerships in water supply and sanitation. Retrieved November 06, 2017, from <http://blogs.worldbank.org/ppps/5-trends-public-private-partnerships-water-supply-and-sanitation>

6.2.2 Aggressive Conservation

The WMP determined that growth in water demands is expected to be 0.2 percent per year between FY 2012 and FY 2040. Water demands from customers are met through water sales, which provide the primary source of revenue for the BWS. As discussed in Section 5, to be conservative from a financial planning perspective and reduce the risk of over-forecasting revenues, projected growth of 0.1 percent, or half of that identified in the WMP, was utilized in the 10-year revenue forecast. However, as the BWS increases the implementation of its conservation programs, the effectiveness of these programs is uncertain and may be greater than anticipated. For example, greater environmental awareness, interest in watershed sustainability, and/ or other social factors may result in greater levels of conservation. This would, in turn, reduce the BWS's water demands and revenues below this conservative forecast.

Scenario

The assumption in Section 5 is that demand will decrease ~0.25 percent per year due to conservation. To evaluate the potential impacts of more aggressive conservation, this analysis considers the following scenario:

Aggressive Conservation – Assume that demand decreases 1 percent per year. In this scenario, it is assumed that the percentage of usage within the existing tiers remains the same, or an across the board drop, with no expectation that only high users conserve.

Impact

Figure 6-3 shows that the aggressive conservation scenario described above will have the impact of reducing revenues from water sales. In 30-years' time, this reduction could be about 20 percent. This will then increase the revenue shortfall throughout the 30-year planning horizon, which may be partially or wholly offset by deferral of growth-related projects, depending on timing and location. To be conservative, potential decreases in costs due to lower demand have not been analyzed. For example, aggressive conservation could result in lower power costs for the BWS, or possibly delay the need for additional growth-related infrastructure. Project deferral is, however, recognized as a mitigation strategy.

Figure 6-4 shows the anticipated trends in additional revenue needs under this scenario. The impacts of lower demand due to aggressive conservation begin nearly immediately and compound throughout the planning period. However, this should not be interpreted to mean that either customers or the BWS should not actively pursue conservation objectives.

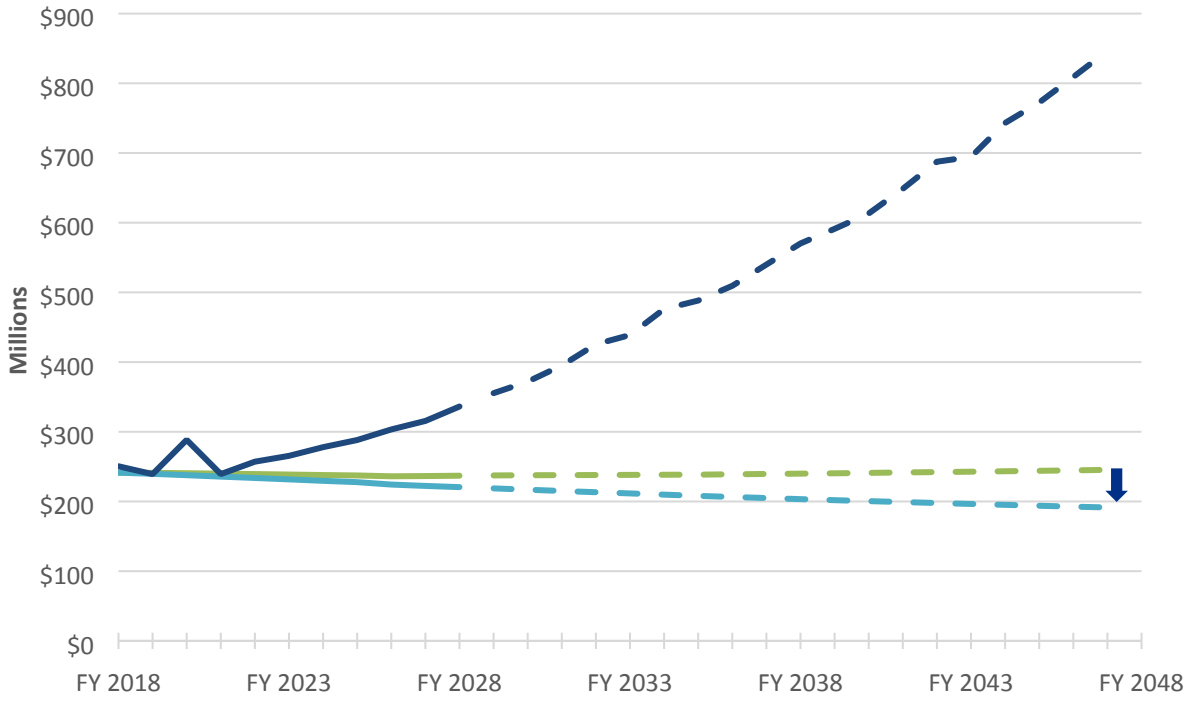


Figure 6-3. Revenue Impact due to Aggressive Conservation

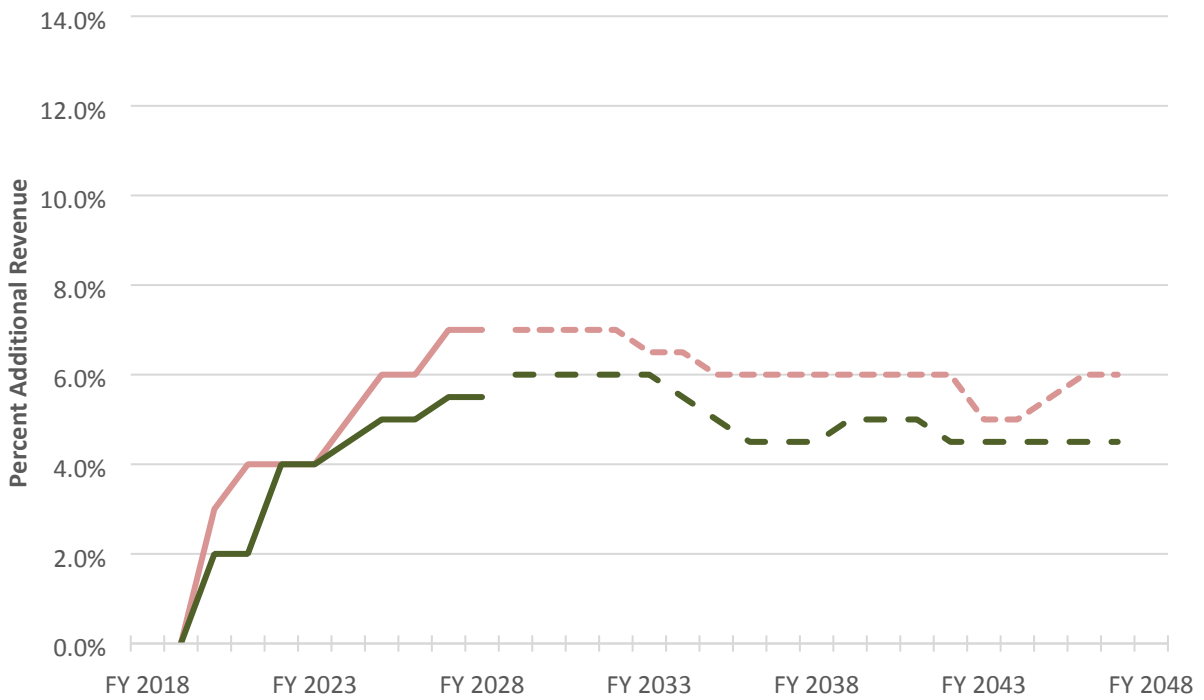


Figure 6-4. Additional Revenue Needs Trend as a Percent of Existing Rate-Based Revenue, Aggressive Conservation

Mitigation and Monitoring

As shown in Figure 6-3, under the assumptions in this scenario, revenues could be about 20 percent lower by the end of the planning period. Because the source of the revenue gap is a result of a sustained change in customer usage patterns, the potential mitigation strategies similarly will require a sustained change. Some expenses may be deferred or be eliminated as the need for new sources would be delayed and power and chemical costs may decrease. The callout below summarizes those strategies that may be appropriate to respond to this situation. If this trend were to be realized, higher rate increases would be needed, and more debt could be issued to help smooth out such rate increases.

Access Working Capital	Defer Expenses	Raise/Restructure Rates	Issue Debt	Public Private Partnerships
--	X	X	X	--

The WMP identifies per capita consumption as a monitoring metric for the BWS's conservation programs. The intended purpose of this metric is to determine if anticipated reductions in per capita demands are being realized. The metric would also be effective in determining if those reductions are greater than anticipated such that consideration of mitigation is warranted.

6.2.3 Aggressive Growth

The WMP determined that a "most probable" growth in water demands is expected to be 0.2 percent per year, and forecast a "high range" demand projection that averaged 0.5 percent per year. The WMP also identified capital projects to provide additional capacity (source, transmission, storage) when and where it is needed to accommodate this planned growth. However, the potential for growth to accelerate beyond what was anticipated, either in terms of timing or magnitude or both, is possible. While the resulting water sales would provide additional annual revenues, it would also result in an increase in the need for capital projects to provide system capacity. Corresponding O&M costs would increase as new facilities are put into service.

Capital projects to increase system capacity are either delivered entirely by the BWS with the costs being offset by a WSFC, or constructed by the developer and dedicated to the BWS, or through a combination of these mechanisms. For example, a developer may provide the transmission and storage while the BWS provides the source. Consequently, the aggressive growth scenario could result in the requirement for the BWS to construct additional capacity-related projects that could impact the ability to implement already planned repair and replacement projects. Additionally, not all growth-related capital cost expenditures that the BWS is required to make may be recovered through the WSFC in place at the time, which would further increase the revenue requirement.

The aggressive growth scenario also involves a water quality component. Depending on the location of the growth relative to sources of supply, meeting rapidly growing demands could result in increasing salinity in portion(s) of the aquifer system. Efforts to offset this could include the construction of additional sources in areas unaffected by increasing salinity or the diversification of sources, e.g., through increased supply of recycled water or seawater

desalination. Such facility costs may need to be shared by the development community and water rate payers.

Scenario

The aggressive growth scenario is broken into two sub-scenarios; growth per WMP assumptions and even greater growth.

WMP High Range Demand Projection Assumptions – Assume 0.6 percent per year growth in usage through FY 2025, then 0.4 percent per year through FY 2040, then 0.5 percent per year through FY 2047. (no change in percent usage within existing tiers)

Aggressive Growth above WMP Assumptions – Assume 1 percent per year growth in usage (no change in percent usage within existing tiers)

Both sub-scenarios would have increases in O&M costs; however, these costs are anticipated to be offset by additional rate-based revenue generated under existing rates due to the increased demand.

Impact

Figure 6-5 and Figure 6-6 show that under the aggressive growth assumptions revenues from water sales will increase. By year 30, that shift is in the 15 – 30 percent range. This increase in water sales revenue will then decrease the revenue shortfall throughout the 30-year planning horizon.

Figure 6-7 and Figure 6-8 show the anticipated trends in additional revenue needs under the high demand and aggressive growth scenarios, respectively. Projections show additional revenue needs lower than in the base case, varying between 2 and 6 percent per year. It is assumed that costs for these growth-related facilities are either a) provided for by developers or b) fully recovered from the WSFC.

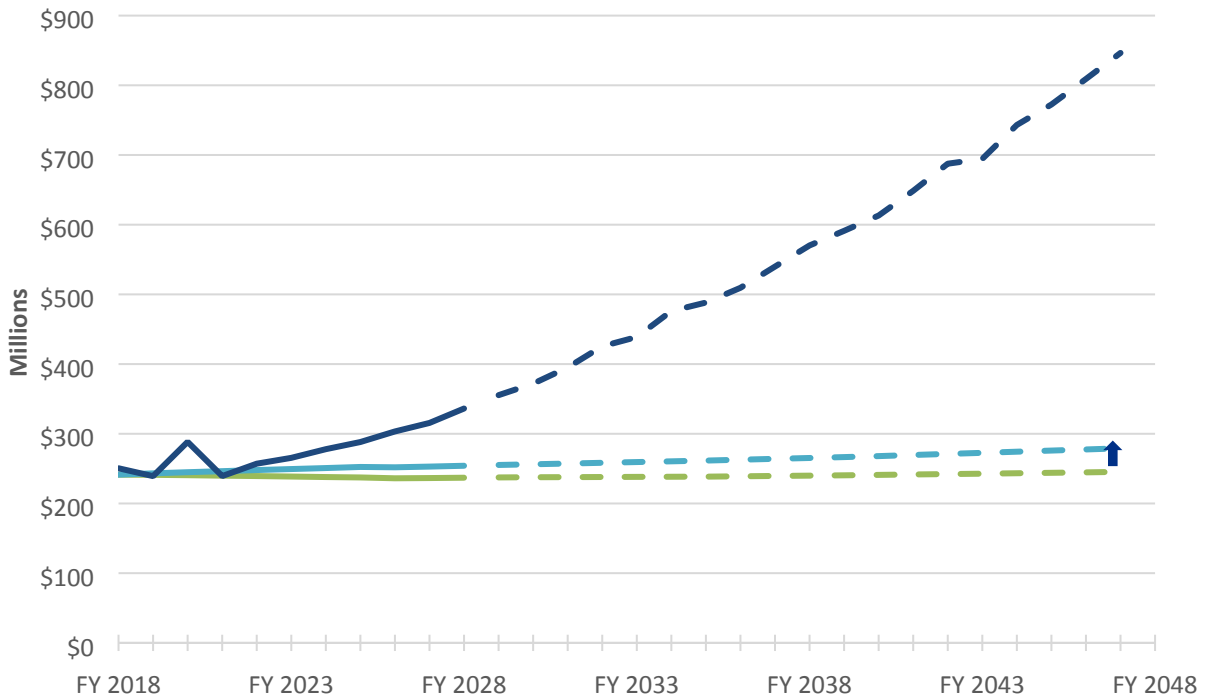


Figure 6-5. Revenue Impact due to WMP High Range Demand Growth

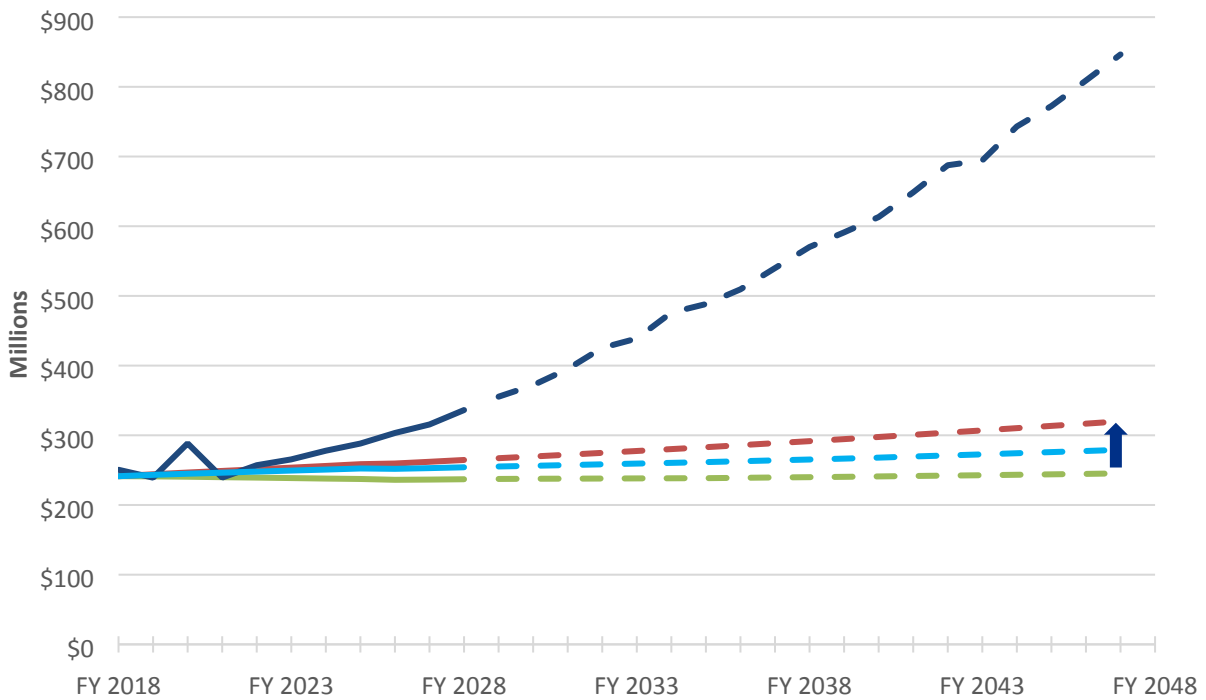


Figure 6-6 Revenue Impact due to WMP High Demand and Aggressive Growth

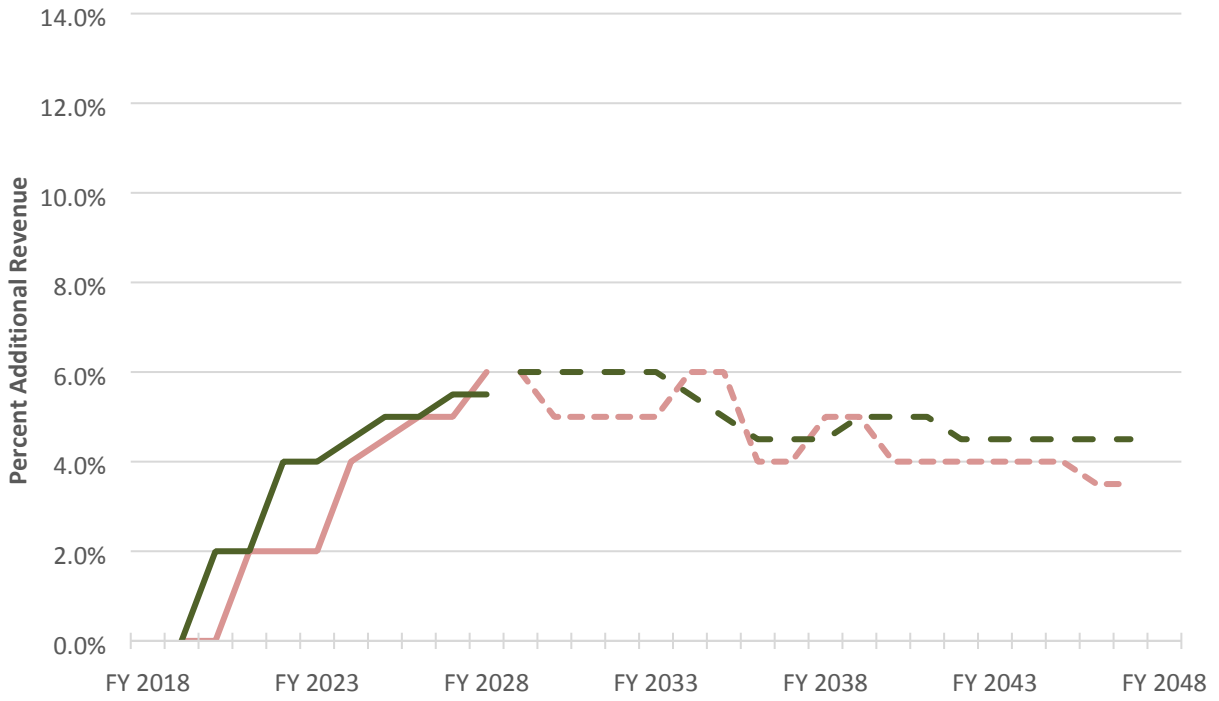


Figure 6-7. Additional Revenue Needs Trend as a Percent of Existing Rate-Based Revenue, WMP High Demand Case

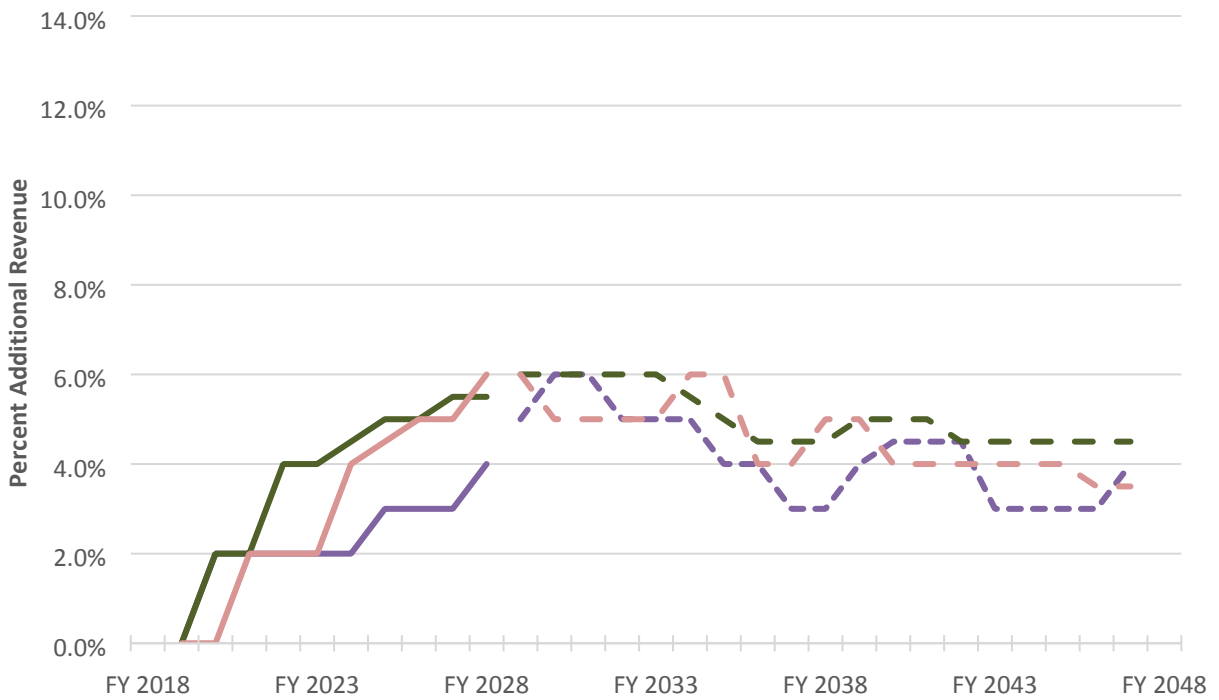


Figure 6-8. Additional Revenue Needs Trend as a Percent of Existing Rate-Based Revenue, Aggressive Growth

Mitigation and Monitoring

While aggressive growth will accelerate capital spending, it will also increase revenues due to increased water sales, and these revenues should offset the increased O&M costs of the additional infrastructure. What is less certain are the magnitude and timing of additional growth-related capital costs. In the event that unanticipated capital costs are not funded from the WSFC or developer contributions, impacts could be mitigated by issuing debt. Working capital could similarly be used in the short-term to finance capital costs, and be replenished by water sales revenue in later years.

As stated above, this scenario presumes that growth-related projects due to the increased demand are covered by developers and/ or the WSFC. For this to occur, the WSFC should be periodically reviewed.

Access Working Capital	Defer Expenses	Raise/ Restructure Rates	Issue Debt	Public Private Partnerships
X	--	X	X	--

The BWS regularly monitors total water demand as a system metric for trending and planning. This metric would also be effective in determining if the growth rate is greater than anticipated such that consideration of mitigation is warranted. Demand forecasts should also be comprehensively updated as part of the WMP updates.

6.2.4 Major Natural Disaster

Major natural disasters such as hurricanes or earthquakes have the potential to cause immediate damage to infrastructure such as pipelines, pump stations, reservoirs, or other assets. An additional impact is a loss in revenue for months or years after the event as water service is interrupted or customers are unable to pay their water bills.

Scenario

The scenario assumed is a large hurricane or major earthquake.

Major Natural Disaster – Assume damage to infrastructure causing capital needs and revenue loss as water service is interrupted or rate collection is reduced. Sampled disaster events caused capital damage ranging from 1.3 to 4.8 percent of net assets and revenue loss of 1.9 to 24 percent over the first year following the event.

Impact

The principle impacts of a natural disaster are relatively short term, in comparison to long range financial planning (e.g., 30 years). The event may cause damage to infrastructure on the order of several percent of net assets, and may cause a relatively short-term reduction in revenues. Both of these impacts manifest themselves as a reduction in working capital. As such, the impact of three hypothetical natural disaster event scenarios is shown in Table 6-3 as a “days cash” impact.

Having sufficient funds to deal with the financial impacts of a major disaster was one of the important drivers in the BWS's revised working capital policy.

Table 6-3. Impact of Major Natural Disaster on Days Cash

Item	Scenario A		Scenario B		Scenario C	
	Rate	\$M	Rate	\$M	Rate	\$M
Damages (% of net assets)	2%	\$22.4	4%	\$44.8	4%	\$44.8
Revenue Loss	50%	\$28.9	25%	\$14.4	100%	\$19.2
	Months 1-3		Months 1-3		Month 1	
Revenue Loss	25%	\$43.3	10%	\$17.3	50%	\$19.2
	Months 4-12		Months 4-12		Months 2-3	
Days Cash	201		163		177	

Mitigation and Monitoring

Because a natural disaster is an acute event, and may not lead to long-term changes to the way the BWS operates, mitigation is primarily focused on maintaining sufficient working capital to absorb short-term losses, and replenishing working capital in the years after the event. Depending on financial conditions at the time, replenishment of working capital may lead to higher rates after the event. If the acute event does result in longer term changes, which are difficult to forecast, mitigation methods would include a combination of federal aid, state aid, increased rates and additional debt.

Therefore, mitigation includes accessing working capital, deferring non-critical expenses in favor of critical expenses to repair the system, and issuing debt if working capital is depleted. Depending on the circumstance, it may also be desirable to utilize some form of outsourcing or P3 delivery mechanism to make necessary system repairs quickly and efficiently. Developing a contracting strategy in advance, which could be implemented quickly in the event it is needed, could provide important time and cost savings.

Access Working Capital	Defer Expenses (non-critical)	Raise/Restructure Rates	Issue Debt	Public Private Partnerships
X	X	--	X	X

Monitoring major natural disasters is a role the BWS fills, along with other government agencies. The BWS activates its Departmental Operating Center to coordinate system operations and emergency repair as appropriate in response to natural disasters and other emergencies. The BWS should also periodically review its emergency operations plan and conduct periodic training drills.

6.2.5 Major Water Source Contamination

Major water source contamination, such as from leaks or legacy land use, has the potential to result in additional capital needs as new treatment requirements, new replacement sources, or new pipelines to transfer existing supplies are needed to mitigate the impacted source(s).

Scenario

The scenario assumed is major contamination of a significant water source.

Major Water Source Contamination – Assume a major (~10 mgd) water source is impacted due either to a sudden leak or long-term legacy land use, and that contamination will persist in the long term.

Impact

The impact of major water source contamination depends primarily on the location and nature of the contamination. If the source is in an area where there is a lack of alternate sources, transmission from other sources will be more expensive. If the contamination can be effectively treated, new treatment at the contaminated source may be possible. Short-term revenue impacts could also manifest if mandatory conservation was put into place. Growth in the subject area could also be put on hold. The potential impacts in Table 6-4 are order of magnitude level estimates based on the assumptions shown, which may or may not be valid in any given event.

Table 6-4. Impact of Major Water Source Contamination

	Develop New 10 mgd Source + 1 mile of 36 in Pipeline	5 miles of 36-inch Pipeline	Install 10 mgd Treatment
Capital Cost	\$85 M	\$125 M	\$30 M
Annual Additional O&M Cost	\$500 k	\$1.25 M	\$3 M

Note: The nature and extent of contamination drives costs, which could vary widely.

Mitigation and Monitoring

Mitigation for major water source contamination is highly dependent on the particular event. However, it is likely that significant short-term capital expenses will be required, and potentially significant long-term increases in O&M are also possible. The short-term capital expenses are mitigated best by accessing working capital or issuing debt. Significant long-term increases in O&M costs may necessitate additional water rate revenue. Depending on the nature of the event and type of contaminants relative to the BWS’s core capabilities, the use of a P3 delivery mechanism such as design-build-operate may be considered.

Access Working Capital	Defer Expenses	Raise/Restructure Rates	Issue Debt	Public Private Partnerships
X	--	X	X	X

Monitoring for source contamination is a core function and the BWS conducts thousands of water quality tests annually. In addition, in areas where source contamination is considered to be a risk, the BWS installs monitoring wells to track any existing or potential contamination. To prepare for potential new regulatory requirements, the BWS should stay actively engaged in regulatory discussions/ groups to monitor the status of potential future regulations outlined in the WMP as well as future regulations not currently on the horizon.

6.2.6 Climate Change

Climate change presents a challenge to the BWS, along with nearly all utilities in a coastal environment and/ or dependent upon climate-related resources such as water. Changing precipitation patterns, rising sea level and groundwater levels, and higher intensity storms all have an impact on the water system. Additionally, climate change may drive the need for increased conservation (voluntary and/ or mandatory) as sources of supply become impacted.

Scenario

Potential changes to precipitation and runoff may cause decreases in aquifer recharge and increasing salinity in basal aquifers and drying up dike sources, rendering some unusable, especially in the Ewa, Kunia, and Waianae areas. Sea level rise would be expected to increase groundwater and salinity levels near the coast that, in turn, would be expected to cause increased corrosion of the BWS's pipelines. Additionally, higher sea levels and storm surges may damage surface assets in the case of storms or tsunamis. For example, the BWS has approximately 29 pipeline segments that utilize bridge crossings in low-lying coastal areas. Altogether, assets that could be impacted from climate change include some water sources, some pump stations, and coastal pipes. All this might drive the need for mandatory conservation.

Climate Change – Assume that higher capital replacement is needed due to increased groundwater salinity (resulting in loss of source yields) and that additional sources are needed to replace failing groundwater sources. Assume 25 percent of infrastructure is low enough and close enough to the coast to be impacted and that the impact will halve the useful life.

Assume that demand decreases 1 percent per year. In this scenario, it is assumed that the percentage of usage within the existing tiers remains the same, or an across the board drop, with no expectation that only high users conserve.

Impact

The impact of climate change on the BWS system is likely to be multifaceted. Long-term capital expenses may increase as groundwater levels and salinities rise, accelerating corrosion on buried assets. Short-term capital expenses may also increase due to more frequent and higher intensity storms damaging coastal above-ground assets. Further, it is assumed that the BWS will have to develop new wells and increase transmission to Waianae, and also shift toward alternative sources such as recycled water or seawater desalination. As seen in Figure 6-9, in the near term, no appreciable difference in revenue requirements is seen. However, over the long term, revenue requirements would begin to increase as assets had to be replaced sooner than originally planned, possibly by 6 percent over the base case by the 30th year. Figure 6-9 also shows a potential decrease in revenue due to the associated conservation assumptions in this scenario. By year 30, revenues could be about 20 percent lower than the base case. Figure 6-10 shows the anticipated trends in additional revenue needs under the climate change scenario. Projections show revenue needs varying between 2 and 8 percent per year.

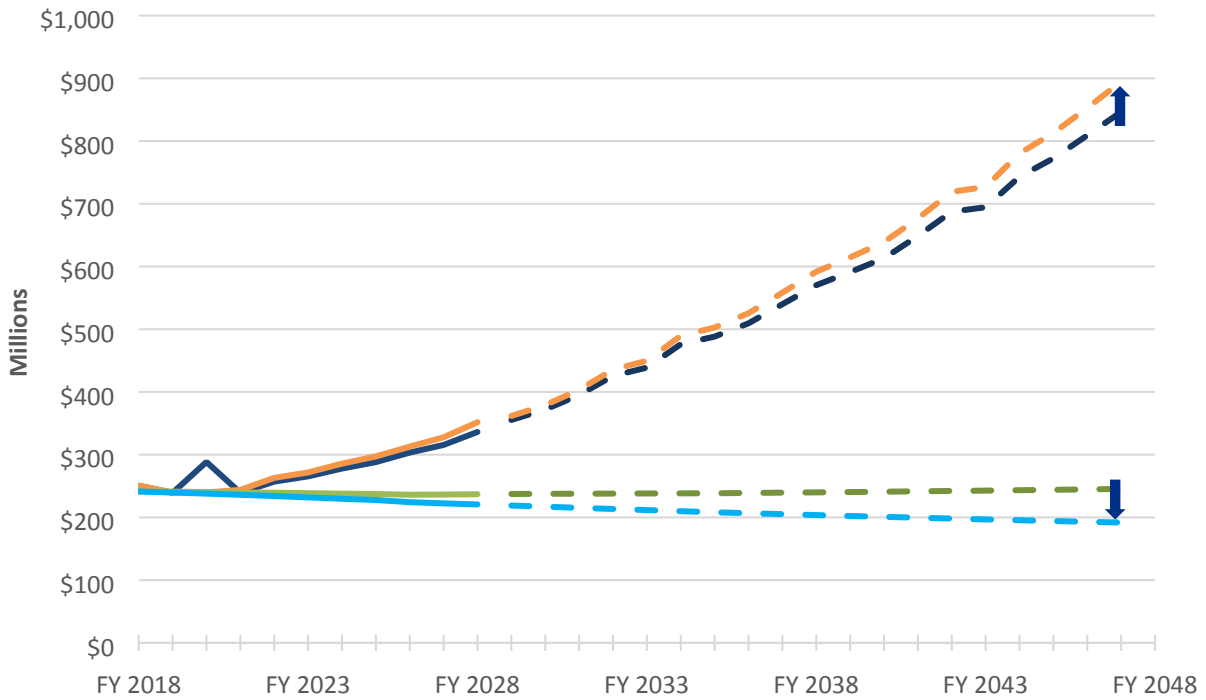


Figure 6-9. Revenue Requirements Impact due to Climate Change

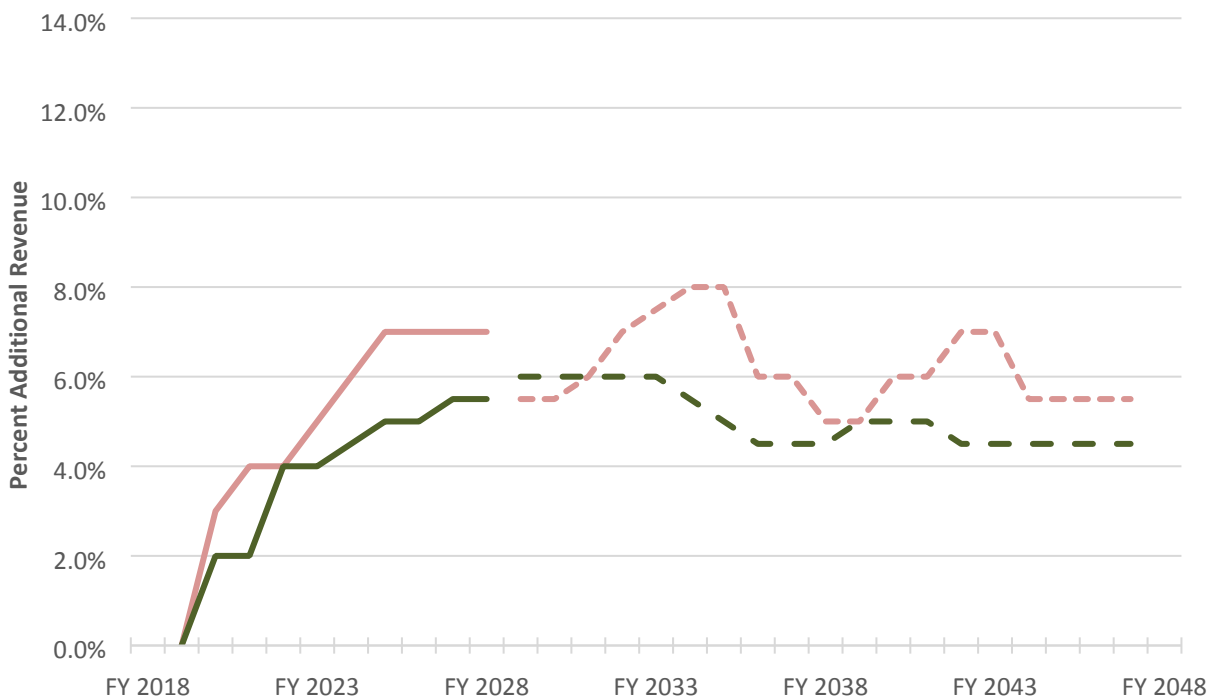


Figure 6-10. Additional Revenue Needs Trend as a Percent of Existing Rate-Based Revenue, Climate Change

Mitigation and Monitoring

Mitigation for climate change impacts will require both short- and long-term capital expenditures to replace and/ or relocate assets in low-lying coastal areas. In addition, alternative water sources such as water recycling and seawater desalination both have significant capital costs, and increased ongoing O&M compared to the existing groundwater sources. Therefore, short-term capital needs can be met by accessing working capital or issuing debt; however, long-term capital needs and increased O&M due to changing water sources must be met through increased rate revenue. Use of a P3 delivery mechanism such as design-build-operation may be considered to address long-term capital needs.

Access Working Capital	Defer Expenses	Raise/ Restructure Rates	Issue Debt	Public Private Partnerships
X	--	X	X	X

BWS monitors several climate change indicators such as precipitation and groundwater salinity. In addition, the BWS conducts its own in-house research in collaboration with the University of Hawai'i. These types of efforts should continue as part of the BWS's normal business practices.

6.2.7 Economic Cycles

Economic cycles are expected to have an impact on the BWS's revenues, capital costs, and borrowing costs. In other areas, the reduced economic activity during a downturn has resulted in reduced water use, resulting in reduced revenues. Conversely, increased economic activity during an upturn is likely to increase water use, water revenues, and system growth. Other factors that may vary during economic cycles include interest rates, which impact borrowing costs, and the overall strength of the construction market, which can result in increased construction costs.

Scenario

An economic downturn is assumed in this scenario.

Economic Downturn – Assume economic downturn similar to the Great Recession of 2008-2009 that lasted 18 months.

Impact

Unlike the other sensitivity scenarios evaluated, there are recent financial and econometric data available to characterize the potential impacts of a future economic downturn.

Figure 6-11 shows the gross domestic product (GDP) for Hawaii and the BWS revenues normalized for rate adjustments from FY 2002 – FY 2015. GDP dropped strongly during the recession, as is well documented. Analysis of revenues adjusted for rate increases shows that adjusted revenues did not start decreasing until approximately two years after the recession was over and have not rebounded to pre-recession levels. This suggests that the decrease in revenues may not be due to the recession, but may instead be a result of other factors such as increasing water and sewer rates and/ or conservation efforts. Consequently, based on these data, it is difficult to attribute a decline in the BWS's revenues to the recession.

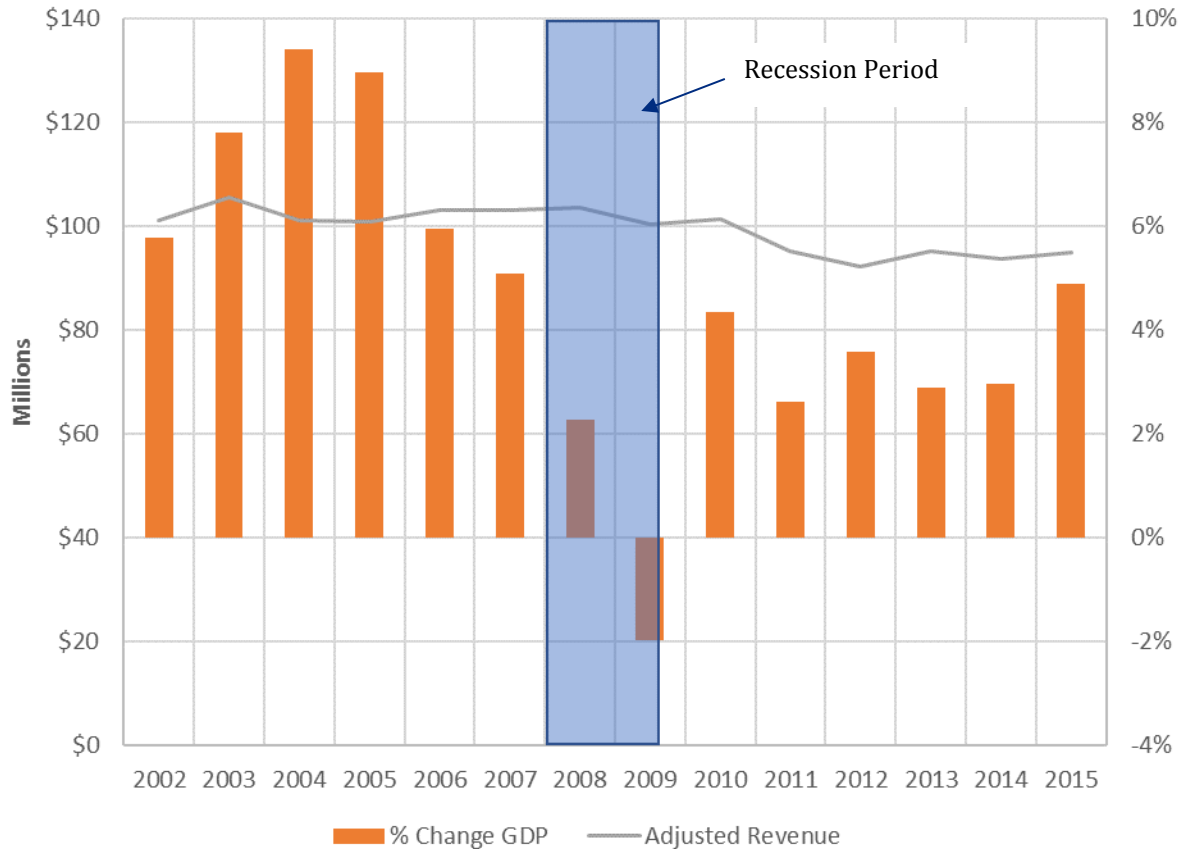


Figure 6-11. Revenue and Adjusted Revenue Before and After Recession

Economic cycles would also be expected to impact the prices the BWS pays for commodities and for construction. Figure 6-12 shows some key capital related economic indicators before, during and after the recession. The year-to-year change in the Honolulu construction cost index (CCI) showed a slight delay in responding to the recession, but indicates that construction costs did drop due to the recession, but rebounded fairly quickly. A short window may appear right after a recession to get more favorable pricing on capital projects due to a more favorable bidding climate. With this opportunity to get “more bang for your buck”, the BWS could benefit from issuing more contracts for construction during this limited window. The year-to-year change in government contracts show a sharp ramp-up after 2011, primarily due to rail, which is likely a significant driver of increased construction costs.

The next question is then whether or not interest rates are similarly low during a recession such that it would be favorable to issue more debt during this time and save cash for use during periods of higher borrowing costs. Using the Ten-Year Treasury Note as an indicator, interest rates were lowest in the years following the recession, a result of the economic stimulus policies implemented at the federal level and lower level of borrowing by corporations and households. With borrowing costs relatively low, this too would suggest favorable conditions for increasing CIP expenditures and use of debt financing.

However, as construction spending begins to increase, this places upward pressure on the CCI. The post-recession data for both of these indicators clearly reflect this impact.

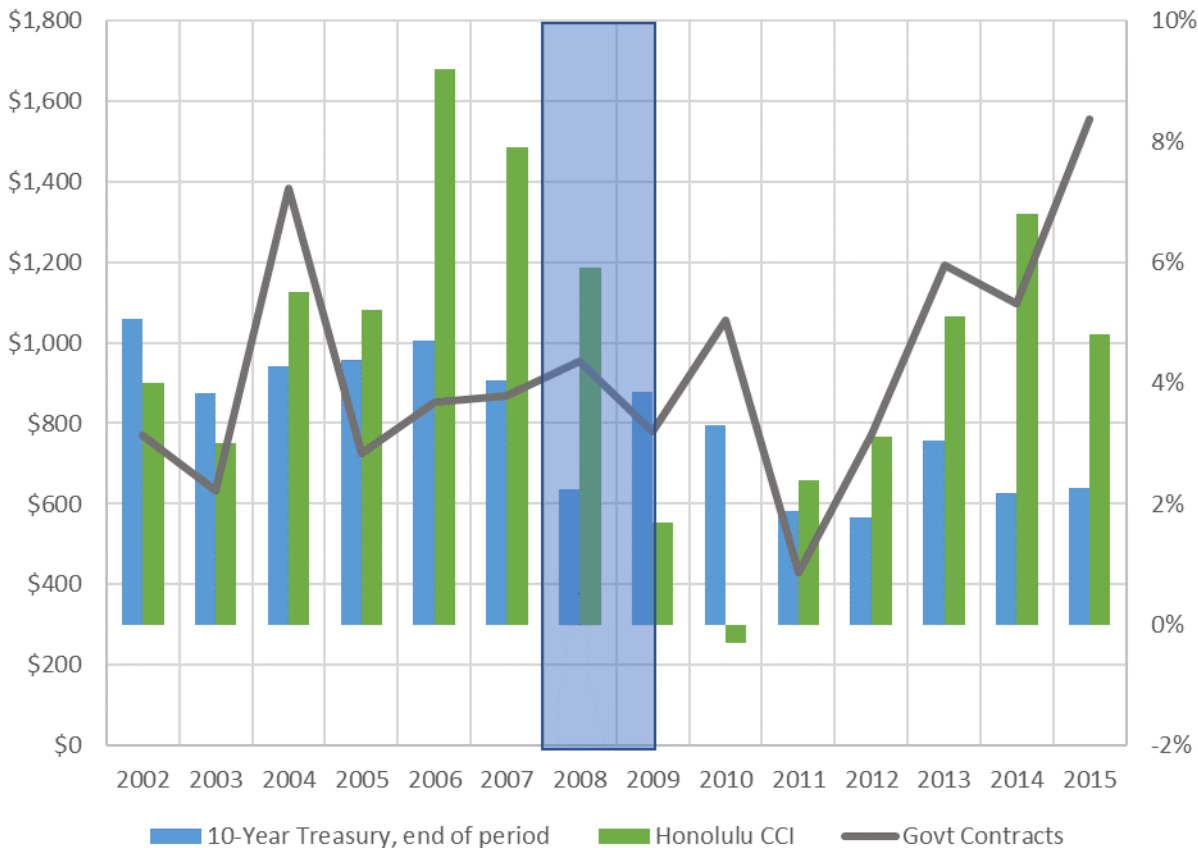


Figure 6-12. Key Capital Related Economic Indicators

One question is what are the relative impacts of lower interest rates versus a more favorable bidding environment? The following tables, while simplified for illustrative purposes, demonstrate the considerations and tradeoffs.

Table 6-5 assumes a \$10 million project that is financed using a 50/50 split of cash and debt. Total project costs are shown for interest rates ranging between 3 percent and 6 percent. For each 1 percent increase in interest rates, the total project costs increase by more than \$1 million over the life of the bonds.

Table 6-5 Impact of Changes in Interest Rate on Total Project Costs, \$ Thousands

Project Amount	Amount Financed	Term	Interest Rate	Interest Amount	Principal	Bond Issuance (0.5%)	Total Cost	Difference
\$10,000	\$5,000	30 years	3%	\$2,589	\$5,000	\$25	\$12,614	
\$10,000	\$5,000	30 years	4%	\$3,593	\$5,000	\$25	\$13,618	\$1,005
\$10,000	\$5,000	30 years	5%	\$4,663	\$5,000	\$25	\$14,688	\$1,069
\$10,000	\$5,000	30 years	6%	\$5,792	\$5,000	\$25	\$15,817	\$1,129

Table 6-6 shows what can happen during robust construction markets, when bids come in higher than expected. In this example, we again assume a \$10 million project, but pay for it all in cash. Bid premiums vary between 3 percent and 10 percent. In this example, bid premiums would have to exceed 10 percent before the additional cost would meet/ exceed \$1 million dollars, or the equivalent impact from a 1 percent increase in interest rates when the \$10 million project is financed using a 50/50 combination of cash and debt.

Table 6-6 Impact of Bid Premiums on Total Project Cost, \$Thousands

Project Amount	Bid Premium	Bid Premium	Total Cost
\$10,000,000	3%	\$300	\$10,300
\$10,000,000	4%	\$400	\$10,400
\$10,000,000	5%	\$500	\$10,500
\$10,000,000	6%	\$600	\$10,600
\$10,000,000	7%	\$700	\$10,700
\$10,000,000	8%	\$800	\$10,800
\$10,000,000	9%	\$900	\$10,900
\$10,000,000	10%	\$1,000	\$11,000

Mitigation and Monitoring

Due to the complex interaction of market forces as a result of economic cycles, the BWS should closely monitor construction market conditions, costs of borrowing, and other factors that may influence project costs. Even in a robust construction market with project bids higher than anticipated, lower interest rates may more than offset these costs. Given that changes in economic conditions are always occurring, but are not possible to predict with much certainty, perhaps the best strategy is to maintain a portfolio of “construction ready” capital projects that can be released for construction during favorable conditions in order to take advantage of those conditions when they occur. However, scaling back on planned capital projects in anticipation of more favorable conditions is not recommended and could jeopardize the overall goals of the risk-based project prioritization.

Access Working Capital	Defer Expenses	Raise/ Restructure Rates	Issue Debt	Public Private Partnerships
X	--	--	X	--

The BWS subscribes to the UHERO economic forecast to monitor changes in economic conditions and expects to continue this into the future.

6.2.8 Summary

The trend analysis indicates that the BWS has sufficient financial tools at its disposal to prepare for, manage, and mitigate risks and potential spikes in revenue needs, which ultimately become increases to the water bill. Annual adjustments to revenue needs in the trend analysis stayed below 10 percent through the application of these financial tools, including leveraging debt and working capital.

Section 7

Conclusions

For the short-term forecast period extending to FY 2028, annual operations and maintenance costs are projected to increase gradually from \$137 million to \$197 million. As a result of substantial increases in investments in the water system, capital costs are expected to increase during this period from \$144 million to as much as \$354 million; although, the amounts vary from year to year. In order to lessen impacts of these cost increases on the revenue requirement, and by extension to the BWS's ability to keep water affordable, the plan identifies a strategy that incorporates the issuance of debt to finance a substantial portion of the capital program. Over the forecast period, the financial modeling indicates that issuance of \$903 million in bonds will limit cumulative revenue adjustment to 44 percent, compared to 118 percent if the capital program were funded entirely in cash.

For the long-term trend analysis extending to FY 2047, operations and maintenance costs are expected to escalate at an average rate of 3.5 percent throughout the period. With completion of the ramp up of pipeline replacement to 21 miles per year, annual capital costs are expected to stabilize at \$180 million to \$200 million in FY 2017 dollars. However, as with operations and maintenance costs, escalation is expected to drive these costs higher. Consequently, by FY 2047, the annual revenue requirement is projected to exceed \$800 million, more than three times higher than the current year. As a result, a trend of annual revenue increases varying from 4.5 percent to 6 percent per year is expected throughout the entire long-term horizon.

Six long range planning scenarios were evaluated: aggressive conservation, aggressive growth, major natural disaster, major source water contamination, climate change, and economic cycles. Mitigation strategies available to the BWS include accessing working capital, deferring expenses, raising/ restructuring rates, issuing debt, and public private partnerships. While the impacts of the different scenarios vary in both timing and magnitude, the analyses support the recent changes the BWS made to its financial policies. These policies serve to strengthen the BWS's financial position overall, and its position to adapt to and respond to both changing market changes and emergency situations. The trend analysis indicates that with diligent implementation of the Water Master Plan, on-going monitoring using the Water Master Plan scorecard and other available metrics, adherence to the financial policies, and proactive management and mitigation, any single year's revenue adjustment could remain below 10 percent.

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Appendix A

Board Report with New Financial Policies

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BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843
www.boardofwatersupply.com




May 8, 2017

KIRK CALDWELL, MAYOR

BRYAN P. ANDAYA, Chair
ADAM C. WONG, Vice Chair
DAVID C. HULIHEE
KAPUA SPROAT
KAY C. MATSUI

ROSS S. SASAMURA, Ex-Officio
FORD N. FUCHIGAMI, Ex-Officio

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

ELLEN E. KITAMURA, P.E.
Deputy Manager and Chief Engineer 

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

Chair and Members:

Subject: Adoption of Resolution No. 873, 2017, Adopting the Board of Water Supply Debt and Working Capital Management Policies

One of the strategic objectives of the Board of Water Supply's 2018 – 2022 Strategic Plan, adopted by the Board at their April 24, 2017 meeting, is to “develop and implement short and long term financial plans and policies.”

The current financial policies were approved by the Board on September 27, 2004. After researching best practices at other water utilities and getting public comment through our Stakeholder Advisory Group, we have revised these policies and organized them into a framework of four major Debt and Working Capital Management Policies: 1) Fund Balance/Working Capital, 2) Purposes and Use of Debt, 3) Debt to Net Asset Ratio, and 4) Debt Service Coverage Ratio. These policies will be a foundation for the development of our financial plan and water rate study.

We respectfully recommend that the Board adopt the Board of Water Supply Debt and Working Capital Management Policies.

Respectfully submitted,



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

Attachments

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

RESOLUTION NO. 873, 2017

**RESOLUTION ADOPTING THE BOARD OF WATER SUPPLY
DEBT AND WORKING CAPITAL MANAGEMENT POLICIES**

WHEREAS, the Board of Water Supply, City and County of Honolulu takes to heart and is committed to its vision of “Ka Wai Ola – Water for Life”, which captures the critical need of water as the basis of life; and

WHEREAS, the Board of Water Supply’s mission is to provide safe, dependable, and affordable water to our customers now and into the future; and

WHEREAS, the Debt and Working Capital Management Policies provide the financial framework to support the Board of Water Supply’s 30-year Water Master Plan adopted by the Board of Directors on October 24, 2016, and the Board of Water Supply’s 2018 – 2022 Strategic Plan adopted by the Board of Directors on April 24, 2017; now, therefore,

BE IT RESOLVED by the Members of the Board of Water Supply, City and County of Honolulu, that the Board of Water Supply Debt and Working Capital Management Policies be adopted to provide financial guidance for the Department.

ADOPTED:

BRYAN P. ANDAYA
Chair

Honolulu, Hawaii
May 8, 2017

Board of Water Supply

Debt and Working Capital Management Policies

Purpose: The financial policies are developed to ensure the financial integrity of the Board of Water Supply, support strong credit ratings, reduce and mitigate rate increases in the future and to support the Board of Water Supply's long range financial planning objectives.

1. Working Capital

- a. Description. Working Capital (also called Uncommitted Operating Fund Balance) is needed to ensure the Board of Water Supply's ongoing ability to fund operating and maintenance expenses, debt service and construction payments in a timely manner. Sufficient funds should be committed to enable the Board of Water Supply to reliably meet its obligations, accounting for differences between when costs are incurred and revenues are received. Working Capital should be sufficient to cover contingencies, including disasters and other unforeseen events. Finally, Working Capital should provide sufficient flexibility and strength to support the Board of Water Supply's credit rating objectives.
- b. Working Capital Target. The Board of Water Supply's objective will be to maintain 180 days cash on hand, where days cash on hand is defined as the number of days of operating expenses that could be covered by Working Capital (exclusive of those funds committed to capital projects or construction contracts). The 180 days cash target is to provide funds for unplanned events such as disaster recovery and rate stabilization. The 180 days cash target is intended to be achieved gradually over an approximately 10-year period, from the adoption of this policy, in order to minimize rate impacts. The Board of Water Supply will maintain a minimum of 60 days cash on hand. The Board of Water Supply may use financial tools such as cost-effective lines of credit, commercial paper, and insurance for use in emergencies and natural disaster recovery to supplement cash and investments to provide financial capacity of more than 180 days cash on hand.
- c. Working Capital greater than 180 days may be re-programmed to fund long-term capital projects in future years.

2. Purposes and Use of Debt

- a. Description. Debt may be issued as fixed or variable-rate obligations, and may be used to finance long-term capital projects. The Board of Water Supply may incur debt through state or federal programs such as the State Revolving Fund

(SRF) and Water Infrastructure Finance and Investment Act (WIFIA), by issuing debt in the public market, or through a private placement or direct borrowing.

- b. Use of Debt. The Board of Water Supply will issue debt to fund long-lived capital projects. By issuing debt to fund capital projects, the Board of Water Supply can better align the costs (through annual debt service payments) with the effective useful life of a facility or project, more effectively allocating the cost of facilities to those customers who benefit from the facilities over time. In addition, the use of debt is a valuable tool to mitigate spikes in capital spending resulting from large project expenditures, helping to reduce needed rate increases.

The longest maturity of any debt issuance will be no longer than the expected useful life of the facility to be constructed. Debt will be issued in compliance with all tax and other federal and state regulations.

Short-term debt may be issued from time to time to fund projects in anticipation of a future long-term bond issue (e.g., a Bond Anticipation Note) or future revenues (e.g., Revenue Anticipation Note). The Board of Water Supply may also utilize revolving credit loans, commercial paper, or similar programs to provide interim construction financing in anticipation of future long-term bond issues, revenue inflow, or to provide funding during unplanned events such as natural disasters as described under Working Capital.

- c. Debt Structure. The Board of Water Supply will use a mix of fixed and variable rate debt that is expected to yield the lowest cost of borrowing, but will limit the percent of variable rate debt to no more than 20% of outstanding debt. The Board of Water Supply may issue debt on either a senior lien or a subordinate lien. Senior lien debt will have the highest claim on Net Revenues, followed by subordinate lien debt.

3. Debt to Net Asset Ratio

- a. Description. The debt to net asset ratio is a measure of financial leverage, and is defined as the ratio of total outstanding debt, including SRF loans and any other borrowing (including both senior and subordinate debt) to net assets.
- b. Debt to Net Asset Ratio Target. To ensure financial flexibility in the future, as well as maintain strong credit ratings, the Board of Water Supply will target a Debt to Net Asset Ratio of no more than 50%.

4. Debt Service Coverage Ratio

- a. Description. The Debt Service Coverage Ratio is a measure of financial margin or the amount of funds available to pay debt service, including all borrowings such

as SRF loans, after paying for all operating and maintenance expenses. It is computed as the ratio of net revenues (total revenues less operating and maintenance expenses, plus depreciation) to annual debt service.

- b. Debt Service Coverage Target. The Board of Water Supply may issue debt on either of its senior or subordinate liens. As the senior lien has the first claim on Net Revenues, the Board of Water Supply will maintain a Debt Service Coverage Ratio on senior lien debt equal to or greater than 1.7, with an “all-in” (that is, a Debt Service Coverage Ratio equal to Net Revenues divided by all outstanding debt, regardless of lien) equal to or greater than 1.6.

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Appendix B

Former Financial Policies

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**Financial Policies
Approved September 27, 2004**

The financial policies enumerated below are designed to ensure the financial integrity of Board operations, protect Board lenders, and ensure adequate financial strength and flexibility to support the Board's strategic initiatives.

1. FUND BALANCE/WORKING CAPITAL RESERVE:

Description: The amount of Unrestricted Operating Funds maintained to meet fluctuating cash flow requirements and respond to emergency situations.

Proposed Policy: Maintain an Unrestricted Operating Fund Balance of 45 days of annual operating budget expenditures, inclusive of debt service requirements.

2. DEBT SERVICE COVERAGE:

Description: The ratio of Net Operating Revenues divided by annual Debt Service requirements. This is indicative of the amount of net revenues available to meet debt service requirements.

Proposed Policy: Targeted coverage of **1.60x** annual debt service on **senior** lien debt. Targeted coverage of **1.30x** annual debt service on **junior** lien debt. (NOTE: The bond covenant requirement is 1.20x for senior lien debt)

3. DEBT TO NET ASSETS RATIO:

Description: The debt to net asset ratio defines, in part, the Board's capital structure, a policy for which guides capital financing by establishing a targeted balance of borrowing versus use of current revenues.

Proposed Policy: 40% to 50% (Currently at 26%)

4. PURPOSES AND USES OF DEBT:

Description: Determine the type of expenditures debt financing can fund.

Proposed Policy: Employ debt to finance long-term capital improvements. Issue debt in compliance with all arbitrage and tax regulations relating to remaining useful life. When appropriate, strive to issue debt with a weighted average life that is shorter than or equal to the useful life of the financed assets. Current revenues are to be used for financing operating expenses.



Financial Policies
Approved September 27, 2004

5. PAY-AS-YOU-GO FUNDING FOR CAPITAL IMPROVEMENTS:

Description: Defines the approach to capital project financing that is intended to balance the Board's cost structure and limit borrowing to optimal levels.

Proposed Policy: Should be in a range in conjunction with the debt to net assets ratio.

6. DEBT STRUCTURE:

Description: Establish general parameters related to debt structure to guide the selection of debt instruments at the time of capital investment.

Proposed Policy: Select the source that provides the most economical financing cost given the specific circumstances (type of projects being financed, current market conditions, etc.). Limit the amount of net unhedged variable debt to no more than 20% of overall debt. Analysis of the available instruments should include the following:

- Objectives and purpose.
- Applicability (tax-exempt, taxable, SRF).
- Contingency plans for rising interest rates (variable rate debt).
- Total costs, including fees and commissions.
- Evaluation of risks, limitations, and legal requirements.

7. CONTINGENCY RESERVE:

Purpose: Designate a portion of the fund balance to cover contingencies in order to protect the Board from an unforeseen event has a significant negative impact on operations.

Proposed Policy: Establish a general contingency reserve funded by setting aside net revenues that exceed budget.

8. RELATIONS WITH RATING AGENCIES:

Description: Establish approach to, frequency, and procedures for communications with Bond Rating agencies.

Proposed Policy: Maintain regular communications with rating agencies. Apprise agencies of significant developments that may impact the Board's credit rating or financial position. Provide audited financial statements, annual budget, and strategic plan annually. Meet at least annually to review ratings and ratings process.



Financial Policies
Approved September 27, 2004

9. USE OF RATE STUDIES – UPDATES AND USE OF COST OF SERVICE ANALYSIS

Description: Define frequency that rate studies are updated and the use of rate study results for establishment of Board rates.

Proposed Policy: Complete cost-of-service rate study every 3 years and use cost-of-service results as a criterion for establishing new rates and rate structures. The amount of any subsidy should be reviewed during this process. Review revenue requirements and rates annually as part of the budget process and adjust rates as appropriate.

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