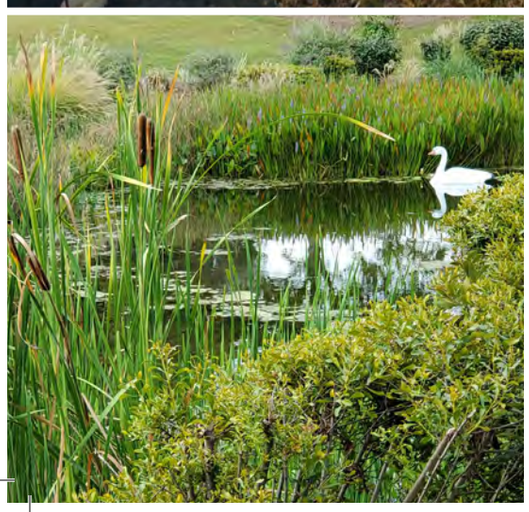

CLAYTON COUNTY Water AUTHORITY

Clayton County Water Authority 2020 Strategic Master Plan

December 2020

Executive Summary

Executive Summary

The Clayton County Water Authority (CCWA), which provides water, wastewater, and stormwater services to the approximately 290,000 residents of Clayton County and its six cities, regularly updates its Strategic Master Plan (SMP) outlining projects needed to support the infrastructure needs of the community. CCWA has engaged in a regular master planning process since 1960, and each strategic master plan provides CCWA with a roadmap for the next ten years. In February 2019 Jacobs and the CCWA began the process to develop the 2020 SMP. Building upon previous strategic master plans, Jacobs and CCWA kicked off the project with a meeting to understand the goals of the project and to explain the comprehensive process to all CCWA participants. This highly inclusive process would involve all levels of CCWA and ask all staff involved to think strategically about what projects should be identified to support CCWA goals over the next 10 years. The interactive process was focused on a series of intensive workshops which sought to identify projects that would not only support the mission and vision of CCWA, but also meet capacity and regulatory challenges into the future.

Once the project identification workshops were completed and a comprehensive project list was developed, the projects were categorized as follows: Utility-wide, Information Technology, Stormwater, Water Production, Distribution and Conveyance, Water Reclamation, and General Services. As the project lists were developed, the team realized that the number of projects identified exceeded the expectation of the team. As a result, the team strategized about how to reduce the number of projects by combining projects, eliminating unnecessary projects, and focusing only on the projects that would truly support CCWA'S mission and vision. Additionally, the team created three project buckets and placed each project into the Regulatory/Capacity, Annual Program, or Discretionary/Other bucket. Only the Discretionary/Other projects were moved forward to scoring, as the Regulatory/Capacity and Annual Program projects were identified as projects that must take place or are included on an existing schedule.

A major contributor to the project list was the Facility Evaluation Update process which was a detailed analysis of the three Water Production Plants (WPP) and three Water Reclamation Facilities (WRF). This effort sought to determine the optimal number and configuration of WPPs and WRFs using a planning horizon of 2050. This process updated the *2017 Water Production Plant and Water Reclamation Facility Evaluation Project.* The 2020 evaluation resulted in a recommendation to decommission the Shoal Creek WRF and maintain all three WPPs, if it is determined that the capacities of the plants may be increased using existing infrastructure at the plants. This decision helped inform the projects on both the Water Production and Water Reclamation project lists.

The final task of the strategic master plan process was to score all projects, identify the fiscal year in which the project will be completed, provide a planning level cost estimate, and indicate any predecessors and successors to create a clear plan for CCWA. The 2020 SMP identified a total of 147 individual projects with a total planning level cost estimate of approximately $677.7 million. At the same time this 2020 SMP was being developed, a separate project called *Water and Sewer Financial Strategy* was ongoing to create a financial model which would provide CCWA with a financial plan to generate or borrow the revenue necessary to fund the entire 10-year SMP. The 2020 SMP and the *Water and Sewer Financial Strategy* project fit hand and glove together to identify a 10-year plan to assure a successful future for the utility.

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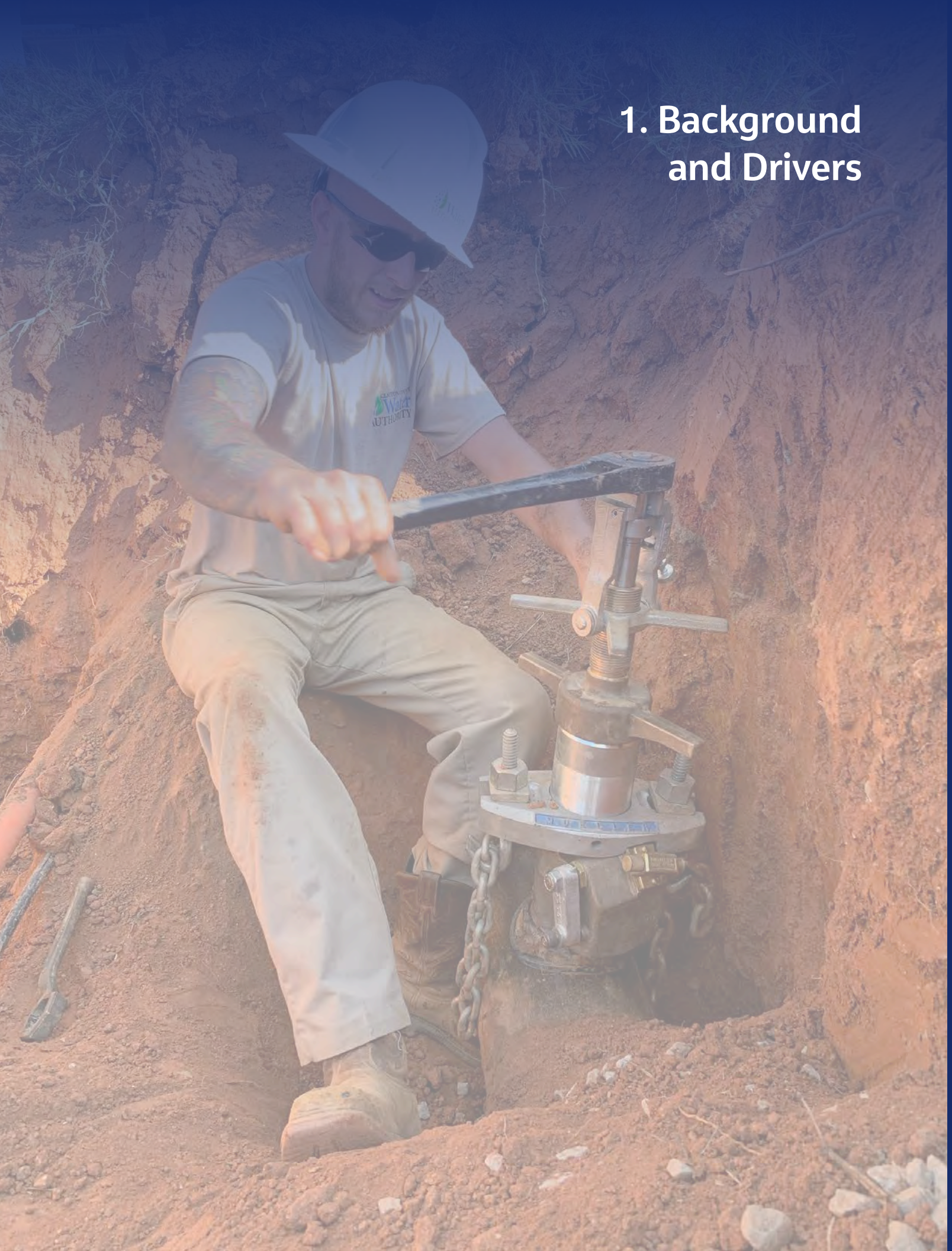
Acronyms and Abbreviations

AADD	Annual Average Day Demand
AADF	Annual Average Daily Flow
AMI	Advanced Metering Infrastructure
AMR	Automatic Meter Reading
ARC	Atlanta Regional Commission
CCWA	Clayton County Water Authority
County	Clayton County
CPES	Parametric Cost Estimating System
DBPR	Disinfection Byproducts Rule
EPA	U.S. Environmental Protection Agency
FY	Fiscal Year
FYB	Fiscal Year Beginning
GAC	Granular Activated Carbon
GAEPD	Georgia Environmental Protection Division
gpm/ft2	Gallon(s) per Minute per Square Foot
GST	Ground Storage Tank
Huie	E.L. Huie Jr.
I/I	Inflow and Infiltration
IPA	Importance-Performance Analysis
IPR	Indirect Potable Reuse
IT	Information Technology
Jacobs	Jacobs Engineering Group Inc.
JDE	JD Edwards World Solution Company
MDD	Maximum Day Demand
mg/L	Milligram(s) per Liter
MGD	Million Gallons per Day
MMF	Maximum Month Flow
MNGWPD	Metropolitan North Georgia Water Planning District
NPV	Net Present Value
NTS	Natural Treatment system
O&M	Operations and Maintenance
PRV	Pressure-release Valve
SAMP	Strategic Asset Management Plan

SCADA	Supervisory Control and Data Acquisition
SMP	Strategic Master Plan
SOP	Standard Operating Procedure
SWU	Stormwater Utility
TP	Total Phosphorus
UV	Ultraviolet
WAS	Waste Activated Sludge
WLA	Wasteload Allocation
WPP	Water Production Plant
WRF	Water Reclamation Facility
WRRF	Water Resources Recovery Facility

1. Background and Drivers



1. Background and Drivers

The Clayton County Water Authority (CCWA) strives to be a "best-in-class" utility; to that end, it has developed strategic master plans (SMP) since 1960 to identify infrastructure needs and regulatory challenges. CCWA conducts master planning on a 10-year cycle, with updates completed on a 5-year cycle, to identify and prioritize key projects. This 2020 SMP is the seventh master plan since CCWA was created in 1955. The 2020 SMP enables CCWA to:

- Respond to and evolve with changing regulations
- Protect the health of its watersheds and downstream water supplies
- Comply with permit requirements
- Avoid enforcement actions
- Establish a plan that aligns operating needs and capital projects with strategic priorities
- Provide a basis for the budgeting process and ensure funding is available for system improvements
- Support CCWA's vision: "Quality Water, Quality Service"

CCWA's master planning efforts have helped meet the community's needs while maintaining a high level of customer satisfaction at a reasonable cost to its customers. The following sections summarize the progress made since the 2015 Update of the Strategic Master Plan (2015 SMP), and the purposes, goals, and drivers for the 2020 SMP.

1.1 Goals of the 2020 SMP

CCWA's master planning process has evolved throughout the years, based on an ever-changing regulatory landscape and the needs and desires of the community. For example, the 2000 SMP and subsequent 2005 SMP Update focused on the 2000 Water Resources Initiative (WRI), which was to plan for growth, provide efficient service, and reclaim water. The WRI focused on the need for new infrastructure through the construction of new facilities. As CCWA began development of the 2010 SMP, it became clear that a different approach would be necessary as the majority of large infrastructure needs had already been met through the 2000 WRI; and the 2007 drought and local/national economic downturn had led to short-term reduction in the demand for CCWA's services. As a result, the 2010 SMP focused on maintaining CCWA's infrastructure investments to meet the community's needs while becoming more efficient in all areas of service. The 2015 SMP then focused on a balanced approach to funding projects, addressing water quality concerns, using risk-based approaches to asset management and workforce continuity. As such, the rehabilitation and renewal of existing conveyance and distribution lines became a central priority for the utility during the 2015 SMP Update and continues to be an important focus of the 2020 SMP. Additionally, the 2020 SMP has a focus on improvements to existing facilities, born out of the 2000 WRI, that are now at or approaching the end of their useful lives.

In 2020, CCWA's master planning effort focuses on changes in the regulatory environment, aging infrastructure, workforce development, improvements to technology, implementing innovation, and planning for the optimal configuration of facilities. The overall goal of the 2020 SMP is to establish a project list, project planning level cost estimate, and an implementation schedule based on a methodical prioritization process that aligns capital spending with CCWA's mission and vision. Some key challenges considered in this 2020 SMP are summarized in Exhibit 1-A.

Exhibit 1-A. Challenges and Approach to SMP Implementation

Challenge	CCWA Approach
Aging and deteriorating underground infrastructure	Strategic approaches were used to select and schedule projects to maintain, upgrade, and operate existing physical assets cost-effectively.
Workforce Development and Knowledge Retention	As the utility grows, the development of its workforce is a key goal of the SMP. The retention of key employees, the ability to hire quality staff, and the potential of retiring employees are major focuses of this SMP. Projects that capture this knowledge for future use in a systematic approach were identified.
Increase Innovation	The approach to innovation was to identify innovative projects during all workshops, and to promote innovation by adding an innovation metric to the project prioritization.
Ensure Demands and Flow Can be Met	The approach updated the demand and flow projections, compared then with existing and potential future plant capacities, and developed a long-term plan for WPPs and WRFs.
Implement Asset Management Best Practices	CCWA developed a Strategic Asset Management Plan through the Asset Management Plan Steering Committee. This committee promotes the implementation of asset management best practices by selecting projects that focus on a continuous cycle of inspections and condition assessments, prioritization, and execution.

1.2 Progress Since the 2015 SMP

The 2015 SMP included 95 projects with a combined estimated cost of approximately $370 million. Additionally, in 2017, a facility evaluation project was completed to assess plant expansion and closure scenarios for the WRFs and WPPs, to better align short-term (10-year) investments with a long-term (35-year) facility plan. Based on this evaluation, CCWA concluded it should focus resources on fewer plants, and initiated a plan to close the Shoal Creek WRF and the J.W. Smith WPP, pending further investigation. This decision impacted the project list established in the 2015 SMP; some projects slated for completion were deferred or replaced with others needed to better-define the impacts of the plant closures. Key improvements within each department made since 2015 are summarized below.

1.2.1 Utility-wide

The 2015 SMP included 17 utility-wide projects with an estimated cost of $32 million. The Strategic Asset Management Plan (SAMP), completed in April 2019, provided a roadmap to improve asset management through several prioritized asset management improvement projects. Assets addressed in the SAMP included warehouse inventory water production plants, water reclamation facilities, lift stations, and linear systems (distribution, conveyance, and stormwater). Several SAMP projects have been completed or are currently in progress. A substantial undertaking is the Inventory Management Improvements Project, which includes a complete reorganization of the CCWA's warehouse, pipe yard, and garage parts room, updates to inventory management metrics and business processes, and improvements to the inventory data in CCWA's financial tracking software (JD Edwards). This project is scheduled to be completed in February 2021.

1.2.2 Information Technology

The 2015 SMP included 13 information technology projects with a combined estimated cost of $8.6 million. One of the most significant projects completed was the JD Edwards World Solution Company (JDE) Upgrade project (#156), which coupled with an integration with Cityworks (Asset Management software for linear assets), provided CCWA with improved asset tracking and financial management. A general technology refresh and several small software upgrades also took place to keep pace with evolving office technology.

1.2.3 Stormwater

The 2015 SMP included 13 individual stormwater projects, with an estimated cost of $41 million.

To address an operational risk (Dependency on Senior Staff Knowledge) identified in the Strategic Asset Management Plan, Linear Assets (Distribution, Conveyance, and Stormwater) Assessment Report (October 2018), CCWA completed Stormwater Operations & Maintenance (O&M) Standard Operating Procedures (SOPs) in November of 2019. The Stormwater O&M SOPs were developed to guide CCWA staff as they perform SW O&M activities as part of the Stormwater Utility (SWU) within Clayton County and the Cities of Forest Park, Jonesboro, Lake City, Lovejoy, Morrow, and Riverdale. Separately, an update to the original Stormwater Utility Guidebook was completed and adopted by the CCWA Board in July 2020. The primary goals of the Guidebook update were to summarize almost 15 years of implementation experience, revise outdated references, and to reflect current stormwater and watershed requirements.

The Upper Flint Master Plan (completed in 2010) resulted in several conceptual designs to be implemented in the 2020 SMP. Part of the Upper Flint River Basin, Phase 1 improvements to the Lake Mirror stormwater system have been completed, and the design of Phase 2 Improvements will likely be completed in 2020. In addition, a conceptual design was developed for improvements to an approximately 5000 linear foot reach of Mud Creek near the intersection of Forest Parkway and State Route 85. These improvements were designed to meet CCWA's goals and objectives of protecting sewer and drainage infrastructure that is threatened by or has been impacted by stream erosion, improving water quality and stream habitat, and reducing downstream flood risks. In 2019, CCWA began to develop the West Jesters Creek Watershed Master Plan, which will result in capital improvement projects for the 2020 SMP.

CCWA has prepared green infrastructure/low-impact design program documents as part of MS4 requirements for the County and cities and has also developed conceptual green infrastructure designs for the Atlanta Hartsfield-Jackson International Airport, new Trade Center concept, Judy Lane, and Charles Drew High School.

CCWA has also engaged in ongoing quarterly coordination with members of the County and cities via the Technical Coordinating Committee to discuss MS4 permitting, compliance, and reporting requirements. As part of these activities, CCWA recently kicked off a coordinated effort to update the County and cities' stormwater management ordinances, to meet the intent of the Planning District's new post-construction stormwater management ordinance.

1.2.4 Water Production

The 2015 SMP included 16 water production projects, with a combined estimated cost of $27.5 million. These included a series of projects to evaluate source water quality concerns, to implement the recommended water quality monitoring and control approaches in the CCWA's reservoirs, and to evaluate a series of advanced treatment technology options. The Source Water Quality Assessment (#301) and

subsequent implementation of oxygenation and geochemical augmentation strategies in 2017 addressed many of the WPPs' source water challenges.

Following the CCWA WPP Treatment Technology Evaluation, CCWA elected to further investigate granular activated carbon (GAC) filtration at the Hooper WPP through an onsite pilot study (currently ongoing) to evaluate the performance of a GAC filter retrofit. Other ongoing Hooper WPP projects include the installation of emergency power generators and improvements to the residuals handling systems.

High-service pumps are in the process of being replaced at the Smith WPP. Flood-proofing improvements, bar screen replacement at the Flint River pump station, and Smith WPP solids-handling improvements were placed on hold, pending the tentative decision to decommission the Smith WPP.

1.2.5 Distribution and Conveyance

The 2015 SMP included 19 projects, with an estimated cost of $163 million. CCWA has been replacing galvanized water mains at an accelerated rate and expects to complete the remaining 43 miles within the next 8 to 10 years. CCWA has installed backflow preventers throughout the system and will continue to replace the remaining commercial meters.

CCWA has developed sewer models for the entire County and continues to perform flow monitoring and inspection activities in gravity sewers. Although not originally included in the 2015 SMP, the Water Distribution Model was also updated and has allowed CCWA to develop and pilot a Unidirectional Flushing (UDF) Program, which has demonstrated success in reducing water quality-related customer complaints. The *Water Production and Storage Analysis* project was also completed in 2020. The first driver of this project was to determine if CCWA could wholesale more water, and the capital improvements needed to do so. Water demands between 2010 and 2019 were below projected demand, and CCWA sought to understand the impact of wholesaling more water to College Park, or wholesaling to other neighboring counties. Another driver for completing this project was to understand the effects of decommissioning a WPP to the water distribution system.

Since 2015, significant progress has been made on large interceptor rehabilitation, including approximately 4 miles of the Flint River Outfall and 1.5 miles of the Jesters Creek Outfall, with a total project cost of $22 million. CCWA has performed Basin Level Sanitary Sewer Rehabilitation for all three basins, as well as condition assessments and rehabilitation of the conveyance system's pressure sewers. This large diameter sewer rehabilitation and replacement program will remain a focus for CCWA in the 2020 SMP. Additionally, roughly 22 miles of galvanized pipe has been removed since 2015 and this will continue to remain a focus for the next ten years.

1.2.6 Water Reclamation

The 2015 SMP included 12 water reclamation projects with a combined estimated cost of $51 million.

Most of the 2015 SMP projects related to the W.B. Casey Water Resources Recovery Facility (WRRF) were completed, are currently in progress, or were otherwise redefined based on further developments resulting from the 2017 Facility Evaluation. Plant upgrades since the 2015 SMP included two major design and construction projects:

1) The 2015 Improvements project, completed in 2017, included a new headworks screening process, rehabilitation of the preliminary treatment unit, and adding a fourth secondary clarifier.
2) The ongoing Phosphorus Polishing and WAS Thickening Facility project (scheduled for completion in 2020) includes a new tertiary treatment plant for phosphorus polishing to enable a 6.6 MGD discharge to the Flint River and a new waste activated sludge (WAS) thickening facility.

The W.B. Casey Plant Capacity Analysis and Plant Expansion Evaluation is another major effort related to both the 2015 SMP and the 2017 Facility Evaluation. This project included a capacity evaluation to determine when and how the plant should be expanded. This project also included a technology evaluation for a new biosolids processing facility.

Projects previously established by the 2015 SMP for the Northeast WRF included an Evaluate Treatment Options (#704) project to identify treatment options and conceptual design for upgrades to enable CCWA to move from their B.1 effluent limits (6 million gallons per day [MGD] maximum month flow [MMF]) to the permitted B.2 limits (10 MGD MMF). It is noted that these B.2 permit limits for a 10 MGD flow are significantly lower for total effluent phosphorous and ammonia. The treatment evaluation was completed, but the conceptual design was put on hold after new flow projections indicated the plant would remain well-below design capacity (B.2 limits) in 2050. Based on these projections, the CCWA requested a new wasteload allocation (WLA) from the Georgia Environmental Protection Division (GAEPD) for interim flow limits, in the hopes of deferring capital upgrades. A draft WLA has been received and is currently being reviewed by CCWA.

The projects identified for Shoal Creek WRF in the 2015 SMP included Identify and Mitigate Odor Issues (#714) and Disinfection Treatment System Evaluation (#715). These projects were deferred following the 2017 facility evaluation, based on the decision to decommission Shoal Creek. Instead, the cost and impacts of closing Shoal Creek were further evaluated. A conceptual design and cost estimate to decommission Shoal Creek was completed. An evaluation also took place to assess the impact on the Smith Reservoir, to determine whether removing the flow from Panhandle Road (Panhandle) Treatment Wetlands would impact the withdrawal rate from the Smith Reservoir.

Additional work is ongoing to pilot geochemical augmentation within the E.L. Huie Jr. (Huie) Constructed Treatment Wetlands, to further reduce the phosphorus load to the lakes. A chemical storage and feed system for the Huie Wetlands is currently in design and is expected to be constructed by mid-2021.

While previously scoped in the 2015 SMP as a Laboratory Information Management System (LIMS), CCWA decided to implement an operational data management system called HACH Water Information Management Solution (WIMS). Implemented at both water production and water reclamation facilities, this program has increased functionality and facilitates data collection, management, sharing, and reporting. CCWA is in the process of integrating the Stormwater Department's data collection and management requirements into the HACH WIMS system.

1.2.7 General Services

The 2015 SMP included 8 General Services projects with a combined estimated cost of $18 million. Most of the projects completed from the 2015 SMP list were related to supervisory control and data acquisition (SCADA) system upgrades identified in a SCADA Implementation Plan completed in 2013. These projects include a project to replace Remote Terminal Units (RTUs) that had reached the end of their useful life with Programmable Logic Controllers (PLCs), a project to upgrade existing networks at water and wastewater facilities to Ethernet, and a project to install monitoring systems at previously unmonitored sites. The remaining scope, which included facility firewalls, wireless local access network access points, and mobility applications, was updated to reflect the newest available technologies and was included in the 2020 SMP Project List. In addition to the SCADA upgrades, a new building was constructed for the General Services department in 2018.

1.3 Drivers for Development of 2020 SMP

Drivers for the development of the 2020 SMP include:

- Revised flow projections
- Regulatory drivers
- Recent performance issues related to taste and odor
- Facility Evaluation update
- CCWA's desire to continue to increase efficiency to maintain "best-in-class" utility status

The following sections outline each of these in further detail.

1.3.1 Population Growth, Water Demand and Wastewater Flow Projections

Water demand and wastewater flows projections are the cornerstone of facility and master planning. Results from these projections drive what projects will be needed, from a capacity basis, over the master-planning period. For the 2020 SMP, the following assumptions were made to project and distribute water demand and wastewater flows:

1) Water billing records from 2016 were used to establish the per capita use and the most current demand distribution. At the time the projections were developed, 2016 was the most recent year with complete billing records.
2) The water demand and wastewater flow projections published in the Water Resource Management Plan (2017 MNGWPD Plan) (MNGWPD, 2017) were used as the basis for the projections but adjusted for the planning period based on recent trends.
3) The population projections per census tract provided by the Atlanta Regional Commission (ARC) were used, and only population within the county boundaries was considered. Demands outside the County were considered wholesale and added separately.
4) The projected population was evenly distributed within each census tract.

1.3.1.1 Population Projections

The ARC is required by the State to generate annual population estimates for the 10-county Atlanta region. These estimates are developed using several data sources, including building permits, school enrollment and occupancy rates. For this analysis, census tract population projections for Clayton County were used to allocate water demands throughout CCWA's water and sewer service areas.

1.3.1.2 Water Demand Projections

In order to distribute the population, the census tracts and the service areas were joined spatially using GIS. Exhibit 1-B shows how the census tracts overlap the water service areas. If a census tract overlapped service area boundaries, the population counts were allocated to each service area based on the ratio of the census tract area to each service area. Exhibit 1-C summarizes the population projections for each water service area. The data shows that the southern portion of the county (i.e., J.W. Smith Low and Noah's Ark South service areas) will experience the greatest percent change in population between now and 2050, with J.W. Smith Low's population expected to grow 65 percent between 2015 and 2050, followed by Noah's Ark South with 44 percent. These two service areas, however, will continue to have the lowest population densities in the County, with an estimated 1,086 people per square mile (J.W. Smith Low) and 1,504 people per square mile (Noah's Ark South) in 2050. In comparison, the service areas estimated to have the highest population densities in 2050 are Crystal Lake (3,959 people per square mile) and Southlake (3,725 people per square mile).

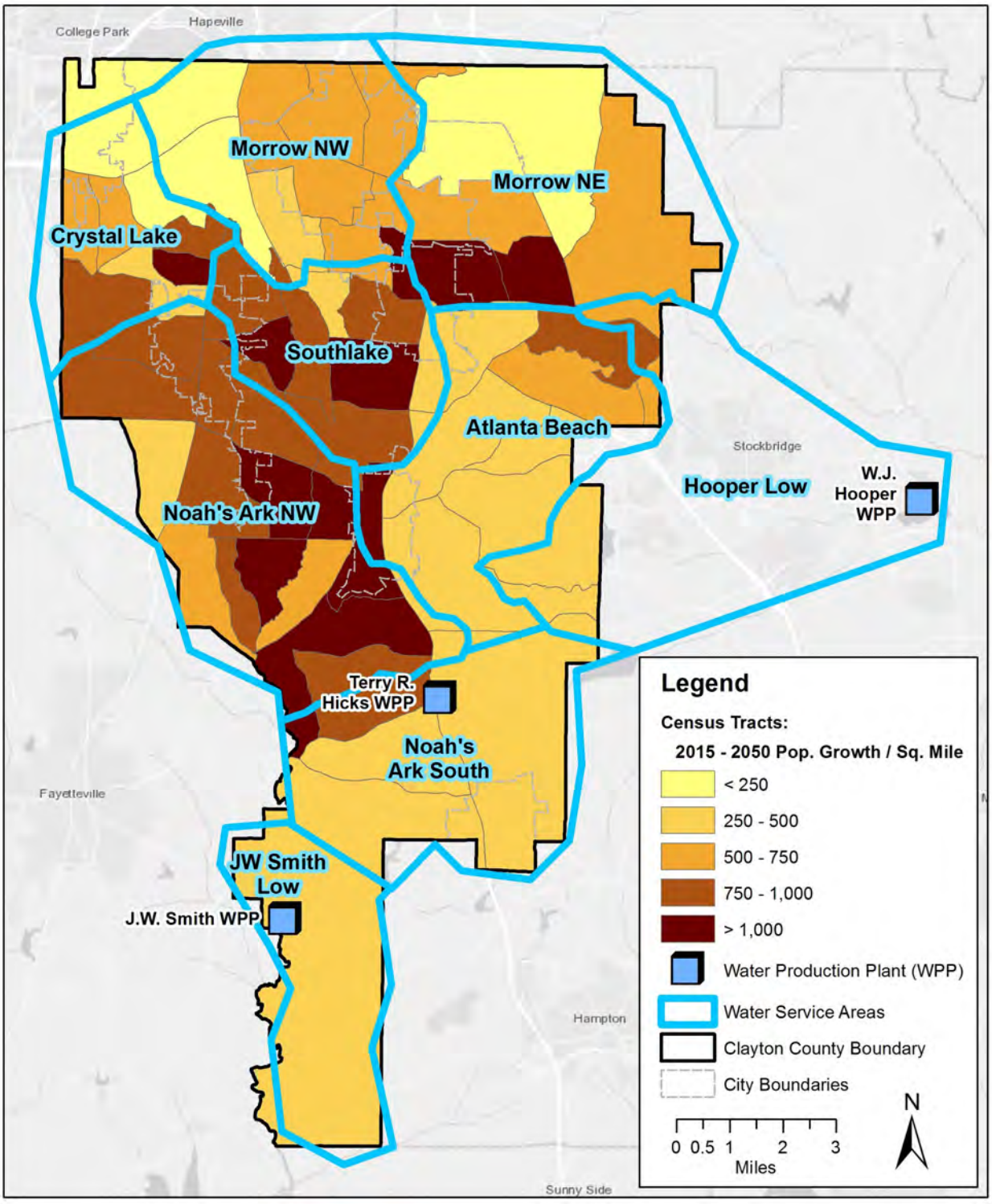


Exhibit 1-B. 2015-2050 Population Growth by Water Service Area

Exhibit 1-C. Population Projections by Water Service Area

Water Service Area	2015	2020	2025	2030	2035	2040	2045	2050	% Increase (2015 - 2050)
Atlanta Beach	38,848	40,113	41,275	42,436	44,045	45,655	47,266	48,872	26
Crystal Lake	23,953	25,659	26,354	27,046	27,909	28,775	29,638	30,502	27
Hooper Low	7,091	7,353	7,656	7,956	8,349	8,741	9,134	9,527	34
J.W. Smith Low	7,668	8,104	8,720	9,336	10,166	10,996	11,826	12,656	65
Morrow Northeast	35,469	36,784	38,462	40,136	42,044	43,950	45,860	47,764	35
Morrow Northwest	28,258	29,865	30,837	31,808	32,808	33,808	34,806	35,806	27
Noah's Ark Northwest	69,975	72,978	76,060	79,132	82,808	86,480	90,159	93,830	34
Noah's Ark South	19,027	20,005	21,014	22,021	23,366	24,708	26,050	27,393	44
Southlake	35,647	36,991	38,346	39,699	41,398	43,093	44,791	46,486	30
Total	265,936	277,852	288,724	299,570	312,893	326,206	339,530	352,836	33

[a] Based on 2016 ARC population projections.

Once population projections were distributed among service areas, the baseline per capita use was calculated using the 2016 billing records (excluding wholesale). Water demand projections were developed using this per capita value, the calculated population projections, and by allocating the expected increase in water demands calculated in the 2017 MNGWPD Plan to the population growth per service area.

In addition to the population-based demands, the 2017 MNGWPD Plan included water demands under a New Commercial category. The Clayton County Department of Economic Development provided guidance and identified areas nearby the airport and along I-285 and I-675 as areas where new commercial growth is most likely to occur. Hence, new commercial demands were applied evenly across these tracts. This expected growth translated to greater water demands than those used for other planning studies between 2015 and 2019 (such as the Water Distribution System Model and the Water Production and Storage Analysis). However, the differences in flow projections do not impact the recommended 2020-2030 capital improvements identified in these two reports.

Exhibit 1-D shows the CCWA projected annual average day demand (AADD) along with actual production over the previous 15 years. The actual water production includes wholesale water to College Park, which currently constitutes approximately 6 percent (or approximately 1.4 MGD) of the total production. Separate water demand projections were made for the wholesale water sold to the City of College Park.

CCWA is contracted to provide up to 3 MGD-MDD of potable water to College Park through 2028, based on a Water Sale Agreement signed by CCWA and College Park. Initial water demand projections were calculated in the Modeling Analysis Conducted for Potential College Park Future Interconnections Technical Memorandum (TM), prepared for CCWA in May 2009. The TM (2009) shows future demands increasing up to 6 MDD-MGD. However, it should be noted that based on the Water Distribution System Modeling results, the water distribution infrastructure upgrades required to provide more than 2 MDD-MGD would be significant and costly. CCWA should continue to monitor these demands and consider purchasing water from existing interconnections upon renewal of this contract in 2028.

Exhibit 1-D also shows that the projected demand for CCWA is expected to increase in 2020 and continue this linear trend over the next 30 years. It is important to note that new commercial development is expected but it is also highly variable. Therefore, any potential delays in economic development activities will also cause a lag in the need to expand water production to supply these activities.

CCWA should closely monitor actual demands and potential new demands from commercial or economic development activities and continue to compare these against the projected demands from this SMP to determine whether demands are increasing as projected. The demands can then be revised as part of the 5-year update in 2025, if necessary.

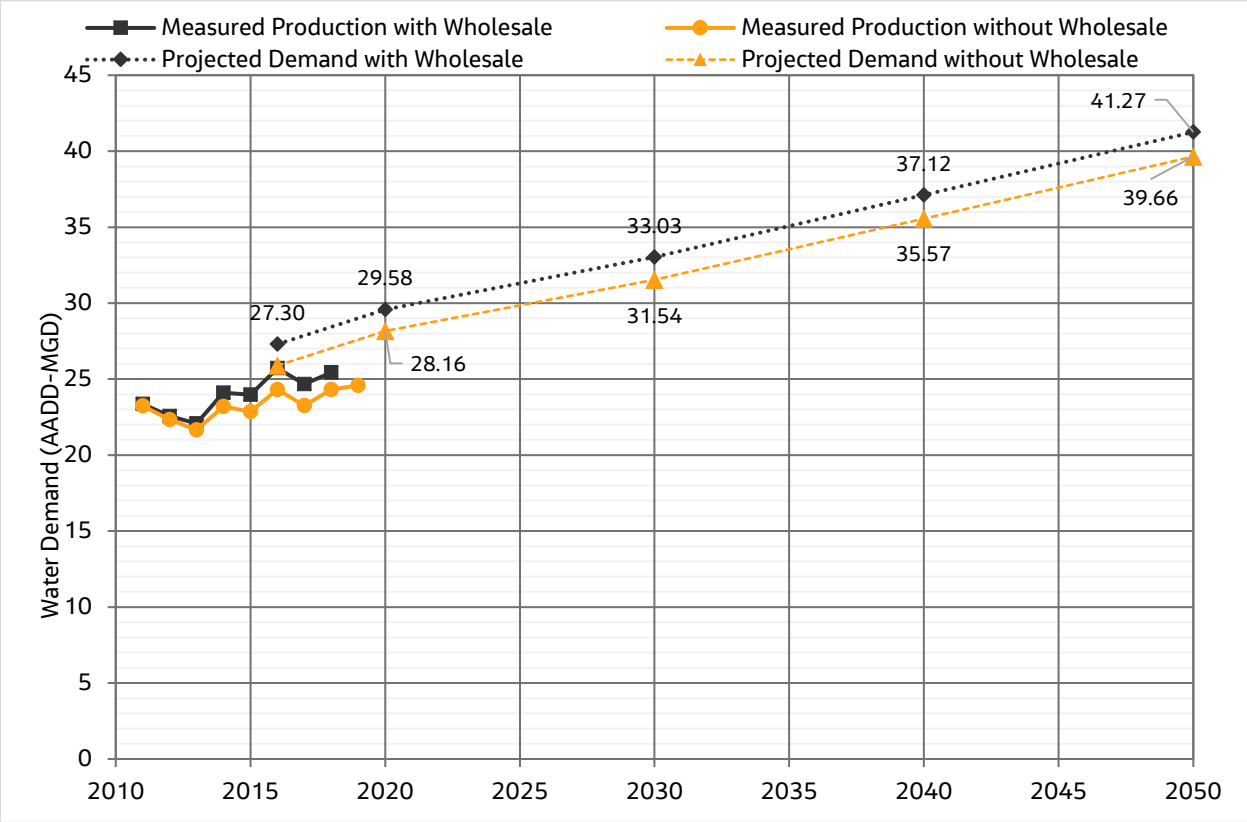


Exhibit 1-D. CCWA Water Demand Projections (AADD-MGD)

For the MDD projections, daily production records for the last 16 years (2004 to 2019) from CCWA WPPs were evaluated to calculate MDD and peaking factors. For this analysis, the wholesale portion was subtracted and analyzed separately. Exhibit 1-E shows the actual AADD, maximum day demand (MDD), and maximum day peaking factor, from 2004 through 2019.

Exhibit 1-E. CCWA Water Demands – 2004-2018 Actual

Year	AADD (MGD)	MDD (MGD)	Peaking Factor
2004	27.66	35.62	1.28
2005	27.34	33.69	1.23
2006	26.98	33.66	1.25
2007	26.87	32.88	1.22
2008	24.68	29.52	1.20
2009	24.35	30.17	1.24
2010	24.26	31.01	1.28
2011	23.36	28.87	1.24
2012	22.56	27.89	1.24
2013	22.08	26.60	1.20
2014	24.09	32.16	1.33
2015	23.98	28.11	1.17
2016	25.71	31.23	1.21
2017	24.68	30.03	1.22
2018	25.42	32.00	1.26
2019	25.77	30.82	1.20
Average Historical Peaking Factor (2004 – 2019)			1.24

Exhibits 1-F and 1-G shows the water demand projections AADD and MDD from 2020 through 2050. The demand was split into three main categories: (1) population-based demand, (2) new commercial demand, and (3) wholesale demand. The categories provide information that could guide the implementation of projects, depending on the status of the commercial development and their expansion. A peaking factor of 1.24, based on CCWA historical usage, was used to calculate the MDD. These projections show that CCWA will have an AADD and MDD of 41.3 and 51.2 MGD, respectively, in 2050.

Exhibit 1-F. CCWA Water Demands –2020-2050 Projected

Year	AADD (MGD)				MDD (MGD)[b]			
	Population Based Demand	New Commercial Demand[a]	Wholesale Demand	Total Water Demand	Population Based Demand	New Commercial Demand[a]	Wholesale Demand	Total Water Demand
2020	26.78	1.38	1.42	29.58	33.21	1.71	1.77	36.69
2030	28.79	2.75	1.49	33.03	35.70	3.41	1.84	40.95
2040	31.21	4.36	1.55	37.12	38.70	5.41	1.92	46.03
2050	33.60	6.06	1.61	41.27	41.66	7.51	2.00	51.17

[a] During the District Plan Update (2017), a new commercial category was developed for Clayton County to account for future economic development within the County.

[b] Calculated using an average historical peaking factor of 1.24. The average peaking factor was calculated using water production data from 2004-2019.

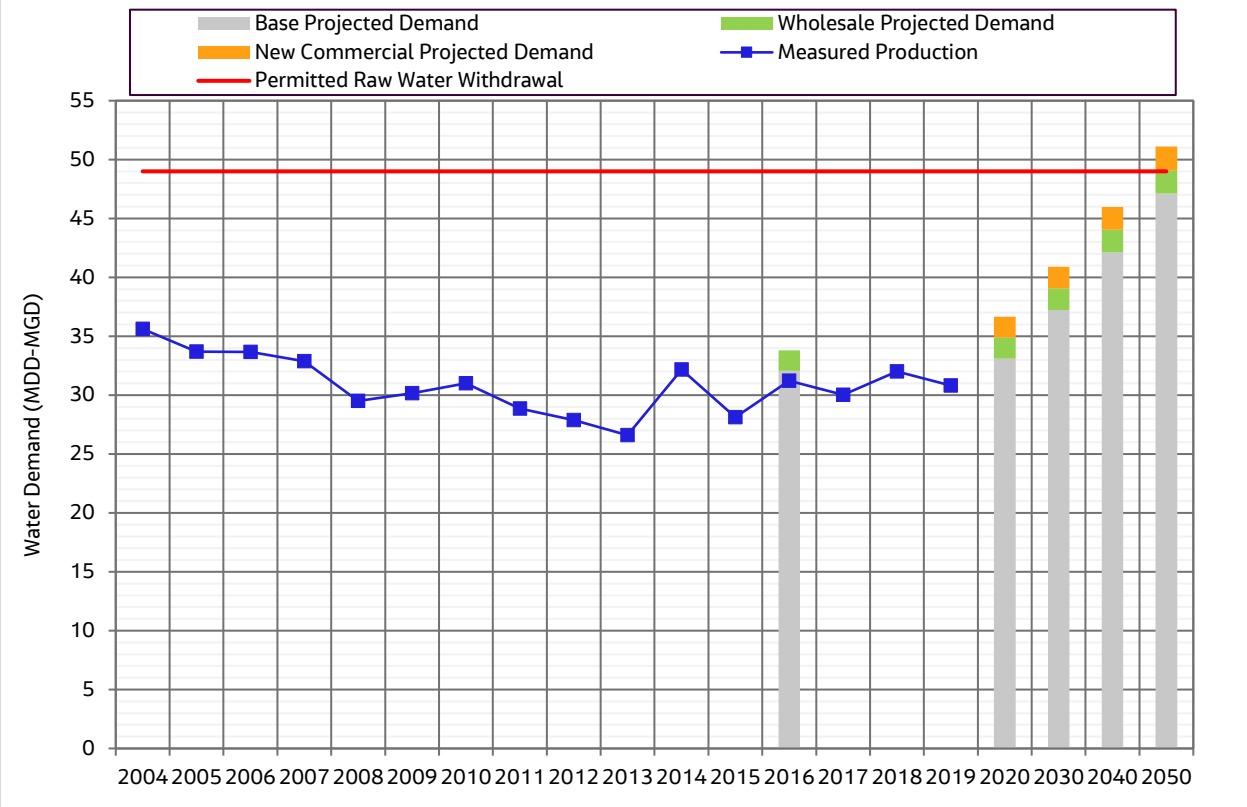


Exhibit 1-G. CCWA Water Demand Projections (MDD-MGD)

CCWA's population-based water demand projections for 2050 (41.27 MGD maximum day) are below the withdrawal permits (i.e., 49 MGD maximum day). However, new commercial and wholesale demands will

need to be continuously monitored to ensure that CCWA can meet the demand of its base customers while not exceeding the withdrawal capacity of 49 MGD.

1.3.1.3 Wastewater Flow Projections

Similar to the water demand projections, the population projections per census tract were allocated to CCWA's sewer service areas. Where a census tract overlapped service area boundaries, the population count was allocated to each service area based on the ratio of the census tract area to each service area. Exhibit 1-H shows how the census tracts overlap the sewer basin service areas, and Exhibit 1-I shows the population projection in each sewer basin service area.

The sewer basin expected to experience the largest population growth is Walnut Creek with 127 percent, followed by Brown Road with 87 percent growth between 2015 and 2050. The Brown Road sewer basin is within the larger Casey WRRF sewer basin, and the Walnut Creek sewer basin is within the larger Shoal Creek WRF sewer basin. The Walnut Creek sewer basin is a small sewer basin with relatively low population density. There are two unsewered areas in the County, labeled as Unsewered East and Unsewered South on Exhibit 1-H.

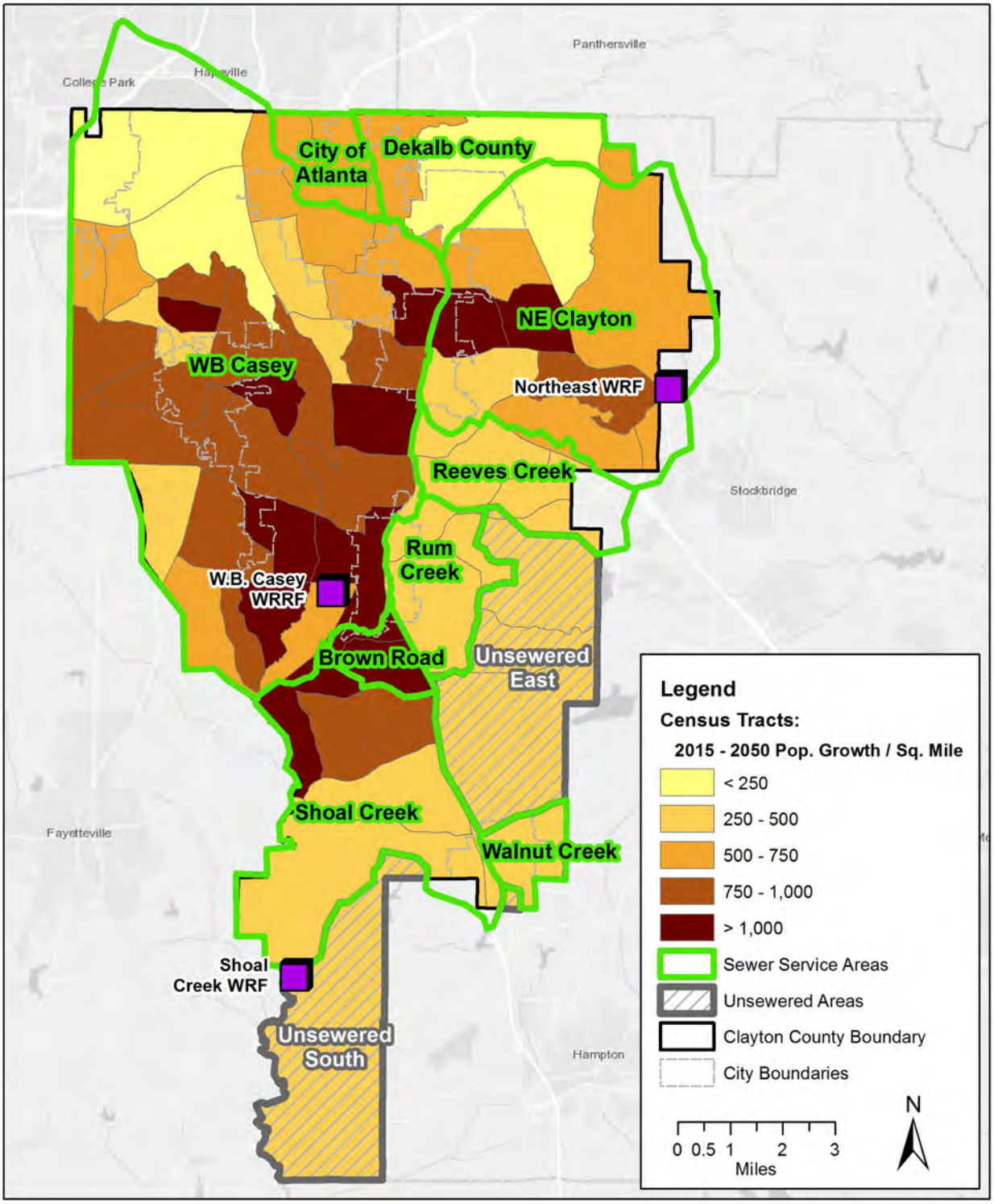


Exhibit 1-H. Population Growth by Sewer Basin Service Area

Exhibit 1-I. Population Projections by Sewer Basin Service Areaa

Service Area	2015	2020	2025	2030	2035	2040	2045	2050	% Increase (2015 – 2050)
Sewered Areas	250,959	261,785	271,494	281,177	293,082	304,967	316,869	328,755	31
City of Atlanta	6,635	7,213	7,434	7,656	7,899	8,142	8,386	8,629	30
Brown Road	2,506	2,656	2,987	3,317	3,659	4,002	4,344	4,687	87
Dekalb County	11,724	12,031	12,477	12,922	13,407	13,892	14,375	14,861	27
Northeast Clayton	49,139	50,780	52,462	54,140	56,538	58,929	61,325	63,718	30
Reeves Creek	9,261	9,442	9,770	10,097	10,474	10,852	11,232	11,609	25
Rum Creek	7,705	7,965	8,290	8,613	8,944	9,276	9,606	9,938	29
Shoal Creek	22,836	23,582	24,782	25,981	27,531	29,079	30,629	32,175	41
Walnut Creek	637	761	861	962	1,083	1,204	1,325	1,446	127
W.B. Casey	140,516	147,355	152,431	157,489	163,547	169,591	175,647	181,692	29
Unsewered Areas	15,914	17,058	18,294	19,528	21,050	22,571	24,093	25,614	61
East	8,969	9,717	10,395	11,071	11,841	12,611	13,381	14,150	58
South	6,945	7,341	7,899	8,457	9,209	9,960	10,712	11,464	65
Total	**266,873**	**278,843**	**289,788**	**300,705**	**314,132**	**327,538**	**340,962**	**354,369**	**33**

[a] Based on 2016 ARC population projections.

Wastewater annual average daily flow (AADF) projections were developed by applying a return ratio and infiltration and inflow (I/I) rate to the water demand projections to determine the base sanitary wastewater flow generated within each census tract. The base sanitary wastewater flow was then distributed among CCWA's sewer basins according to the proportion of census tracts within each basin. Wastewater flows from wholesale customers were analyzed separately.

A return ratio of 73 percent was used to calculate the base sanitary wastewater flow. This number represents the Countywide average percentage of indoor water use returned as wastewater flow; it was generated by the Demand Side Management Least Cost Planning Decision Support System model using the historical water demands per customer category. The 73 percent is the average indoor water use for all customer categories within the County and has stayed constant since the 2009 Water Resource Management Plan Update (MNGWPD, 2009).

An I/I rate of 20 percent on a year-round basis was used, in accordance with the 2017 MNGWPD Plan. This rate is lower than that calculated through the development of sewer basin models, which conservatively calibrated I/I rates around rain events. The I/I rate was applied to the base sanitary wastewater flow for all tracts within sewer basins to calculate AADF. CCWA's plant-specific MMF projections were calculated by applying peaking factors for the individual plants, as determined from the three latest years of flow data. Exhibits 1-J through 1-M indicate recent flow data and projected flows through 2050 for total combined wastewater flow, the W.B. Casey WRRF, the Northeast WRF, and the Shoal Creek WRF, respectively.

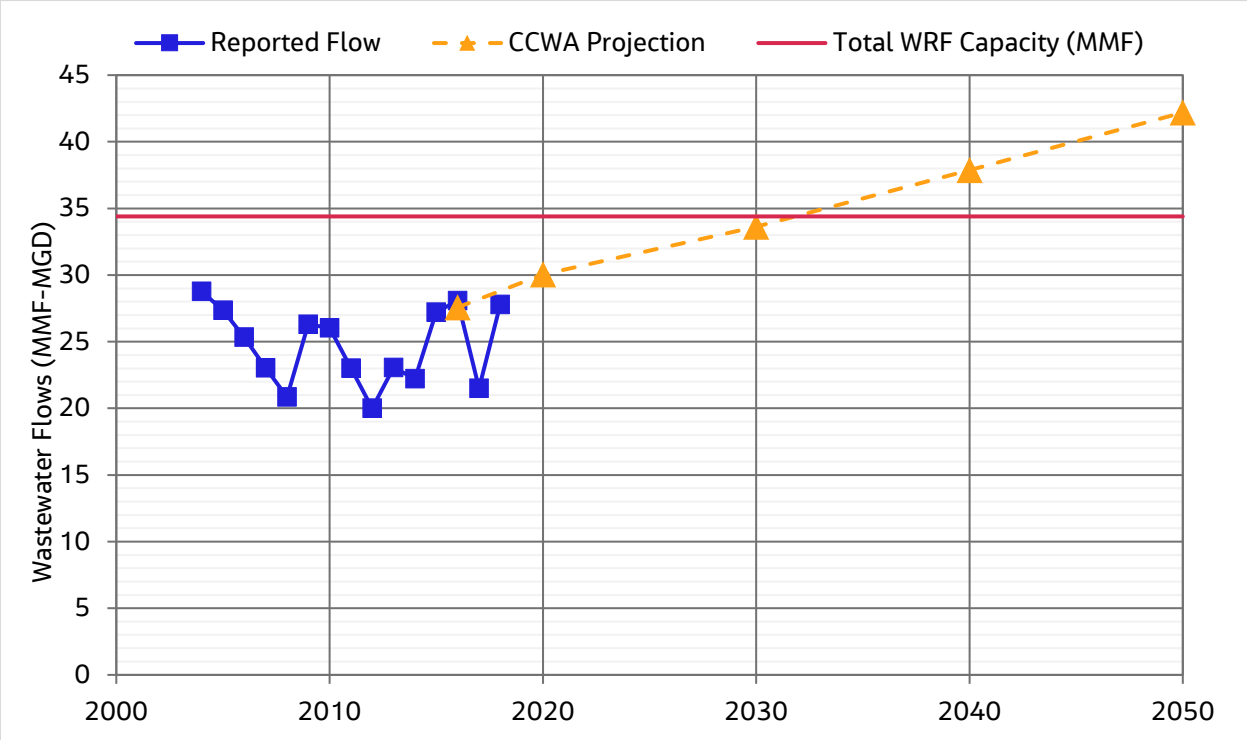


Exhibit 1-J. CCWA Wastewater Flow Projections (MMF-MGD)

Note:
CCWA Projection does not include wholesale wastewater customers.

MMF = Maximum Month Flow

The WRF Capacity (Total) assumes the current monthly average permit limits as of September 2020; that is W.B. Casey WRRF at 24 MGD (including B.2 capacity once Casey Polishing Plant is online), Shoal Creek at 4.4 MGD, and Northeast WRF at 6 MGD (B.1).

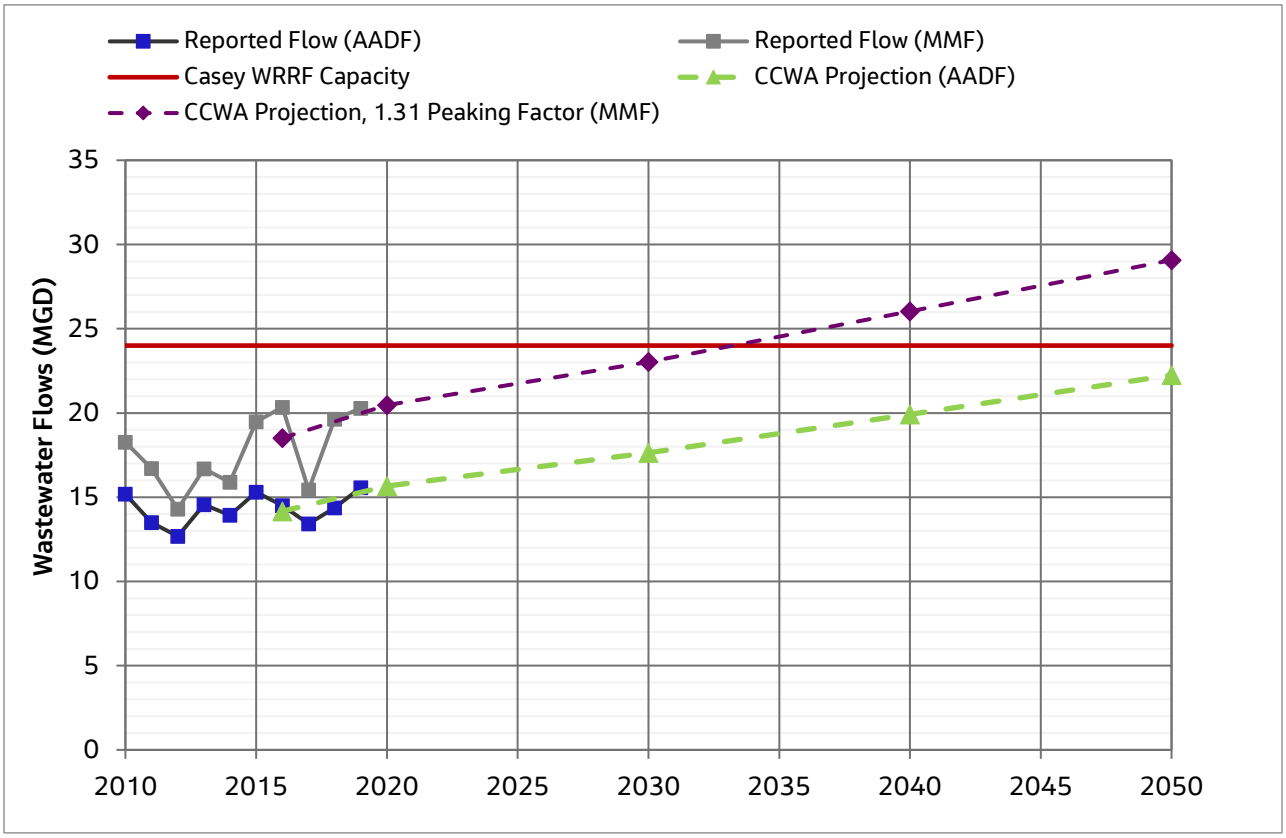


Exhibit 1-K. CCWA Wastewater Flow Projections, W.B. Casey WRRF

Note:

CCWA Projection does not include wholesale wastewater customers.

The Casey WRRF Capacity assumes the current monthly average permit limits as of September 2020; that is W.B. Casey WRRF at 24 MGD (including B.2 capacity once Casey Polishing Plant is online)

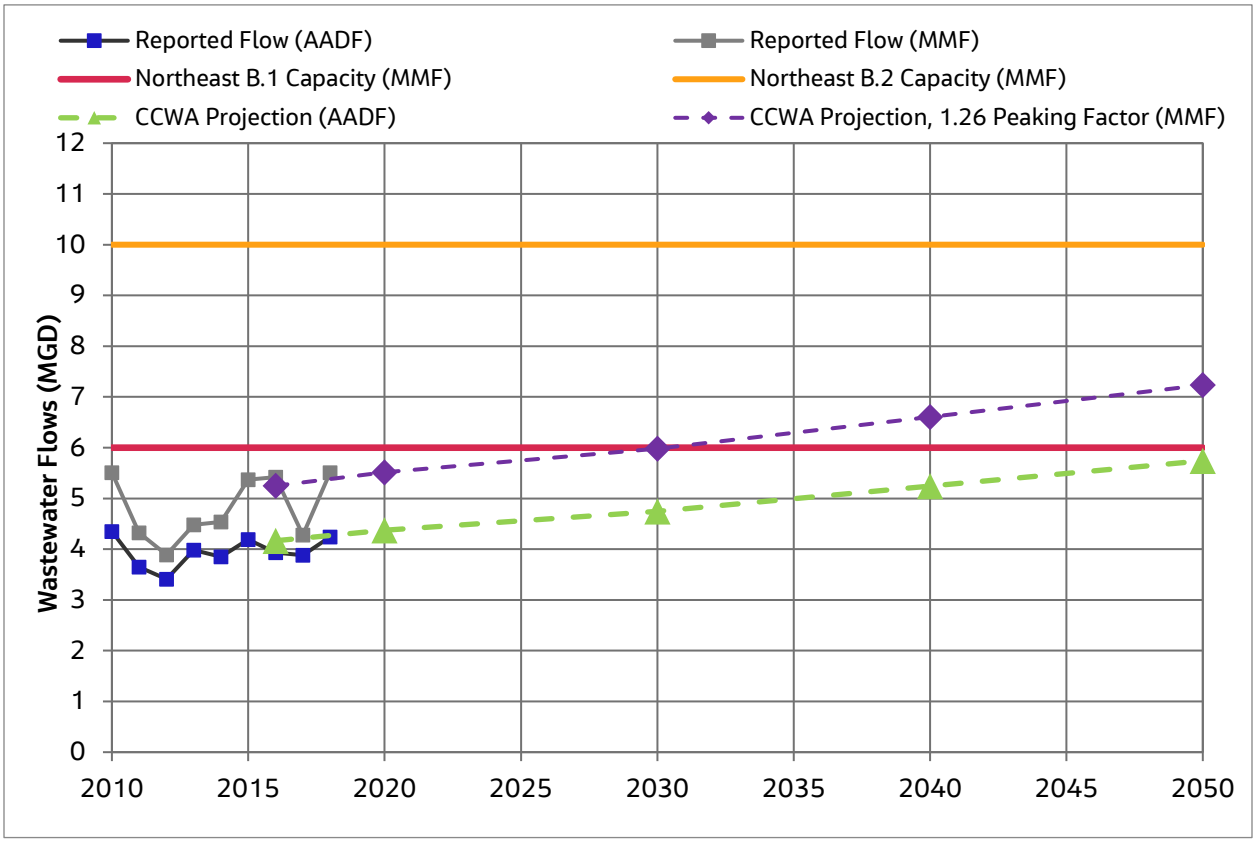


Exhibit 1-L. CCWA Wastewater Flow Projections, Northeast WRF

Note:

CCWA Projection does not include wholesale wastewater customers.

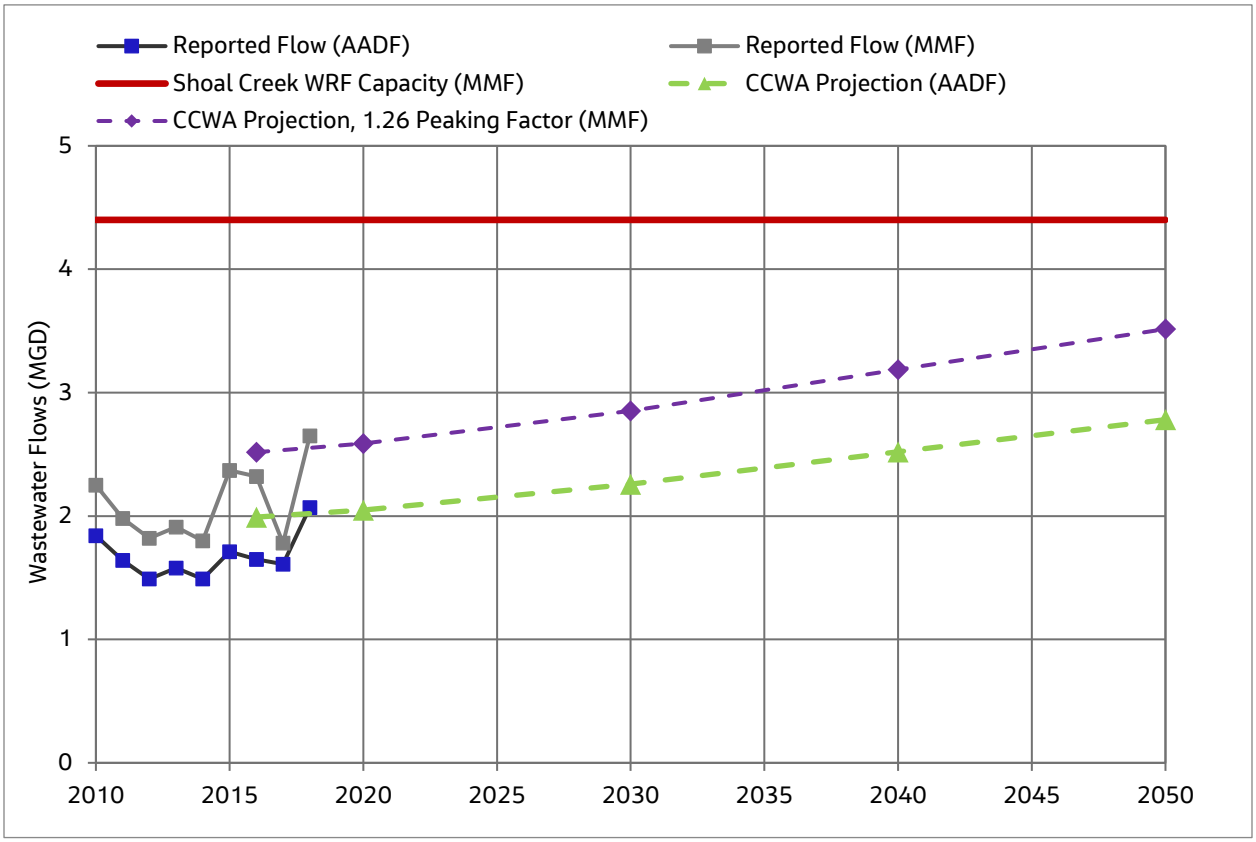


Exhibit 1-M. CCWA Wastewater Flow Projections (MMF), Shoal Creek WRF

Note:

CCWA Projection does not include wholesale wastewater customers.

Historically, wastewater flows have increased slightly since 2014, reaching an MMF of 27.8 MGD in 2018 which is still lower than the flows observed in 2004 (28.8 MGD). W.B. Casey WRRF treats 70 percent of the wastewater flow generated within CCWA's service areas, followed by Northeast WRF with 20 percent, and finally Shoal Creek WRF with 10 percent.

The future projections show a flow increase into the W.B. Casey WRRF because the majority of the development, specifically New Commercial, is expected to occur. Using the peaking factors calculated for each facility, W.B. Casey WRRF is projected to exceed its 24 MGD permitted capacity in 2033, Northeast WRF is projected to exceed its 6 MGD permitted capacity in 2030, and Shoal Creek is WRF is not expected exceed it 4.4 MGD permitted capacity before 2050. Based on the updated projections, the CCWA requested a new wasteload allocation (WLA) from the Georgia Environmental Protection Division (GAEPD) for interim flow limits, in the hopes of deferring capital upgrades. A draft WLA has been received and is currently being reviewed by CCWA.

Wastewater flow projections for College Park were calculated in the College Park Sanitary Sewer System Interconnection Feasibility Analysis TM (2008). During that analysis, it was estimated that future wastewater flow from College Park would be up to 2 MMF-MGD in 2050 and are included in the Casey basin.

1.3.1.4 Regulatory Drivers

During the 2020 SMP process, multiple Project Identification Workshops were held, each of which involved a review of current regulations and potential future regulations that might impact CCWA operations.

Exhibit 1-N outlines all the regulations discussed during the Project Identification Workshops. Major topics of discussion during each regulatory review included nutrient criteria (1), biosolids disposal (3), emerging contaminants (12), drought management (13), Metro North Georgia Water Planning District Requirements (16), an upcoming Reuses Guidance (17), and the American Water Infrastructure Act (AWIA) (20). Requirements or considerations required for each topic were discussed while documenting project identification needs.

Exhibit 1-N. Pertinent Regulations and Issues

Regulation/ Issue	Description	Water	Wastewater	Stormwater	Current	Evolving	Emerging
1. Nutrient Criteria	The GAEPD developed an NNC implementation plan in 2013 with a goal of having all the NNC prepared by 2021. GAEPD has been focusing on nutrient loadings for specific receiving waters (primarily lakes). No near-term changes to the loading limitations for the Ocmulgee River Watershed or Lake Jackson are anticipated. Future increases in wastewater discharges would require reductions in effluent limits to maintain current loadings.		X	X		X	
2. Capacity, Management, Operations, and Maintenance CMOM	CCWA has an approved CMOM program with GAEPD and is in compliance with the requirements for the MNGWPD.		X		X		
3. Biosolids and Residuals	A recent slope stability failure at a Georgia landfill has prompted many landfills throughout the state to further limit biosolids. This has resulted in significant cost increases for municipal biosolids disposal. GAEPD is considering changes to landfill regulation for high-moisture content materials (which would include dewatered biosolids) that may further affect disposal costs. Georgia Water Quality Control Act Sewerage Sludge (Biosolids) Requirements (Rule 391-3-3.17) have established beneficial reuse requirements. Georgia Department of Agriculture has proposed changes to Rule 40-31 Soil Amendments, increasing labeling, product sampling, and recordkeeping requirements for soil amendments (including biosolids intended for land application). The proposed rule requires additional notification for products derived from industrial byproducts, including identifying the industrial by-product source.	X	X		X	X	

Exhibit 1-N. Pertinent Regulations and Issues

Regulation/ Issue	Description	Water	Wastewater	Stormwater	Current	Evolving	Emerging
4. Long Term 2 Enhanced Surface Water Treatment Rule	EPA released the Long Term 2 Enhanced Surface Water Treatment Rule in 2006 to address public health risks associated with Cryptosporidium. The Rule requires source water monitoring to characterize Cryptosporidium risk and includes a "toolbox" of implementation strategies to control Cryptosporidium, including source water management, filtration, and disinfection.	X			X		
5. Stage 2 D/DBPR	In 2006, EPA's Stage 2 D/DBPR Rule introduced a locational running annual average for TTHMs and HAAs to provide uniform control of DBP exposure across municipal water systems. The Rule requires removal of total organic carbon from source water to control DBP precursors. The Rule may require systems to optimize treatment or add treatment processes to enhance DBP precursor removal, or to implement distribution system modifications to control formation of DBPs.	X			X		
6. Fluoride	In 2015, the U.S. Public Health Service decreased the recommended concentration of fluoride in drinking water for dental health to 0.7 mg/L. CCWA may need to adjust added fluoride doses in accordance with this guidance.	X			X		
7. Manganese	There are possible future health-based regulations for manganese in drinking water. In the US, manganese in drinking water has historically been subject to a Secondary Maximum Contaminant Level of 0.05 mg/L due to the potential for aesthetic impacts to drinking water, although lower finished water manganese levels of approximately 0.02 mg/L are typically recommended to minimize discoloration issues. In 2019, Health Canada issued a new health-based limit for manganese in drinking water of 0.12 mg/L based on research that higher levels of manganese may have adverse health effects. There is speculation that the USEPA may promulgate future health-based regulations (i.e. a Maximum Contaminant Level) for manganese. Manganese has been part of UCMR monitoring in the US. However, the health based MCL is expected to be higher than the SMCL for aesthetics, and utilities will need to continue to target lower manganese concentrations to minimize aesthetic concerns.	X					X

Exhibit 1-N. Pertinent Regulations and Issues

Regulation/ Issue	Description	Water	Wastewater	Stormwater	Current	Evolving	Emerging
8. Lead and Copper	EPA's LCR requires systems to monitor lead and copper levels in drinking water at the tap and take action to control lead and copper corrosion. EPA released the proposed LCR revisions in 2019 and the final Rule is expected to be released in 2020. The proposed revisions will impact all systems and include the following new requirements: Reduced lead trigger level to 10 ppb, above which systems are required to optimize corrosion control treatment, increase monitoring, and replace lead service lines Modified sample site selection criteria that require systems to update sampling plans and may cause higher observed lead level Modified corrosion control treatment requirements emphasizing the use of orthophosphate corrosion inhibitors A service line inventory indicating the material of all publicly owned and privately-owned service lines in a publicly available electronic format The development of a lead service line replacement plan and new protocols to encourage full lead service line replacement and minimize the potential for lead exposure in the process	X			X	X	
9. NPDES MS4	CCWA must submit to GAEPD a SWMP every 5 years and an update report annually demonstrating SWMP implementation progress. The most-recent MS4 permit includes runoff reduction requirements (green infrastructure) be adopted by December of 2020, and the development of an Enforcement Response Plan and an Impaired Waterbodies Plan.			X	X	X	
10. TMDLs Program	GAEPD's TMDL program continues to focus on fecal coliform bacteria, biota/habitat, and chlorophyll-a. Since biota are intensive to monitor and measure quantitatively, there has been a focus on alternate parameters such as total suspended solids. Recently completed chlorophyll-a TMDLs recommendations included reductions in both point and nonpoint source pollutants. While GAEPD does not accept third-party biological monitoring, they now accept certain data (fish IBI) that may prompt them to investigate for delisting of impaired stream segments.		X	X	X	X	

Exhibit 1-N. Pertinent Regulations and Issues

Regulation/ Issue	Description	Water	Wastewater	Stormwater	Current	Evolving	Emerging
11. Emerging Contaminants	There are possible future treatment requirements for emerging contaminants, such as pharmaceuticals and personal care products, hormones, herbicides and pesticides, nanomaterials, and microplastics. EPA is expected to propose the Fifth UCMR5 in 2020 to collect additional occurrence data on candidate contaminants.	X	X				X
12. Drought Management Rule	GAEPD adopted Drought Management Rules in 2015 that replaced former rule provisions relating to outdoor water use, as well as the 2003 Drought Management Plan. The Drought Management Rules, Chapter 391-3-30, require specific drought response strategies during specified levels of declared drought that may limit or restrict some of the outdoor water uses.	X			X	X	
13. 2010 Georgia Water Stewardship Act	The Stewardship Act requires implementation of a Water Loss Control Program and development of specific measures to internally evaluate water efficiency.	X			X		
14. Georgia State Regional Water Plans	CCWA will need to track updates to the Upper Flint, Lower Flint, and Middle Ocmulgee Regional Water Plans; specifically, related to instream flows, future points source nutrient load reductions, and nonpoint source pollutant loadings.	X	X	X	X	X	
15. Metropolitan North Georgia Water Planning District	MNGWPD issued Water Supply and Water Conservation, Wastewater Management, and Watershed Management water resource management plans in 2003 and 2009. In 2017, MNGWPD combined the plans into one comprehensive Water Resource Management Plan to highlight the interrelationships between approaches to water, wastewater, and watershed management. The Water Resource Management Plan includes action items that utilities are expected to implement. GAEPD is responsible for auditing utilities to determine good-faith compliance with the Plan when issuing permits that allow an increase in water withdrawal, drinking water, or wastewater treatment capacity, renewal of MS4 stormwater permits, or GEFA loan funding.	X	X	X	X		

Exhibit 1-N. Pertinent Regulations and Issues

Regulation/ Issue	Description	Water	Wastewater	Stormwater	Current	Evolving	Emerging
16. Indirect Potable Reuse Guidance	GAEPD is preparing an indirect potable reuse guidance document for new or modified drinking water, surface water withdrawal, and wastewater discharge permits through existing permitting processes if the request may affect an existing or currently proposed facility. The guidance is expected to direct permittees to consider the impacts of spills, overflows, discharges, water and wastewater treatment technologies and limitations, emerging contaminants, and the relationships among elements regulated in different GAEPD programs, such as preparing or updating Source Water Assessment Plans and wastewater treatment plant modifications or expansions.	X	X				X
17. GAEPD Reservoir Management Plans	GAEPD Environmental Planning Criteria (Rules 391-3-5 and 391-3-16) requires CCWA to have Reservoir Management Plans at each of its water supply reservoirs. Proposed rule changes require addressing recreational use of the reservoir.	X					X
18. EPA RTCR	EPA released the RTCR in 2013 to further reduce risks of fecal contamination in the water distribution system and introduced an MCL for E. coli. The RTCR updated the distribution system sampling and reporting procedures for total coliform and E. Coli. CCWA must perform assessments and corrective actions in response to detected coliform contamination in its distribution system.	X			X		
19. AWIA	Implemented as a 2018 amendment to the Safe Drinking Water Act, AWIA (America's Water Infrastructure Act) requires CCWA to assess the risks to, and resilience of, its water production system. A Risk and Resiliency Assessment (RRA) must be performed to determine the risk to the system from malevolent acts and natural hazards, the resilience of the infrastructure (including SCADA/cyber-resilience), the monitoring practices of the system, the financial infrastructure of the system, the use, storage, or handling of various chemicals by the system, and the O&M of the system. CCWA submitted an RRA to the EPA and received certification in March 2020. Furthermore, the RRA must be reviewed at least every 5 years to determine if revisions are required. Upon review, the water system must recertify the RRA or certify a revision to the assessment. The system is also required to update the Emergency Response Plan (ERP) within 6 months of each RRA certification, so the revised plan includes information from the most recently certified RRA. CCWA submitted an ERP to the EPA and received certification in September 2020.	X			X		

Exhibit 1-N. Pertinent Regulations and Issues

Regulation/ Issue	Description	Water	Wastewater	Stormwater	Current	Evolving	Emerging
20. GAEPD Category 1 Dams	The Georgia Rules for Dam Safety (Rule 391-3-8) require that CCWA operate its Category I dam(s) in accordance with permit(s) issued by the GAEPD. Specific requirements include conducting routine maintenance, performing quarterly inspections, performing biennial engineer's inspections (unless a waiver is granted), operating each gate annually, and submitting all inspection reports to GAEPD annually. Additionally, CCWA must prepare an Emergency Action Plan for each of its Category I dams for approval by GAEPD.	X			X		
21. PFOS/PFOA	Per- and polyfluoroalkyl substances (PFAS) are a large group of human-made chemicals (including PFOS and PFOA) used in consumer products and industrial processes, which are persistent in the environment. In 2016, EPA released a PFOS and PFOA drinking water health advisory due to adverse health effects. In February 2020, EPA determined that PFOS and PFOA are subject to regulation as a drinking water contaminant. Pending regulations on PFOS/PFOA may require additional source water monitoring and prompt systems with elevated levels to implement advanced treatment such as GAC adsorption, ion exchange, or reverse osmosis.	X					X
22. Cyanotoxins	Seasonal cyanobacteria blooms in source water can release cyanotoxins into raw water. In 2015, EPA released a drinking water health advisory for two cyanotoxins (cylindrospermopsin and microcystins) due to adverse health effects (especially for small children). The health advisory levels are based on a 10-day running annual average. Systems experiencing algal blooms in source water may need to implement source water algae management strategies and adjust treatment processes to remove cyanotoxins through oxidation or activated carbon adsorption.	X					X
23. Opportunistic Pathogens	Opportunistic pathogens (including Legionella, Mycobacterium, Pseudomonas aeruginosa, and Naegleria Fowleri) can proliferate in premise plumbing systems and cause illness through alternate pathways such as inhalation. Legionella has been identified as the leading cause of waterborne illness in the U.S. Some systems are coordinating with large buildings and high-risk groups to facilitate localized treatment for control of opportunistic pathogens. Legionella was on the Fourth Candidate Contaminant List, and the EPA is considering including Legionella in UCMR5.	X					X

Exhibit 1-N. Pertinent Regulations and Issues

Regulation/ Issue	Description	Water	Wastewater	Stormwater	Current	Evolving	Emerging

Notes:

µg/L = microgram(s) per liter

AWIA = America's Water Infrastructure Act of 2018

CMOM = Capacity, Management, Operations, and Maintenance

D/DBPR = Disinfectants and Disinfection Byproducts Rule

DBP = disinfection byproduct

E. coli. = Escheria coli

EPA = U.S. Environmental Protection Agency

ERP = Emergency Response Plan

GEFA = Georgia Environmental Finance Authority

HAA = haloacetic acid

LCR = Lead and Copper Rule

MCL = maximum contaminant level

mg/L = milligram(s) per liter

MS4 = Municipal Separate Storm Sewer System

NNC = numeric nutrient criteria

NPDES = National Pollutant Discharge Elimination System

PFOA = perfluorooctanoic acid

PFOS = perfluorooctanesulfonate

ppb = part(s) per billion

RRA = Risk and Resilience Assessment

RTCR = Revised Total Coliform Rule

SWMP = Stormwater Management Plan

TMDL = total maximum daily loads

TTHM = total trihalomethanes

UCMR = Unregulated Contaminant Monitoring Rule

UCMR5 = Fifth Unregulated Contaminant Monitoring Rule

1.3.2 Other Water Quality Drivers

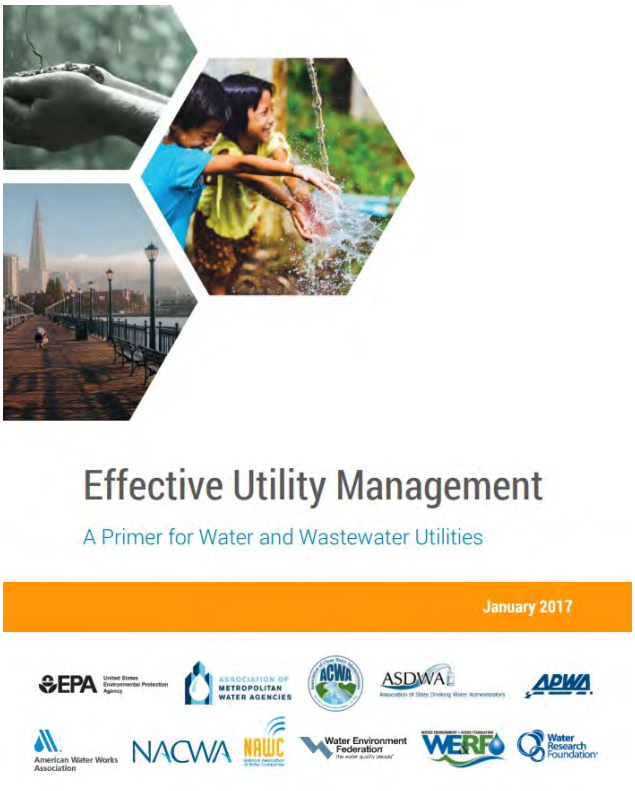
CCWA's reservoirs occasionally have elevated levels of algal growth that contribute to the production of taste and odor issues in finished water. In the fall of 2017, a significant taste and odor event impacted the Hooper WPP.

In response to the 2017 taste and odor event, CCWA employed a holistic approach to treat both the source of the taste and odor issues and to improve the WPPs' abilities to remove these compounds. The project implemented reservoir real-time monitoring systems, upgraded reservoirs with oxygenation systems and geochemical augmentation, as well as added a powdered activated carbon system for the Blalock Reservoir raw water that is pumped to the Hicks WPP. As noted, piloting is ongoing to determine the optimal technology for the Hooper WPP. These systems have been online for a year and have significantly improved the source water quality.

The continued implementation of the indirect reuse program, in which the Huie Constructed Treatment Wetland replenishes raw water storage reservoirs, suggests CCWA likely will continue to have the potential for algal production in the reservoirs. Therefore, the control and management of algal production in the reservoirs will be an important component of the overall integrated water management program for CCWA, as well as continued customer satisfaction with tap water taste and odor. CCWA is working on a predictive model to identify when a taste and odor event is likely to occur, so that operational adjustments can be made.

1.3.3 Maintain "Best-in-Class" Utility Status

To support ongoing efforts to be a "Best-in-Class" utility, CCWA focused on becoming more efficient in all aspects of its operations. The framework for implementing this approach involves completing an enterprise-wide assessment that uses the "Ten Attributes of Effectively Managed Water Sector Utilities" from the U.S. Environmental Protection Agency (EPA) publication Effective Utility Management, A Primer for Water and Wastewater Utilities1 to guide the development of strategies for improvement:



1) Product quality
2) Financial viability
3) Water resource adequacy
4) Customer satisfaction
5) Infrastructure stability
6) Operational optimization
7) Employee and leadership development
8) Operational resiliency
9) Community sustainability
10) Stakeholder understanding and support

For this SMP, these correlate directly to the scoring factors used to rank projects that improve operations and long-term infrastructure stability but are not directly or immediately tied to regulatory compliance. This approach was developed by EPA and six national water and wastewater associations to promote a customizable process to help utilities make practical, systematic changes to achieve excellence in utility performance. Implemented during the 2010 SMP, and improved upon as part of the 2015 SMP, this framework for scoring and prioritizing projects is also used in the 2020 SMP.

2. Project Development

2. Project Development

The 2020 SMP process involved developing and integrating strategies to identify and prioritize future project needs that align with CCWA's mission to provide reliable water services to their communities through innovation, efficiency and the protection of their water environment and vision to provide "Quality Water, and Quality Service."

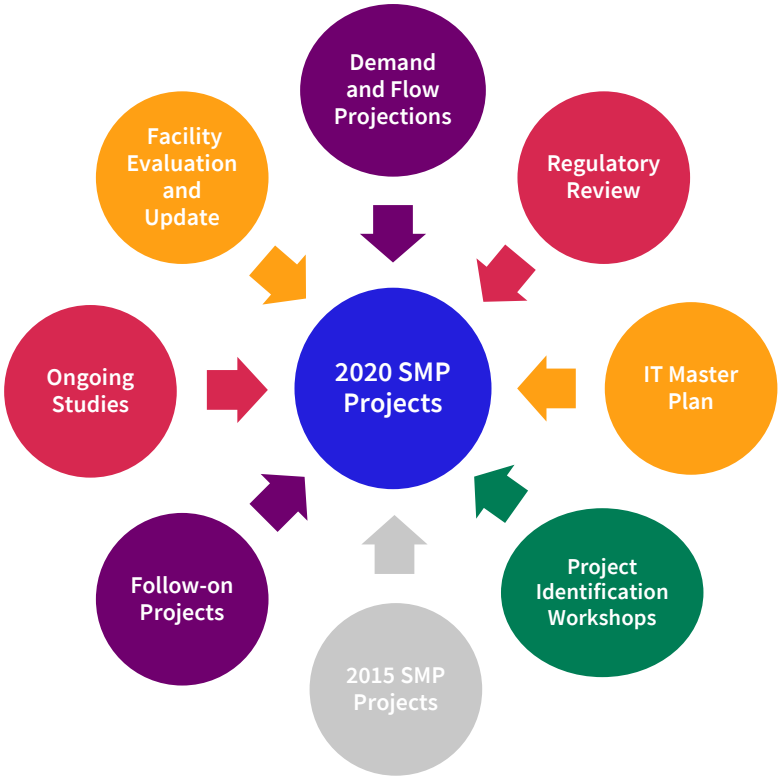


Exhibit 2-A. Sources of Projects for the 2020 SMP

The strategic master planning process began in the spring of 2019, with participation from more than 40 CCWA employees, as well as staff from Jacobs Engineering Group Inc. (Jacobs), Hazen and Sawyer, River 2 Tap, The Collaborative Firm, and PCM, to identify the needs to be addressed in the SMP. The inclusive approach to the planning process was undertaken to ensure that the final master plan recommendations would be comprehensive and to generate buy-in for its implementation.

As shown in Exhibit 2-A, projects included in the 2020 Project List were identified through a variety of sources including Project Identification Workshops, follow-on projects and ongoing studies, the Information Technology (IT) Master Plan, and the Facility Evaluation Update. More than 20 workshops and facility tours were conducted with various staff members and consultants during the project development process to discuss the needs of specific departments or facilities and to identify projects.

This section summarizes the primary drivers of the 2020 Project List.

2.1 Project Identification Workshops

The first step in the project development process was to conduct several Project Identification Workshops. Each workshop was attended by multiple CCWA staff and other consultant staff. Workshops covered a variety of topics for each discipline, including emerging issues, regulatory requirements, current operational challenges, near- and long-term needs, progress since the 2015 SMP, IT, and other needs identified by CCWA staff and subject matter experts. The 2017 Water Production Plant and Water Reclamation Facility Evaluation Project (2017 Facility Evaluation) was discussed at each of the relevant Project Identification Workshops, with a focus on current and future treatment plant capacities, so that a Facility Evaluation update could be conducted as described in Section 2.2.

2.1.1 Utility-wide

The Utility-wide workshop was split into two separate workshops, held on June 5 and July 19, 2019. There was discussion around new requirements, certifications, and cyber security projects related to the RRA and ERP required by the AWIA. The 2020 SMP includes a placeholder for security improvement projects that result from the RRA and ERP. The Utility-wide workshops also focused on the financial benefits of attaining the WaterFirst designation and the need for documentation, standardization, and optimization of business processes, which includes the benefit of capturing institutional knowledge as CCWA staff retire. This Utility-wide project list also incorporates the SAMP projects to provide a comprehensive roadmap of the Utility-wide projects to be completed.

2.1.2 Information Technology

Each Project Identification Workshop involved a discussion of the IT-related projects needed and software solutions. Two consistent themes were identified within these IT discussions: (1) the desire for increased staff mobility and automation, and (2) a need for continued cyber security initiatives. Mobility-related projects can be found on both the Utility-wide and IT projects lists. The IT project list was created based on discussions during the project identification workshops, and work completed between CCWA staff and PCM during development of the IT Master Plan (Appendix D).

2.1.3 Stormwater

The Stormwater Workshop was held on March 26, 2019. The workshop focused on strategies to improve public outreach and awareness, new MS4 NPDES permit requirements, TMDL requirements, green infrastructure, and possibilities for using new technologies (e.g., 5G networks) to mitigate flooding risks. The conversation around IT needs and software solutions underscored the importance of collecting quality data to inform operational decisions and emergency response capabilities. As with previous years, a large majority of the stormwater utility revenues will be required to implement 20-207 / Implement Stormwater Capital Improvement Projects and 20-206 / Implement Watershed Improvement Projects.

2.1.4 Water Production

CCWA owns and operates three water production plants, capacities for which are provided in Exhibit 2-B below.

Exhibit 2-B. Summary of Water Production Plant Capacities

WPP	Permitted Capacity (Maximum Day, MGD)
Terry R. Hicks WPP	10
W.J. Hooper WPP	20
J.W. Smith WPP[1]	8

[1]The J.W. Smith WPP is currently operated at 8 MGD due to the current operations schedule but is designed to treat up to 12 MGD.

Water Production projects were identified through a series of three Project Identification Workshops, one workshop for each WPP. Each Project Identification Workshop began with a tour of the facility given by a CCWA water plant staff member and was followed by a traditional workshop that covered regulatory drivers, progress made on previous SMP projects, and the short- and long-term needs of the facility. The

Water Production Project Identification Workshops also contained a discussion surrounding the Facility Evaluation Update project and how this update could impact the WPPs.

The conversation surrounding regulatory drivers was common to all three facilities. There was extensive discussion regarding the specific contaminants that will likely be regulated in the future, including manganese, perfluorinated compounds (such as PFAS), microcystins, and perchlorate. A new Lead and Copper Rule (LCR) and Long Term 2 Enhanced Surface Water Treatment Rule are expected within the horizon of this SMP. Because public perception of emerging contaminants often drives regulation, it was generally suggested that CCWA take a proactive stance by implementing a sampling plan for emerging contaminants and leaving space for future processes like carbon adsorption or ozone in future designs. It is also expected that a new set of Indirect Potable Reuse guidelines will be introduced within the horizon of this SMP, serving as another driver for higher levels of treatment. Proactive strategies may include implementing on-line monitoring equipment for various contaminants/compounds, both in the reservoirs and in treated water (at the WPPs and in the distribution system).

CCWA's water demand projections for 2050 (51.2 MGD maximum day) exceed the withdrawal permits (i.e., 49 MGD maximum day). Therefore, the future and long-term accommodation of wholesale customers would require purchasing water through our interconnections or a new or increased source water withdrawal permit. For planning purposes, it was assumed that the combined treatment capacity of CCWA's WPPs would not exceed the withdrawal capacity of 49 MGD. Therefore, projects were developed to maximize the water production potential at each facility such as WPP Efficiency Improvements Evaluation (20-313).

2.1.4.1 Hooper Water Production Plant

The Hooper WPP Project Identification Workshop was held on June 18, 2019. Plant staff have noticed filter blinding when the plant operates at or above 90% of design capacity (18 MGD), made worse by rainfall events and algal growth in the Hooper Reservoir. Algal growth management strategies were also discussed as CCWA experiences diatom issues in the Hooper Reservoir during the early spring. CCWA constructed a reservoir monitoring and treatment system that will mitigate these issues in the future.

The Hooper WPP plays a vital role in CCWA's water production strategy, since CCWA cannot meet water demands if this plant is offline. If the Hooper WPP is taken offline, CCWA must buy treated drinking water from the City of Atlanta or Dekalb County. It was noted that while the Hooper WPP can take individual coagulation basins offline for maintenance, the single raw water pipeline from the raw water pumps and the conduit from the plant's coagulation basins to the filters act as a single point of failure, necessitating the single point of failure correction identified in project 20-309 / Single Points-of-Failure Elimination Study and Implementation.

Another major project needed for the Hooper WPP is to upgrade the plant to a 22 MGD facility. This would be combined with a retrofit of the existing filters with GAC technology, if deemed feasible after the conclusion of an ongoing pilot study. This would include the design and construction of two additional filters.

2.1.4.2 Hicks Water Production Plant

The Hicks WPP Project Identification Workshop was held on June 19, 2019. Key discussion points included the need for redundancy improvements to allow the plant to be partially (rather than completely) taken offline for maintenance, and historical plant bottlenecks (turbidity carryover from the clarifiers negatively impact filter run times). The Source Water Quality Assessment and subsequent implementation of oxygenation and geochemical augmentation strategies (Implement Recommended Water Quality Monitoring and Control Approaches in CCWA Reservoirs) has decreased the algae counts in the reservoirs

and mitigated the taste and odor risk to the plant. By reducing the raw water algae this project has also had an ancillary benefit of limiting turbidity issues at the plant that have historically limited the production capacity. It is recommended that CCWA complete a full high-rate study to determine whether Hicks WPP can actually be high rated to 15 MGD, and whether necessary improvements and upgrades required to achieve this higher capacity are feasible.

It was additionally noted that the Hicks WPP could benefit from having onsite raw water storage available, which would allow for mixing of raw water from Blalock and Smith Reservoirs prior to treatment. This could provide more consistent raw water quality at the head of the plant, which would benefit plant operations. Strategies to address this issue were discussed, including the use of the Huie Pond Complex for raw water storage (which would require a pond reclassification to Category 1 dam with GAEPD).

2.1.4.3 Smith Water Production Plant

The Smith WPP Project Identification Workshop was held on July 25, 2019 and discussed needs for the Smith WPP and re-pump stations. This Project Identification Workshop also included a discussion of the Facility Evaluation Update, and the projects that would and would not be required under the potential Decommission Smith WPP Scenario. Staff indicated they have mitigated solids-handling challenges with the existing gravity thickener noted in previous evaluations through a regular sludge withdrawal regimen, and therefore do not believe a second gravity thickener would be required at the plant.

The Smith WPP currently operates two shifts to produce an average of 7 to 8 MGD. Smith WPP will be able to produce up to 12 MGD through the addition of a third shift. Like the Hooper and Hicks WPPs, the major short-term project at Smith is 20-305 / Smith WPP High-Rate Analysis, which will determine the feasibility and necessary requirements to high-rate this facility to either 12 MGD or 15 MGD.

2.1.4.4 Repump Stations

The Smith WPP Project Identification Workshop also included a discussion of CCWA's repump stations and closely aligned with recommendations provided in the *Water Production and Storage Analysis TM*. Improvements to existing repump stations, such as the installation of VFDs and backup generators, were clarified as necessary redundancy and reliability upgrades prior to the abandonment and demolition of elevated storage tanks. Water quality throughout the system is expected to improve as water age is reduced. Previous evaluations confirmed the need for CCWA to design and construct a booster pump station in the Northwest region of the County to facilitate wholesale water supply to College Park, as well as the construction of a new repump station in place of the Forest Avenue elevated storage tank. These two improvements are needed to maintain system pressure in the north and northwest service areas as demand increase over the planning period.

2.1.5 Distribution and Conveyance

The Distribution and Conveyance Workshop was held on July 26, 2019. The discussion of regulatory drivers involved a discussion of overflow issues in the sanitary sewer system and discussions of a new DBPR rule. The integration of data collected from different sources was a key point in the conversation around necessary IT upgrades and software solutions. Many of the distribution and conveyance projects in the 2015 SMP were migrated to the 2020 SMP Final Project List because they are annual projects that occur every year. These projects include the Galvanized Water Main Replacement Program, Commercial Meter Replacement and Fire Metering Program, UniDirectional Flushing Program, Sewer Condition Assessment Program, Small Diameter Sewer Rehabilitation and Replacement Program, Large Diameter Sewer Rehabilitation and Replacement Program, Pressure Sewer Assessment and Rehabilitation Program, and Georgia Department of Transportation projects. For these projects, a 10-year budget was identified, and an annual amount was provided equally for each fiscal year.

CCWA also made the decision to include regular updates to both water and sewer models on the project list to ensure proper planning. The decision was made to update both models every 5 years. The sewer model update was split between the Casey Basin model and the DeKalb, Northeast, and Shoal Creek Basin models which will be updated twice during the 10-year planning period.

2.1.6 Water Reclamation

CCWA owns and operates three water reclamation facilities, capacities for which are provided in Exhibit 2-C below.

Exhibit 2-C. Summary of Water Production Plant Capacities

WPP	Permitted Capacity (Maximum Month, MGD)
Northeast WRF	6[1]
W.B Casey WRRF	24
Shoal Creek WRF	4.4

[1]The Northeast WRF is currently permitted for a B.1 NPDES permit limit of 6 MGD and has B.2 limits at a flow of 10 MGD.

Water Reclamation projects were identified through a series of four Project Identification workshops: one for each of the three WRFs and one for Natural Treatment Systems (NTS). Each Project Identification Workshop began with a tour of the facility and was followed by a discussion that addressed regulatory drivers, recent progress on 2015 SMP projects, updated flow projections, and the short- and long-term needs of the facility. The workshops also addressed the Facility Evaluation Update and how the prior decision to close Shoal Creek would impact the needs of the WRFs if carried forward.

While regulatory drivers are the same, impacts are different for the various facilities. The most significant regulatory drivers include:

- Increased restrictions on landfilling biosolids - Currently, CCWA prioritizes the beneficial reuse of biosolids. Biosolids from the W.B. Casey WRRF are pelletized and sold as an agricultural amendment, and biosolids from Shoal Creek WRF and Northeast WRF are sent to a composting facility. Recently, many landfills have begun prohibiting biosolids, and compost disposal rates have increased dramatically in response to a more competitive market. As a result of the increased cost and uncertainty of disposing unstabilized biosolids, CCWA has considered regionalizing their biosolids processes at the W.B. Casey WRRF. The possibility of transferring biosolids from Northeast WRF to W.B. Casey WRRF was evaluated under the W.B. Casey WRRF Capacity Analysis and Plant Expansion Evaluation project (2019). Based on the assumptions made during this project, regionalization would benefit CCWA if compositing prices increased above $100/ wet ton. Based on this, CCWA has elected to include a cake receiving station in the concept design of the Casey WRRF Biosolids facility, which was completed in 2020. Construction of the cake receiving station will depend on market changes at the time of construction.
- More stringent nutrient limits – Effluent nutrient limits are different at all three WPPs.
  - Shoal Creek WRF - With a current total phosphorus (TP) discharge limit of 2.0 mg/L, Shoal Creek has the greatest potential to have a reduced limit in the future.
  - W.B. Casey WRRF - A new WLA was approved to increase the flow to the Flint River from 6.6 MGD (current permit) to 14.6 MGD (this increased flow will be required when the plant is expanded from 24 to 32 MGD). In the draft permit limits, the effluent phosphorus limit remains the same, at 0.30 mg/L monthly average, and the ammonia limit is reduced from 2.0 mg/L to 1.0 mg/L

monthly average. The draft future ammonia limit is now being met with the current activated sludge process. The new W.B. Casey WRRF permit (renewed in March 2020) requires additional monitoring of nitrogen constituents (total Kjeldahl nitrogen, nitrate/nitrite, and organic nitrogen).

  - Northeast WRF - A new WLA was requested in November 2019 to revise B.2 limits to a lower effluent flow. Current B.1 permit limits for effluent phosphorous and ammonia are 0.3 mg/L and 1.3 mg/L, respectively. A draft WLA was received from EPD in July 2020, proposing an effluent phosphorous limit of 0.22 mg/L and an ammonia limit of 0.6 mg/L at a discharge flow of 8 MGD.

- Indirect Potable Reuse (IPR) - As IPR continues to be a defining feature of the CCWA system, WRF effluent quality will impact treatability and needed improvements at the WPPs. Draft permit limits for the W.B. Casey WRRF 32-MGD upgrade will require increased disinfection to meet reuse standards (the fecal coliform limit will be reduced from 200 #/mL to 23 #/mL). Moving into the future, all WRF and WPP projects will need an integrated approach to ensure their goals and treatment objectives are aligned.
- Emerging contaminants - Due to IPR, emerging contaminants may have to be addressed at WRFs in the future. While no action is currently being taken, space for additional unit processes has been and will continue to be incorporated into any plant upgrade work. For example, the W.B. Casey WRRF phosphorus polishing facility design considered space in the layout and hydraulic profile for a future filtration process.

2.1.6.1 Natural Treatment Systems

The Natural Treatment Systems (NTS) Workshop was held on May 1, 2019 and addressed both the Huie Pond Complex and the Panhandle Wetlands.

The conversation around regulatory drivers focused on sampling for emerging contaminants, and potential considerations for using the Huie Pond Complex for one or more purposes - equalization, backwash storage, or raw water storage.

Staff and consultants also discussed coagulant dosing strategies at W.B. Casey WRRF to reduce average effluent TP to the Huie Wetlands. In consideration of future flows, and a discussion of potential future discharge locations, NTS staff indicated that they anticipate the Huie Wetlands could be high-rated without building additional cells. Further evaluation would be required to confirm this assumption. Regardless of whether the system could be rerated, the treatment at Huie is limited by the two 36-inch pipelines that run from the NTS distribution box to the Huie Wetlands. It was discussed during the workshop that it would be too cost-prohibitive to expand the Huie Wetlands with more cells.

Construction of the Panhandle Wetlands was completed in 2002, and construction of cells in the Huie Wetlands were completed from 2005 to 2010. Considering that O&M guidance for the Panhandle and Huie Wetlands were prepared in the early 2000's, staff discussed the importance of assessing the wetlands to identify maintenance activities or capital projects that will improve the functionality and longevity of the wetlands.

The Shoal Creek WRF sends treated effluent to the Panhandle Wetlands, where it is treated and pumped to the Shoal Creek Reservoir. A decision will need to be made regarding the future use of the Panhandle Wetlands, should Shoal Creek WRF be decommissioned.

2.1.6.2 Shoal Creek WRF

The Shoal Creek WRF Project Identification Workshop was held on May 10, 2019. Operations staff reported that there is no difficulty in consistently meeting current permit limits. It was noted that the

nutrient limits for Shoal Creek WRF have the greatest potential to be reduced by regulators in the future in comparison to W.B. Casey WRRF and Northeast WRF.

Projects identified for the Shoal Creek WRF include aeration system upgrades, improvements to the screening systems, and UV Disinfection System Upgrades. The scope of these upgrades will be expanded or reduced based on the decision to decommission Shoal Creek WRF.

It was noted that the fiberoptic line currently routed through Shoal Creek WRF to Smith WPP will need to be re-routed to the Smith WPP if Shoal Creek WRF is decommissioned. Similarly, CCWA will need to consider a solids management approach for the thickened alum sludge that is currently produced at Smith WPP and treated alongside wastewater biosolids at Shoal Creek WRF, if the Shoal Creek WRF is decommissioned.

2.1.6.3 W.B. Casey WRRF

The W.B. Casey WRRF Project Identification Workshop was held on May 15, 2019. A major concern voiced by staff is concrete corrosion issues at some facilities; most notably at the primary clarifiers and the influent pump stations. Staff also discussed at length their safety concerns with the pelletizing facility such as dust hazards and the inability to safely maintain the belt filter presses on the mezzanine level of the building. These maintenance activities are now performed by contractors and thus no 2020 SMP project was included.

The biggest operational challenge for staff at W.B. Casey WRRF is managing peak flow. Conveyance to the Huie Wetlands (the only current effluent discharge option) is limited to around 39 to 40 MGD. The addition of a fourth secondary clarifier at the plant provides about 2 million gallons of equalization and has helped in peak flow situations. Completion of the W.B. Casey WRRF Phosphorus Polishing Improvements project will mitigate the peak flow management concerns.

There were several projects identified for the W.B. Casey WRRF, including the following: repair concrete in the primary clarifiers, investigate opportunities for energy recovery, perform upgrades to the pelletizing facility to address safety concerns, assess the effluent gravity line and wetland distribution gravity lines, and optimize the chemical dosing strategy to meet lower effluent phosphorous limits after the new polishing facility comes online. There are also a series of projects to restore the capacity of the plant to the design basis of 24 MGD as identified by the W.B. Casey Plant Capacity Analysis and Plant Expansion Evaluation project. These projects include adding an additional blower to the bioreactors to meet peak air requirements, upgrading the raw water pump station, and upgrading the RL Jackson Raw Water Pump Station.

The major project identified on the Water Reclamation project list is the Casey Solids Upgrade to replace the existing solids facilities that are at capacity and also at the end of their useful life with a new 32 MGD facility. Projects identified that can be completed as part of either the 24 MGD Capacity Recovery upgrades or the 32 MGD upgrade include adding screening to the RL Jackson Transfer Pump Station and Casey Raw Water Influent Pump Station, upgrading the W3 Pump Station, and adding equalization.

2.1.6.4 Northeast WRF

The Northeast WRF Workshop was held on May 22, 2019. Much of the conversation at the workshop focused on ongoing work to evaluate needed improvements to move from the current NPDES Permit B.1 (6 MGD) to the B.2 (10 MGD) limits. Based on future flow projections, the Northeast WRF will soon exceed the B.1 flow limit; however, the B.2 flow limit of 10 MGD is not reached until after 2050. Therefore, it was discussed that GAEPD may be amenable to an interim flow limit between the B.1 and B.2 limits. Since this

time, CCWA has submitted a new WLA request, and a draft WLA received from GA EPD in July 2020 is currently under review.

In addition to addressing a needed capacity increase, there is a need to consider long-term plans for biosolids management. Trucking biosolids from the Northeast WRF to W.B. Casey for pelletizing was discussed as a possible long-term solution.

The group agreed that decommissioning the Northeast WRF will not be considered in the Facility Evaluation Update due to the challenge of building the required conveyance infrastructure to route influent flows to W.B. Casey WRRF.

2.1.7 General Services

The General Services Workshop was held on April 19, 2019. No traditional regulatory drivers were identified as part of this workshop. The conversation around IT needs and software solutions focused on SCADA system upgrades. Due to the pace of change in technology, it was determined that every five years, a SCADA master plan update project should be completed to identify any necessary projects to be implemented over the planning period. There was a discussion surrounding the 2015 Lift Station Assessment project and the need for more lift station rehabilitation projects. An annual lift station rehabilitation program was added to the 2020 SMP list.

2.2 2020 Facility Evaluation Update

Once project identification workshops were complete, CCWA sought to confirm the long-term plans for individual water and wastewater facilities in order to prioritize projects in line with the Authority's long-term plan. The 2017 Facility Evaluation project evaluated the optimal configuration of water production plants and water reclamation using a planning horizon of 2050 and concluded that both the Shoal Creek WRF and Smith WPP should be decommissioned in 2023 and 2031, respectively. However, at the end of the 2017 Facility Evaluation project, several critical questions regarding the feasibility of the proposed WPP and WRF decommissioning remained unanswered.

Since 2017, CCWA has completed additional evaluations related to decommissioning Shoal Creek WRF and has prepared updated demand and flow projections for the service area. Therefore, a 2020 Facility Evaluation Update (see Appendix B for details) was completed to reevaluate the decision reached in 2017. The following sections summarize the steps taken to evaluate the optimal configuration of water production and water reclamation facilities.

2.2.1 Water Production

During the 2017 Facility Evaluation, a series of workshops were held with CCWA management, project consultants, and plant staff to discuss the feasibility of expanding and decommissioning each plant. Potential future expansion considered factors such as the plant's history, current plant processes, site layout, surrounding land use and ownership, and location. Potential future capacities were also developed with the overarching assumption that the cumulative maximum day WPP capacity in 2050 would be 49 MGD to meet the existing permitted withdrawal capacity. The 2020 Facility Evaluation update assessed the 2017 expansion alternatives and added new capacity options (i.e., Hicks WPP at 12 MGD and Smith WPP at 15 MGD) as it may not be feasible to expand the Hicks plant to 15 MGD.

Once capacity options were established for each facility, the next step was to screen the list of scenarios based on assumptions regarding the water production system. These assumptions included:

- The Hooper WPP will not be expanded beyond 22 MGD, which is the maximum withdrawal allowed from the Hooper Reservoir.
- A new 49-MGD Hicks WPP will not be considered for evaluation, as CCWA did not want to consider scenarios with only one WPP.
- The water production capacity must be at least 49 MGD to match 2050 demand and to maximize use of existing permitted raw water withdrawal. Scenarios requiring a new raw water withdrawal permit were eliminated.
- Alternatives should generally reduce the need to purchase water from other entities as much as possible.
- Any scenario that resulted in two major plant expansions would not be considered.

Based on this screening criteria, three scenarios remained at the end of the screening exercise (Exhibit 2-D).

Exhibit 2-D. Future Water Production Plant Capacities

Plant Capacity (Maximum Day, MGD)	Plant Capacity (Maximum Day, MGD)		
	Terry R. Hicks WPP	W. J. Hooper WPP	J.W. Smith WPP[1]
Existing Conditions	10	20	8
Status Quo A	15	22	12
Status Quo B	12	22	15
Decommission Smith	27	22	0

[1]The J.W. Smith WPP is currently operated at 8 MGD due to the current operations schedule but is designed to treat up to 12 MGD.

Once the scenarios were established, an engineering analysis was performed to determine all the capital upgrades that would be required in order to reach a firm capacity of 49 MGD by 2050. This process involved obtaining feedback from CCWA staff during project identification workshops, and plant tours to determine the age and condition of the existing infrastructure. Lifecycle assumptions for major WPP components were developed, along with a timeline for WPP expansions and decommissions based on projected demands and on optimal timing of plant expansions to realize the full value of existing assets. Finally, a conceptual design was developed for plant expansions.

The selection of the optimal scenario was completed through a cost-benefit analysis. The detailed engineering analysis, together with lifecycle and O&M assumptions determined collaboratively with CCWA staff, were used to develop detailed cost estimates over the next 30 years for each of the three scenarios. Operations costs were developed for internal maintenance, chemicals, power, and staffing using historical CCWA data from 2016-2018. The capital investments and O&M costs for each plant were combined for each scenario, and the cumulative cost was converted into net present value (NPV) for a comparison of each scenario in 2019 dollars. Scenarios were scored using updated performance measures from the 2017 Facility Evaluation, which are intended to represent nonfinancial considerations and to represent all stakeholders with interest in the future of CCWA. Weights for each of the scenarios were determined via a pair-wise scoring exercise completed by CCWA staff. Scores for each scenario were assigned in a collaborative workshop between the CCWA management team and Jacobs staff, where a robust discussion

ensured that the group arrived at a consensus for each score. Cost estimation and scenario scoring were discussed separately from one another, to ensure that the scoring of scenarios relied solely on non-monetary factors. Results from the cost-benefit analysis are displayed in Exhibit 2-E.

Exhibit 2-E. Cost-Benefit Analysis for Water Production Scenarios

Scenario	30-Year Lifecycle Cost NPV[1] ($ 2019)	Benefit Score	Cost-Benefit Ratio
Status Quo A	$206,910,000	3.9	1.9
Status Quo B	$222,680,000	3.2	1.4
Decommission Smith	$332,270,000	4.5	1.4

[1]Breakdown of 30-year lifecycle costs available in Appendix B. Lifecycle costs include capital costs for plant upgrades and distribution system upgrades between 2020 and 2050, including projects listed in the 2020 SMP Final Project List. Lifecycle costs also include operational costs for chemicals, staffing, power, and labor.

Based on the results of the 2020 Facility Evaluation Update, the CCWA project team elected to move forward with evaluating the feasibility of the Status Quo A scenario. The Status Quo A scenario has the lowest cost-benefit ratio, driven by the significantly lower cost. While this is the recommended scenario, additional analysis would be required to confirm that high-rating the Hicks WPP to 15 MGD would be feasible (Exhibit B-23). This is the most fiscally conservative approach and is also prudent as there is a significant amount of time before the improvement projects for the three scenarios diverge (see section 2.2.1 above).

While Status Quo B is $100M less than the Decommission Smith WPP scenario, it is not recommended as it has lower operational optimization/resiliency, lower construction impact scores, and the lowest cost-benefit ratio. The Decommission Smith WPP scenario provides the greatest benefit, particularly the operational optimization/resiliency and infrastructure stability. This is because the New Hicks WPP will have advanced treatment and will be designed to reliably provide excellent water over the next 50 years. Should changes in raw water quality or regulations dictate the need for additional advanced treatment, the Decommission Smith scenario will provide the highest level of treatment of the scenarios evaluated. If the Status Quo A scenario is deemed infeasible, CCWA will re-evaluate the Status Quo B an Decommission Smith WPP scenarios.

Exhibit 2-F below summarizes the key differences in improvements required by scenario. While it will be critical to complete the high rate feasibility studies in the near-term to select a final scenario, the capital upgrades associated with each scenario are roughly equivalent between the three scenarios for the next two 5-year planning cycles. Thus, as CCWA selects a scenario for implementation now, it should be noted that the minimal investment will be lost if they pivot to a different scenario in the future.

Exhibit 2-F. Summary of Water Production Improvements by Scenario

Improvements	Status Quo A	Status Quo B	Decommission Smith WPP
Improvements (2020-2030)			
Efficiency Improvements	X	X	X
Redundancy Improvements	X	X	X
Upgrade Hooper WPP to 22 MGD	X	X	X
Hicks WPP Solids Handling Improvements	X	X	

Exhibit 2-F. Summary of Water Production Improvements by Scenario

Improvements	Status Quo A	Status Quo B	Decommission Smith WPP
Smith WPP Improvements – Replace flocculators, solids handling improvements	X	X	
Hicks WPP Liquid Lime Upgrade	X	X	X
Flint River Pump Station Improvements	X	X	X
Chemical Feed System Storage Replacement	X	X	X
Smith Reservoir Oxygenation System	X	X	X
Improvements (2030-2040)			
Replace Pumps and PRVs	X	X	X
High Rate Hicks WPP to 15 MGD	X		
Expand Hicks WPP to 12 MGD		X	X
Expand Smith WPP to 15 MGD		X	
New Hicks WPP			X
Upgrade Smith RW PS (10 to 17 MGD)			X
Upgrade Transmission Main from Hicks WPP to Morrow GST, Convert Jonesboro to Booster Pump Station	X	X	X
Install 8615 LF from New Hicks WPP to the Hooper Low Pressure Zone			X
Upgrade Transmission Main, Hooper WPP to Morrow GST			X
Smith to Noah's Ark: 24 to 30-inch line replacement		X	
Improvements (2040-2050)			
Demolish Smith WPP			X
Abandon Noah's Ark and Smith WPP			X

2.2.2 Water Reclamation

The evaluation of water reclamation facility configuration utilized a methodology similar to that of water production evaluation. There were three key studies performed since the 2017 Facility Evaluation project that informed the 2020 Facility Evaluation Update. In 2018, a hydrological model of the Flint River basin was developed as part of the *Upper Flint Hydrology Study* to estimate future levels in the Smith and Shoal Creek Reservoirs to determine whether adequate raw water supplies could be maintained if Shoal Creek were decommissioned in the future. The modeling effort indicates if the Shoal Creek WRF and Panhandle wetlands are decommissioned, CCWA will be able to sustain adequate levels in both reservoirs while withdrawing up to 17 MGD from the Smith Reservoir. Several options for conveying Shoal Creek WRF flows were evaluated in the *2019 Shoal Creek WRF Decommissioning Study*, and the cost for the selected option was used in the 2020 Facility Evaluation Update. Additionally, CCWA had generally established that the W.B. Casey WRRF will require large capital upgrades, but the question remained as to whether they would need to be completed prior to transferring flows from Shoal Creek. Through the W.B. Casey WRRF Capacity Analysis and Plant Expansion Evaluation Project (2019), it was determined that the W.B. Casey WRRF plant would need to be upgraded before flows were transferred from Shoal Creek. Furthermore, this study determined that the existing W.B. Casey WRRF facilities had less than the rated influent and aeration

capacity, and that near-term upgrades would be required to recover capacity to match the permitted capacity of 24 MGD.

Several assumptions were carried over from the 2017 Facility Evaluation including:

- Neither the W.B. Casey WRRF nor the Northeast WRF would be considered for decommissioning
- Scenarios where only one water reclamation facility would remain were eliminated

Scenarios providing more than 50 MGD or more of treatment capacity were eliminated from consideration. For this analysis, the future capacity of the Northeast WRF was assumed to be no more than 10 MGD, which is the current B.2 permitted flow. Scenarios were narrowed down to those that would provide a total capacity ranging between 42 MGD to 49 MGD and are summarized in Exhibit 2-G below.

Exhibit 2-G. Future Water Reclamation Facility Capacities

Facility	Current Capacity	Status Quo	Decommission Shoal Creek WRF
W.B. Casey WRRF	24	32 (Upgrade by 2030)	32 (Upgrade by 2024)
Shoal Creek WRF	4.4	4.4	0
Northeast WRF	10	10	10

Based on the use of Northeast WRF being identical in the two evaluated scenarios, it was determined that the future of the Northeast WRF would not impact analysis of these scenarios and was therefore excluded from the engineering analysis described in the next section.

Once the scenarios were established, an engineering analysis was performed to determine all the capital upgrades that would be required under each scenario. The engineering analysis followed the same methodology as described in the WPP process, and resulted in the following set of projects under each scenario:

Status Quo	Decommission Shoal Creek WRF
▪ Casey Capacity Recovery Upgrades ▪ Casey Solids Facilities Upgrades ▪ Casey Liquid Plant Expansion (24 to 32 MGD in 2030) ▪ Shoal Creek UV Facility Replacement	▪ Casey Capacity Recovery Upgrades ▪ Casey Solids Facilities Upgrades ▪ Casey Liquid Plant Expansion (24 to 32 MGD in 2024) ▪ Shoal Creek Decommissioning

The methodology for cost estimation of water reclamation facilities followed that used for WPPs, with the addition of biosolids disposal costs for operational cost calculations. Scores were similarly assigned to water reclamation scenarios, summarized in Exhibit 2-H below.

Exhibit 2-H. Cost-Benefit Analysis for Water Reclamation Scenarios

Scenario	30-Year Lifecycle Cost NPV[1] ($ 2019)	Benefit Score	Cost-Benefit Ratio
Status Quo	$332,890,000	1.5	0.5
Decommission Shoal Creek	$333,940,000	4.3	1.3

[1]Breakdown of 30-year lifecycle costs available in Appendix B. Lifecycle costs include capital costs for plant upgrades and collection system upgrades between 2020 and 2050 for the Casey WRRF and Shoal Creek WRF, including projects listed in the 2020 SMP Final Project List. Lifecycle costs also include operational costs for chemicals, staffing, power, biosolids disposal, and labor. Costs for the Northeast WRF are not included.

Based on the results of the 2020 Facility Evaluation Update, the decision made in 2017 to decommission Shoal Creek was confirmed and selected. This option received the highest unweighted benefits score, weighted benefit score, and benefit-cost ratio. The two scenarios were found to have very similar lifecycle costs; however, decommissioning Shoal Creek WRF was determined to be more beneficial because it balances interbasin transfers (Criterion 1), relies on newer facilities (Criteria 2, 3, and 4), and offers opportunity for consolidated and more environmentally sustainable solids handling (Criterion 7).

Based on updated flow projections, the total capacity needed at Casey WRRF in 2050 requires an upgrade to a 32 MGD facility to meet projected 2050 flows under both scenarios. Therefore, in order to defer the capital costs unique to the Decommission Shoal scenario, the CCWA project team decided that the decommissioning of Shoal Creek WRF would be deferred until 2030, when a Casey WRRF upgrade would be required regardless of taking on flows from the Shoal Creek basin. This will allow more time for planning the design and construction of a pump station and transmission main required to decommission the Shoal Creek WRF. In the meantime, CCWA will continue to monitor sewer basin flows, revise future projections, and refine project schedules as needed.

2.3 Project List Development

A comprehensive project list was developed after each of the Project Identification Workshops and then reviewed by CCWA staff. Some projects were removed, and other projects added that had been identified after the workshops took place. The lists were refined in preparation for the project scoring process and scoring for projects in each functional area was facilitated by a subject matter expert. At the end of project development and project scoring, 147 total projects were selected to be included in the 2020 SMP. Exhibit 2-I summarizes the number of projects for each functional area (or department). A more detailed list of the 147 projects is provided in Appendix A.

Exhibit 2-I. Summary of Total Project Counts

Functional Area	Number of Projects	Percent of Total Count
Utility-Wide	46	32
Information Technology	8	5
Stormwater	8	5
Water Production	30	20
Distribution & Conveyance	20	14
Water Reclamation	31	21
General Services	4	3
Total Projects	**147**	**100**

3. Project Prioritization

3. Project Prioritization

After project lists were developed, CCWA completed prioritization activities to assist with project implementation planning. Prioritization involved scoring each project according to seven scoring factors aligned with CCWA's mission and vision. A series of scoring meetings were held for each functional area. The subject matter expert of each functional area attended the scoring meeting and arrived with each project already scored according to the seven scoring factors. A robust discussion then took place and CCWA staff came to consensus on a score for each scoring factor for each project.

3.1 Alignment of Mission and Vision, Selection of Strategies, and Importance/Performance Analysis

During the 2010 master planning process, CCWA worked to align its mission and vision with the EPA's 10 Attributes of Effectively Managed Water Sector Utilities and a variety of national water and wastewater associations. These strategies, detailed in Exhibit 3-A, were used as part of the 2010, 2015, and 2020 master-planning processes with weights reestablished during each master plan update to reflect the utility's changing needs and performance improvements over time.

Exhibit 3-A. Scoring Factors for Project Scoring

Strategy	Description
Product Quality (PQ)	Consistently provide superior product quality in sufficient quantities
Customer Satisfaction (CS)	Exceed customer expectations
Employee and Leadership Development (ED)	Hire and develop professional, highly motivated employees who will lead CCWA in the future
Operational Optimization/Resiliency (OO)	Optimize operations to control costs and ensure CCWA can respond effectively to changing regulatory, environment, and economic conditions
Financial Viability (FV)	Ensure financial viability by promoting sound business practices and long-range planning
Infrastructure Stability (IS)	Ensure infrastructure sustainability by developing sound asset management practices
Stakeholder Understanding, Support and Community Sustainability (SS)	Develop strong stakeholder understanding, support, level of innovation, and community sustainability

Innovation, a driving factor of the 2020 SMP, was added to the Stakeholder Understanding, Support and Community Sustainability strategy to reflect CCWA's goal to employ innovative ideas, practices, and technologies when applicable.

As part of the 2020 SMP's development, CCWA performed an importance-performance analysis (IPA), where the CCWA Management Team answered a series of questions to evaluate how "important" each strategy was to the successful operations of CCWA. Following that exercise, the CCWA Management Team scored how well CCWA "performed" each of the strategies and used the importance-performance "gap" to determine which strategies should receive the greatest attention (i.e. highest weight). Exhibit 3-B shows the results of the IPA exercise and reflects that the largest "gaps" were in Employee and Leadership

Development, Infrastructure Stability, and Operation Optimization & Resiliency. Consequently, these strategies were assigned a higher weighting (Exhibit 3-C). For Customer Satisfaction, the CCWA Management Team scored performance higher than importance; therefore, this scoring factor received the lowest weight. Lower weights do not reflect that the strategy is of lower priority to CCWA; rather, it indicates a smaller gap between importance and performance.

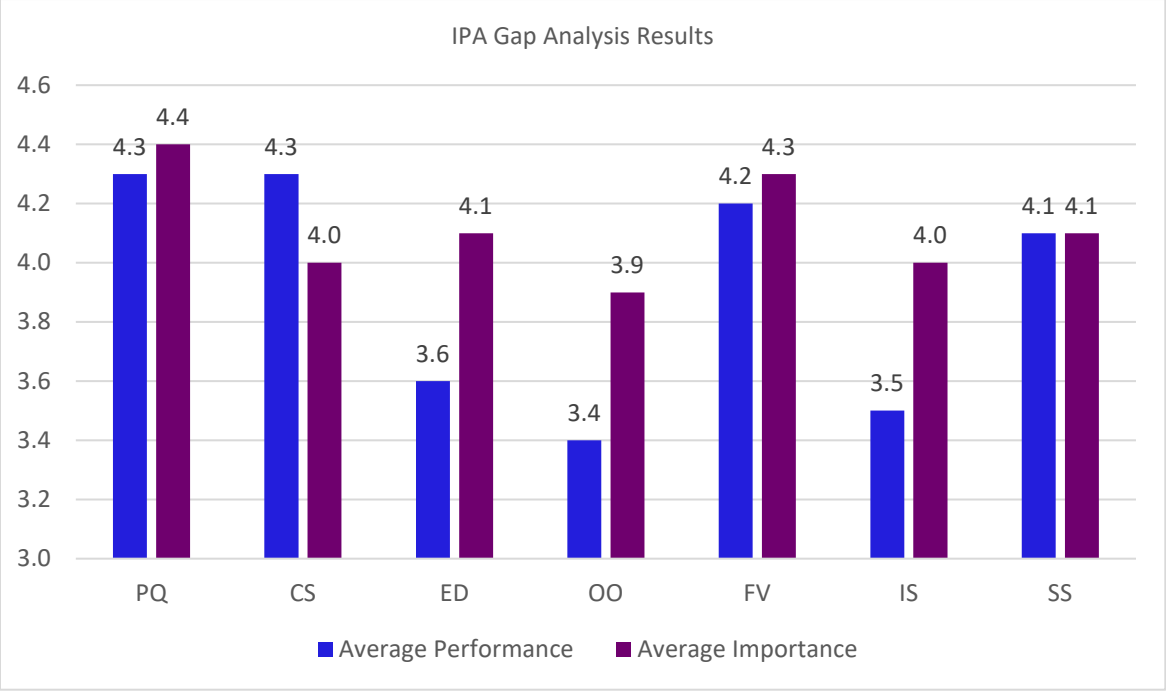


Exhibit 3-B. IPA Gap Analysis Results

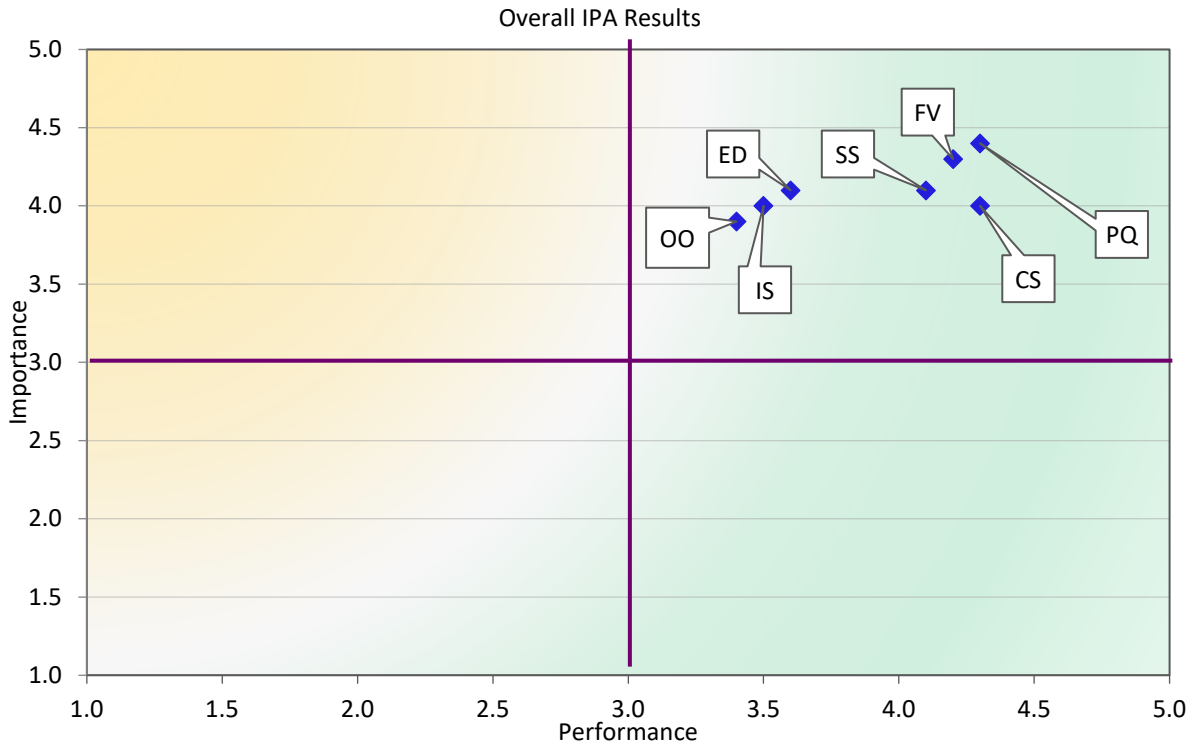


Exhibit 3-C. IPA Gap Analysis Matrix

The goal of the IPA process is to prioritize each strategy according to its "importance" and "performance" score. Strategies that land in the upper right quadrant indicate not only the high importance of the strategy, but the high performance of the strategy. The IPA process showed that all strategies landed in the preferred quadrant. The location of the strategy can help to determine where effort should be focused. Exhibit 3-D shows the ultimate weight assigned to each strategy as a result of the IPA process.

Exhibit 3-D. Strategy Weighting

Strategy	Weighting
Product Quality (PQ)	18
Customer Satisfaction (CS)	2
Employee and Leadership Development (ED)	24
Operational Optimization/Resiliency (OO)	20
Financial Viability (FV)	9
Infrastructure Stability (IS)	22
Stakeholder Understanding, Support and Community Sustainability (SS)	5

3.2 Project Prioritization

3.2.1 Project Categorization

Given the large number of diverse projects on the Final Project List, projects were divided into the following categories:

1) Annual Programs Projects
2) Regulatory/Capacity Projects
3) Discretionary Projects
4) SAMP Projects (from 2019 SAMP)

This project categorization allowed for a reduction in the number of projects to be scored, acknowledging that annual programs and regulatory/capacity driven projects are necessary to be completed on a specific timeline; therefore, scoring is not required. Since the SAMP projects were scored during the SAMP project, and those same scores were used, only the discretionary projects were scored as part of the 2020 SMP. The 2020 SMP used a scoring process similar to the 2015 SMP and the SAMP, wherein Innovation was added to the definition of Stakeholder Understanding, Support, and Community Sustainability, and scoring factors were refined to provide more clarity to the CCWA Staff performing the scoring exercise. Descriptions of these categories can be found in Exhibit 3-E.

Exhibit 3-E. Project Categorization

Category	Description	Scoring
Annual Program Projects	Projects that require annual funding to support recurring work/activities.	Not scored
Regulatory/Capacity Projects	Projects necessary to maintain or increase facility treatment capacity and maintain regulatory compliance.	Not Scored
Discretionary Projects	Projects to improve operations and long-term infrastructure stability but which are not directly or immediately tied to regulatory compliance or capacity needs.	Scored
SAMP Projects	Projects originating from the 2019 SAMP.	Scores used from the original Strategic Asset Management Plan

Exhibit 3-F presents the total number of projects sorted into each category by functional area.

Exhibit 3-F. Project Categorization Totals

Functional Area	Total Number of Projects	Annual	Discretionary	Regulatory & Capacity	SAMP
Utility-wide	46	1	18	1	26
Information Technology	8	5	2	1	-
Stormwater	8	2	6	-	-
Water Production	30	-	25	5	-

Exhibit 3-F. Project Categorization Totals

Functional Area	Total Number of Projects	Annual	Discretionary	Regulatory & Capacity	SAMP
Distribution & Conveyance	20	10	8	2	-
Water Reclamation	31	-	19	12	-
General Services	4	4	-	-	-
Total	**147**	**22**	**78**	**21**	**26**

3.2.2 Scoring Factors

The CCWA scoring factors were collaboratively developed with staff during the 2015 SMP process, so the total benefit scores as determined during the prioritization would accurately reflect the fundamental objectives of CCWA. There was one addition to the scoring factors in the 2020 SMP. Level of Innovation was added to the Stakeholder Understanding Support and Community Sustainability Strategy. Scoring Factors are summarized in Exhibit 3-G.

Exhibit 3-G. Factors used for Project Scoring

Strategy	Scoring Factor
Product Quality/Quantity (PQ)	1. Impact on drinking water quality, effluent/reclaimed water quality, or stormwater quality 2. Regulatory compliance 3. Impact on capacity
Customer Satisfaction (CS)	1. Customer satisfaction levels 2. Customer complaints 3. Customer responsiveness
Employee and Leadership Development (ED)	1. Morale, retention, interest in CCWA positions 2. Staff competency, skill levels, opportunities for leadership positions 3. Internal customer satisfaction
Operational Optimization / Resiliency (OO)	1. Operational efficiency - likelihood of injury and/or insurance claims 2. Responsiveness in emergency conditions, ability to recover from natural/ manmade incident 3. Risk to employees, customers, community or property
Financial Viability (FV)	1. Impact on overall financial position (short or long-term) 2. Financial Policy and Procedure Integrity/Compliance 3. Budget Management Effectiveness
Infrastructure Stability (IS)	1. Asset Management best practices 2. Risk of existing infrastructure - Including risk posed by climate change 3. Technological feasibility and/or impact to IT 4. Planned versus reactive maintenance

Exhibit 3-G. Factors used for Project Scoring

Strategy	Scoring Factor
Stakeholder Understanding Support and Community Sustainability (SS)	1. Ability to improve relationship with stakeholders and generate positive media coverage 2. Improves protection of the watershed 3. Support community economic development efforts 4. Level of innovation

3.2.3 Project Scoring Workshops

Three workshops were held with the CCWA Management Team and consultants to prioritize and score each of the 77 discretionary projects (Exhibit 3-H). Through collaborative discussions led by the relevant consultant subject matter expert, the CCWA Management Team collectively assigned scores for each strategy for each discretionary project. A project received a score of 0, 1, 3, 7, or 10 for each strategy through group consensus. Exhibit 3-I provides an example of the scoring worksheet that was completed for all discretionary projects scored.

Exhibit 3-H. 2020 SMP Scoring Workshops

Exhibit 3-I. Project Scoring Worksheet Benefits Score Results

2020 Strategic Master Plan Scoring						
	Scale					
Scoring Factors	0	1	3	7	10	Weight
PQ: PRODUCT QUALITY/QUANTITY 1. Impact on drinking water quality, effluent/reclaimed water quality, or stormwater quality 2. Regulatory compliance 3. Impact on capacity	Potential Negative Impact	No Impact	MAY improve quality OR MAY increase regulatory confidence OR MAY provide needed capacity	LIKELY to improve quality AND LIKELY to increase regulatory confidence OR LIKELY to provide needed capacity	WILL improve quality AND WILL increase regulatory confidence AND WILL provide needed capacity	18%
CS: CUSTOMER SATISFACTION 1. Customer satisfaction levels 2. Customer complaints 3. Customer responsiveness	Potential Negative Impact	No Impact	MAY improve customer satisfaction OR MAY reduce customer complaints OR MAY increase responsiveness	LIKELY to improve customer satisfaction AND LIKELY to reduce customer complaints OR LIKELY to increase responsiveness	WILL improve satisfaction AND WILL reduce customer complaints AND WILL increase responsiveness	2%
ED: EMPLOYEE AND LEADERSHIP DEVELOPMENT 1. Morale, retention, interest in CCWA positions 2. Staff competency, skill levels, opportunities for leadership positions 3. Internal customer satisfaction	Potential Negative Impact	No Impact	MAY improve morale/retention OR MAY improve staff competency OR MAY improve internal customer satisfaction	LIKELY to improve morale/retention AND LIKELY to improve competency OR LIKELY to improve internal customer satisfaction	WILL improve morale/retention AND WILL improve competency AND WILL improve internal customer satisfaction	24%
OO: OPERATIONAL OPTIMIZATION / RESILIENCY 1. Operational efficiency - likelihood of injury and/or insurance claims 2. Responsiveness in emergency conditions, ability to recover from natural/ manmade incident 3. Risk to employees, customers, community or property	Potential Negative Impact	No Impact	MAY improve efficiency OR MAY improve responsiveness/recovery OR MAY reduce risk	LIKELY to improve efficiency AND LIKELY to improve responsiveness/recovery OR LIKELY to reduce risk	WILL improve efficiency AND WILL improve responsiveness/recovery AND WILL reduce risk	20%
FV: FINANCIAL VIABILITY 1. Impact on overall financial position (short or long-term) 2. Financial Policy and Procedure Integrity/Compliance 3. Budget Management Effectiveness	Potential Negative Impact	No Impact	MAY improve financial position OR MAY support Policy and Procedure Integrity/Compliance OR MAY support Budget Management Effectiveness	LIKELY to improve financial position AND LIKELY to support Policy and Procedure Integrity/Compliance OR LIKELY to support Budget Management Effectiveness	WILL improve financial position AND WILL support Policy and Procedure Integrity/Compliance AND WILL support Budget Management Effectiveness	9%
IS: INFRASTRUCTURE STABILITY 1. Asset Management best practices 2. Risk of existing infrastructure - Including risk posed by climate change 3. Technological feasibility and/or impact to IT 4. Planned versus reactive maintenance	Potential Negative Impact	No Impact	MAY address Asset Management best practices OR MAY reduce risk	LIKELY to address Asset Management best practices AND LIKELY to reduce risk	WILL address Asset Management best practices AND WILL reduce risk	22%
SS: STAKEHOLDER UNDERSTANDING SUPPORT AND COMMUNITY SUSTAINABILITY 1. Ability to improve relationship with stakeholders and generate positive media coverage 2. Improves protection of the watershed 3. Support community economic development efforts 4. Level of Innovation	Potential Negative Impact	No Impact	MAY generate positive media coverage due to innovation OR MAY improve watershed protection OR MAY support economic development	LIKELY to generate positive media coverage due to innovation AND LIKELY to improve watershed protection OR LIKELY to support economic development	WILL generate positive media coverage due to innovation AND WILL improve watershed protection AND WILL support economic development	5%

Exhibit 3-J shows the average score by functional area, for each strategy. The Water Production projects scored the highest for infrastructure stability, on average, followed by Distribution & Conveyance and Utility-wide projects.

Product Quality/Quantity and Stakeholder Understanding and Support and Community Sustainability both received the highest score for the lowest number of projects, and Financial Viability received the lowest score. Only 5 percent of the projects scored a 10 for Financial Viability.

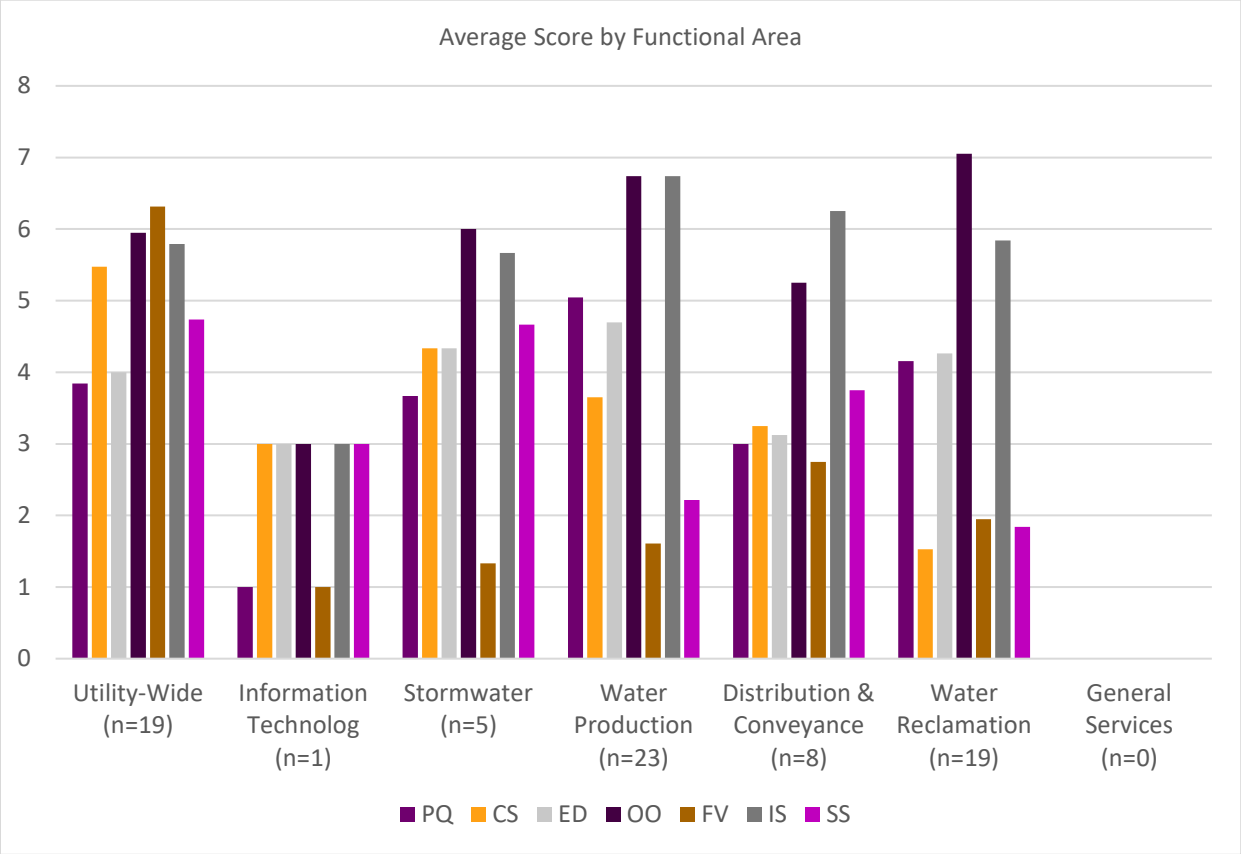
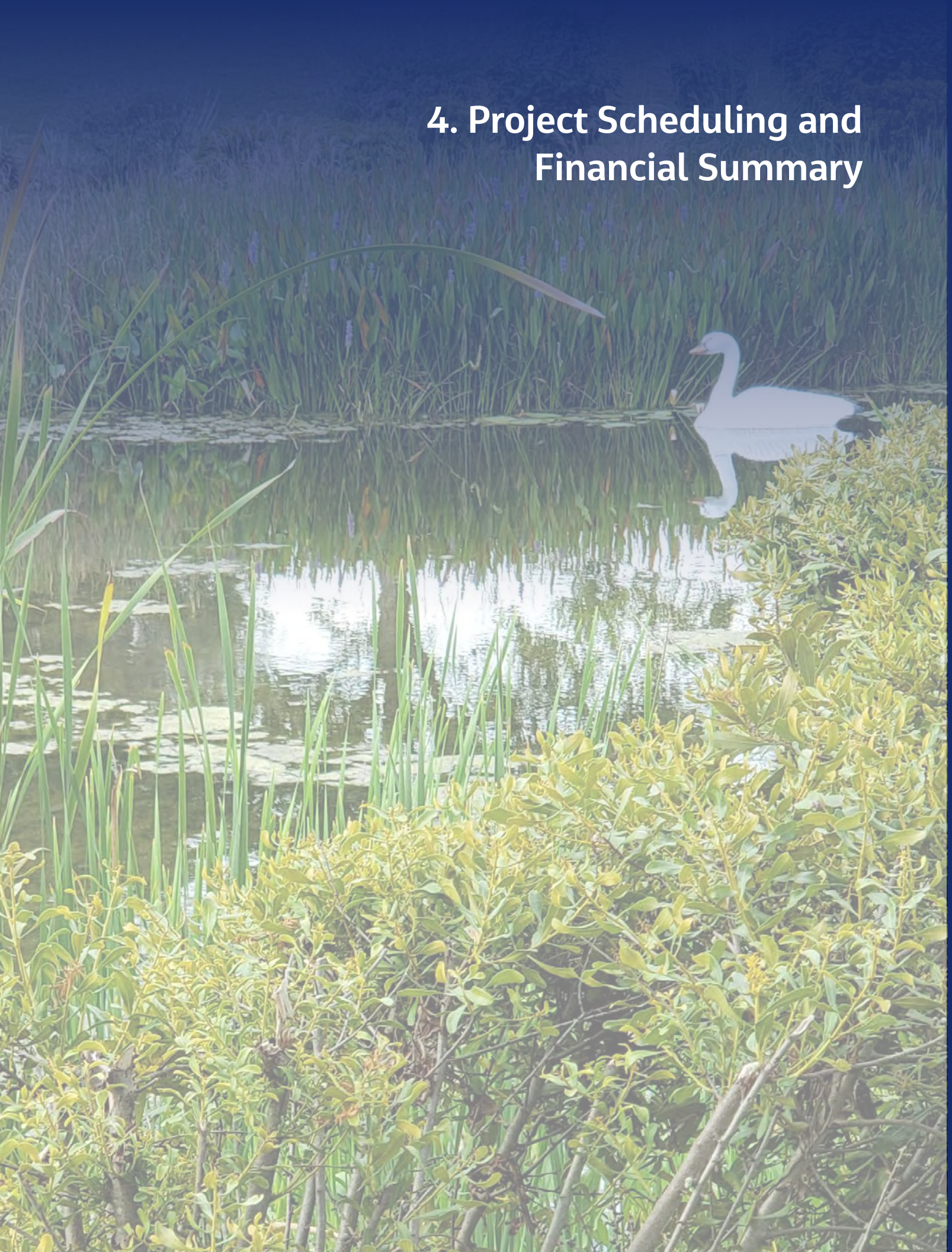


Exhibit 3-J. Average Scores by Functional Area

The average score among functional areas ranged from 17.5 to 92 points, of a total possible 100. Water Production and Water Reclamation scores were higher on average, primarily because of high scores for both Operational Optimization/Resiliency and Infrastructure Stability, both of which were weighted relatively high. The Infrastructure Stability strategy demonstrated the greatest variability among the functional areas. Water Production and Distribution & Conveyance projects scored relatively high for this strategy, while IT projects scored relatively low.

4. Project Scheduling and Financial Summary



4. Project Scheduling and Financial Summary

While the project scoring exercise provided a good barometer as to how the various projects support CCWA's mission and vision, scheduling and cash-flow considerations must factor into the development of the 2020 SMP. Naturally, annual budgets factor into the scheduling of projects, and in many cases a lower-scored predecessor project must be completed before a higher-scored successor project. While the project score was used as a guide in the scheduling of projects over the 10-year master planning period, it was not the only factor considered.

4.1 Project Cost Estimates

After the project lists were finalized and projects were laid out over the 10-year master-planning period, planning-level cost estimates were developed for all projects. Jacobs staff and the appropriate subject matter experts provided planning level cost estimates for each project. Some near-term projects were provided with a more granular level cost estimate, given the year in which the project will occur, or the level of detail available for them. A series of meetings between Jacobs staff and CCWA was held to review the planning level cost estimates. Some estimates were adjusted during those meetings and consensus was gained on the appropriate potential costs. Some large projects were segregated into smaller parts for budgetary purposes, such as engineering and design, while other projects were shuffled to meet budgetary constraints. Planning level cost estimates developed within the Strategic Asset Management Plan and Collection System Pilot (2019) project were integrated into the Utility-wide project list and in some cases, projects from the SAMP were rescoped and re-estimated to accommodate new Utility-wide initiatives.

Exhibit 4-A. Summary of Total Project Costs by Functional Area

Functional Area	Total Project Costs	Percent of Overall SMP Cost
Utility-Wide	$40,185,000	6
Information Technology	$11,475,000	2
Stormwater	$42,470,000	6
Water Production	$47,470,000	7
Distribution & Conveyance	$215,150,000	32
Water Reclamation	$302,530,000	45
General Services	$18,475,000	3
Total	**$677,755,000**	**100**

4.2 Final Project List

The report appendices summarize the final list of 2020 SMP projects, including the functional area, total benefit score, planning level estimated cost, project category, project estimated duration, and the budget category that will fund each project. Additional details and project description for each project are provided in the project lists in Appendix A.

4.3 Cash Flow and Rate Model

Under a separate project (*JA-OP-19-01 Water and Sewer Financial Strategy*) a comprehensive rate model was developed, considering the cash-flow requirements needed to complete all the projects within the 2020 SMP. Based on the project schedules developed by the subject matter experts and CCWA staff, a cash-flow model was developed for projects to be funded by the Water and Sewer Enterprise Fund. The cash-flow model excludes the stormwater projects, because they are funded from a separate stormwater utility. Exhibits 4-B through 4-I provide a visual representation of the 2020 SMP projects over the 10-year planning period. The suggested rate increase requirements needed to finance the 2020 SMP are provided in the *Water and Sewer Financial Strategy* Final TM. Exhibit 4-B below provides a financial summary of all projects in the SMP, including Stormwater projects.

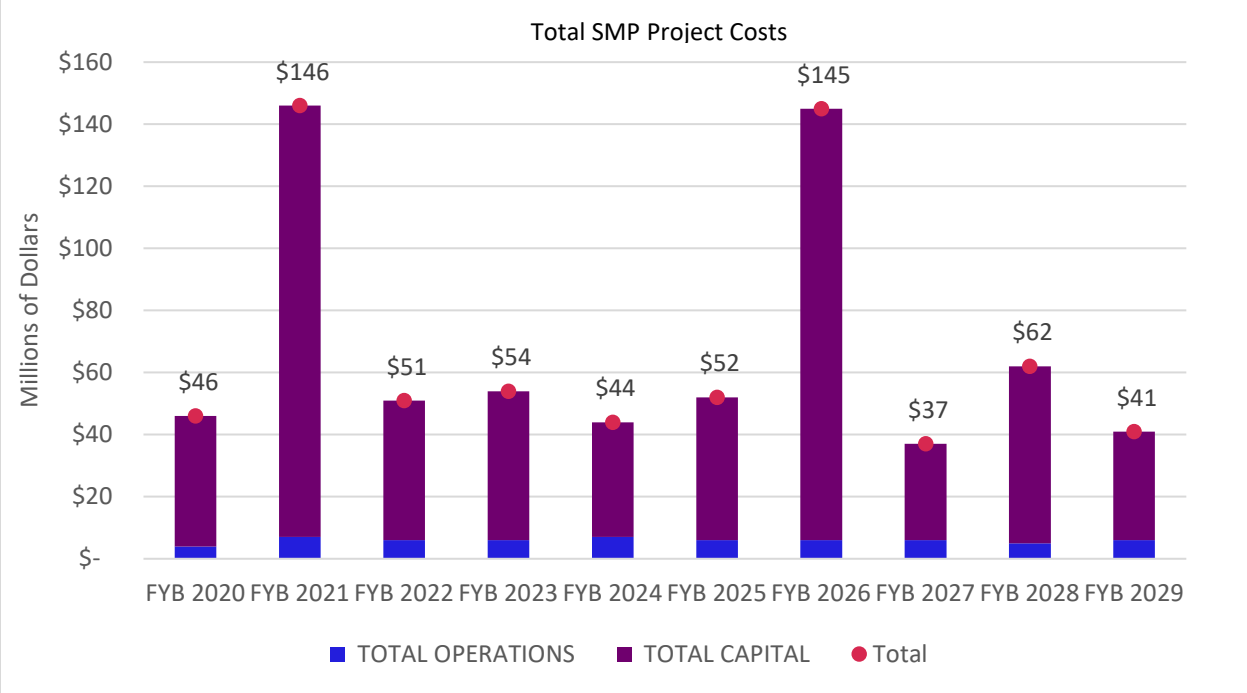


Exhibit 4-B. Financial Summary of all SMP Projects in 10-year Implementation Period

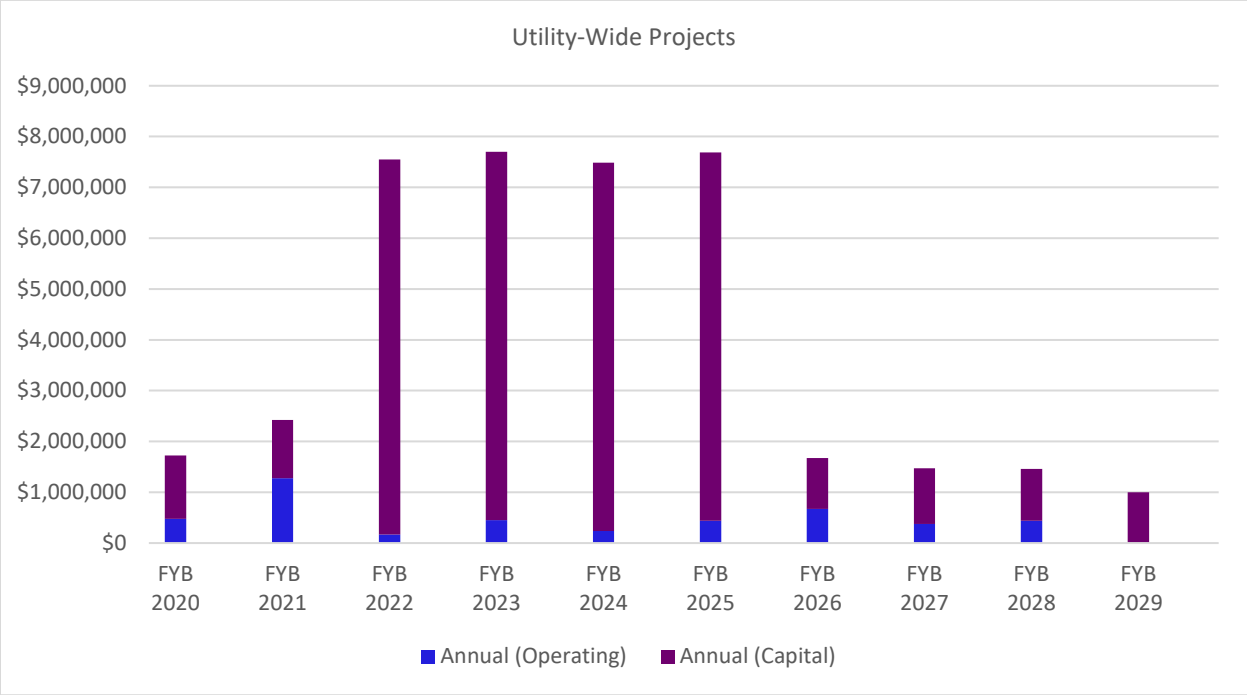


Exhibit 4-C. Financial Summary of all Utility-wide Projects in 10-year Implementation Period

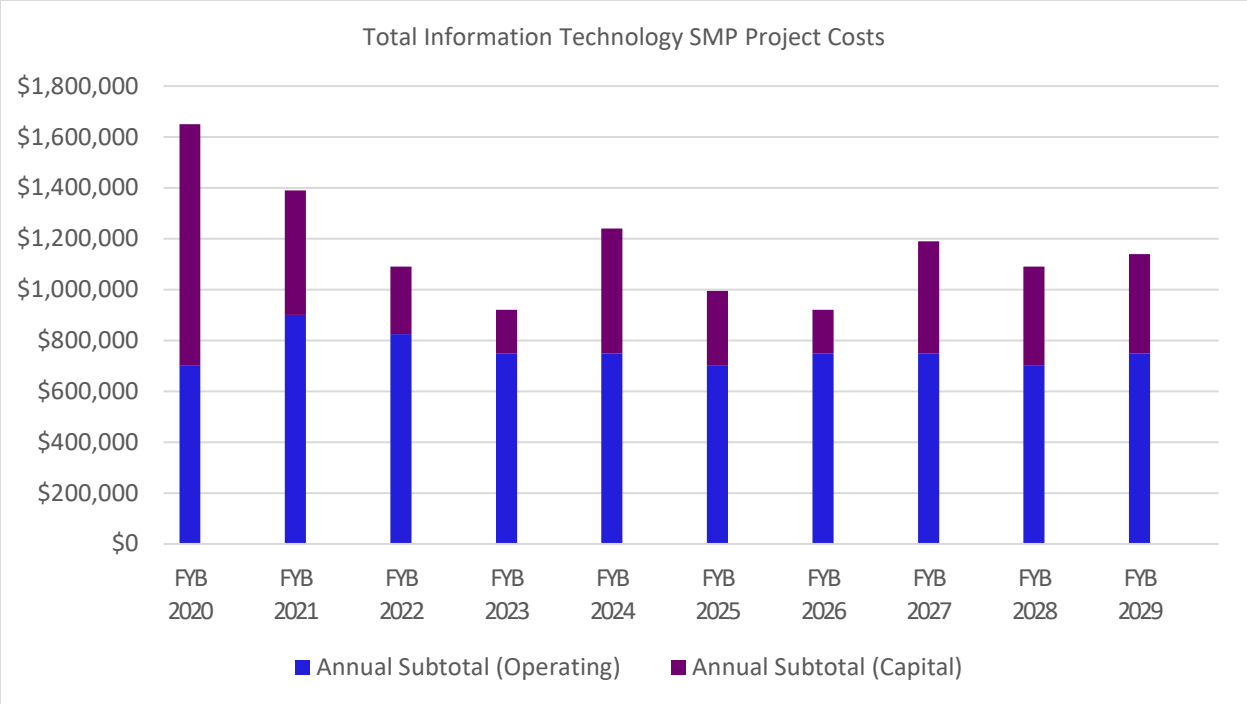


Exhibit 4-D. Financial Summary of all Information Technology Projects in 10-year Implementation Period

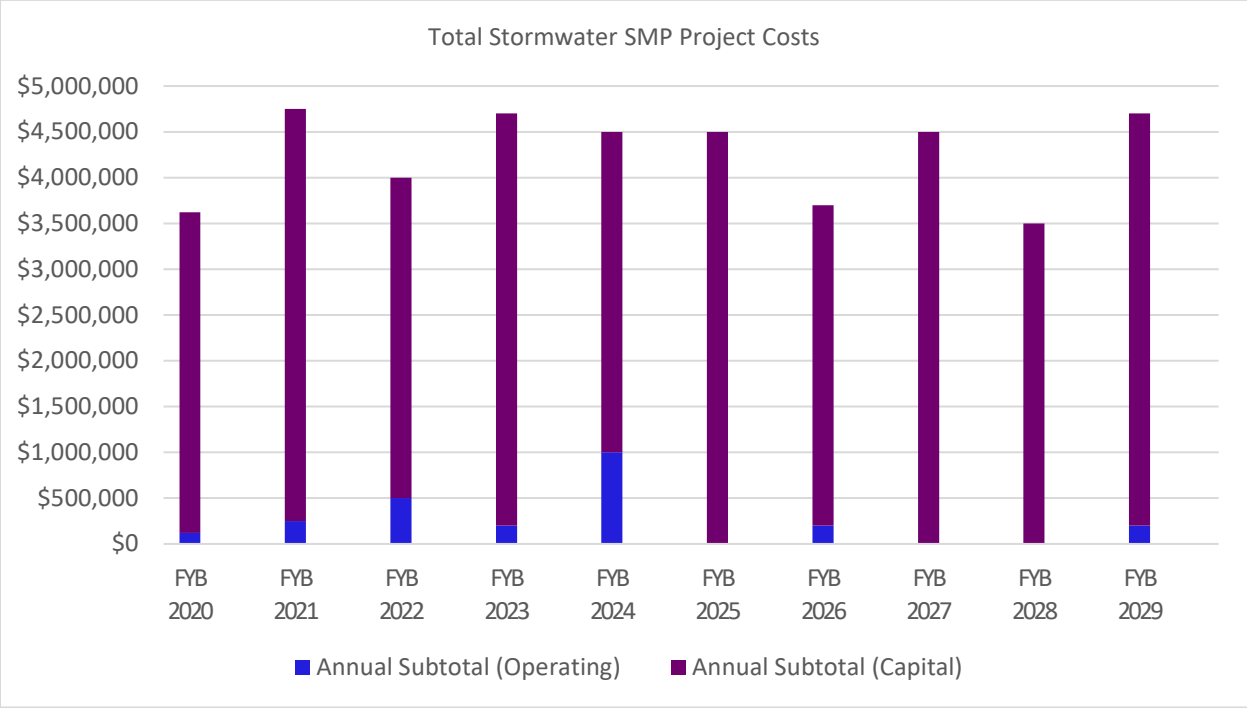


Exhibit 4-E. Financial Summary of all Stormwater Projects in 10-year Implementation Period

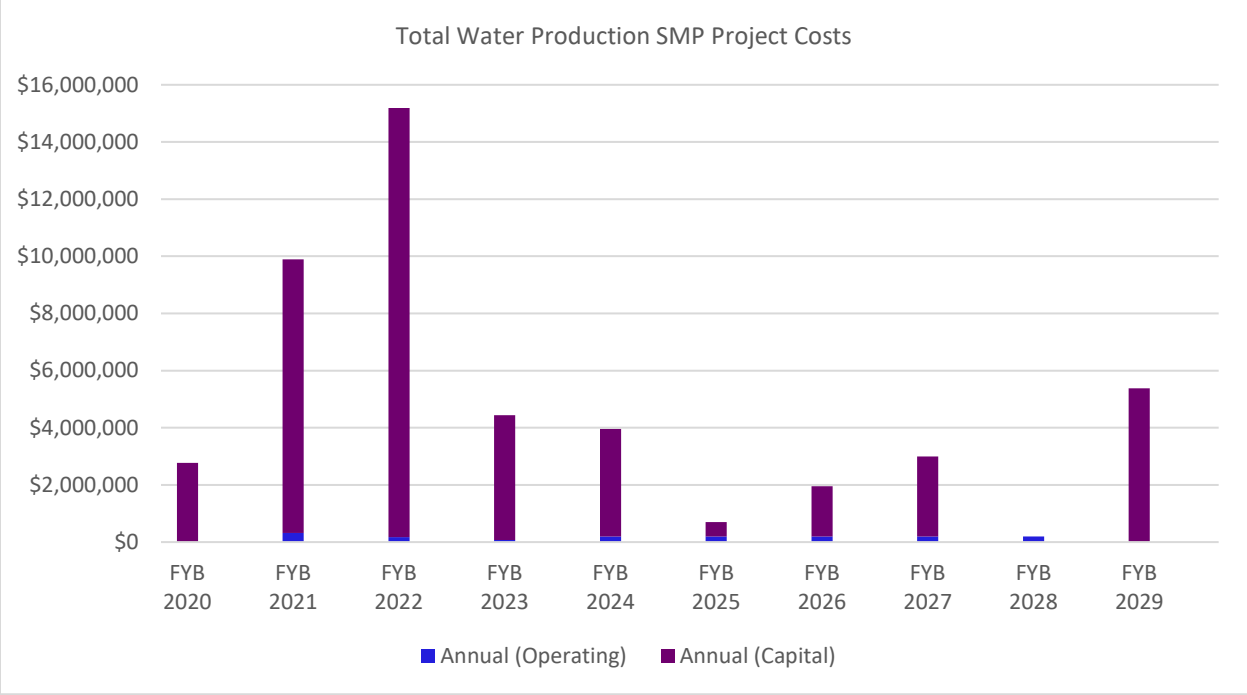


Exhibit 4-F. Financial Summary of all Water Production Projects in 10-year Implementation Period

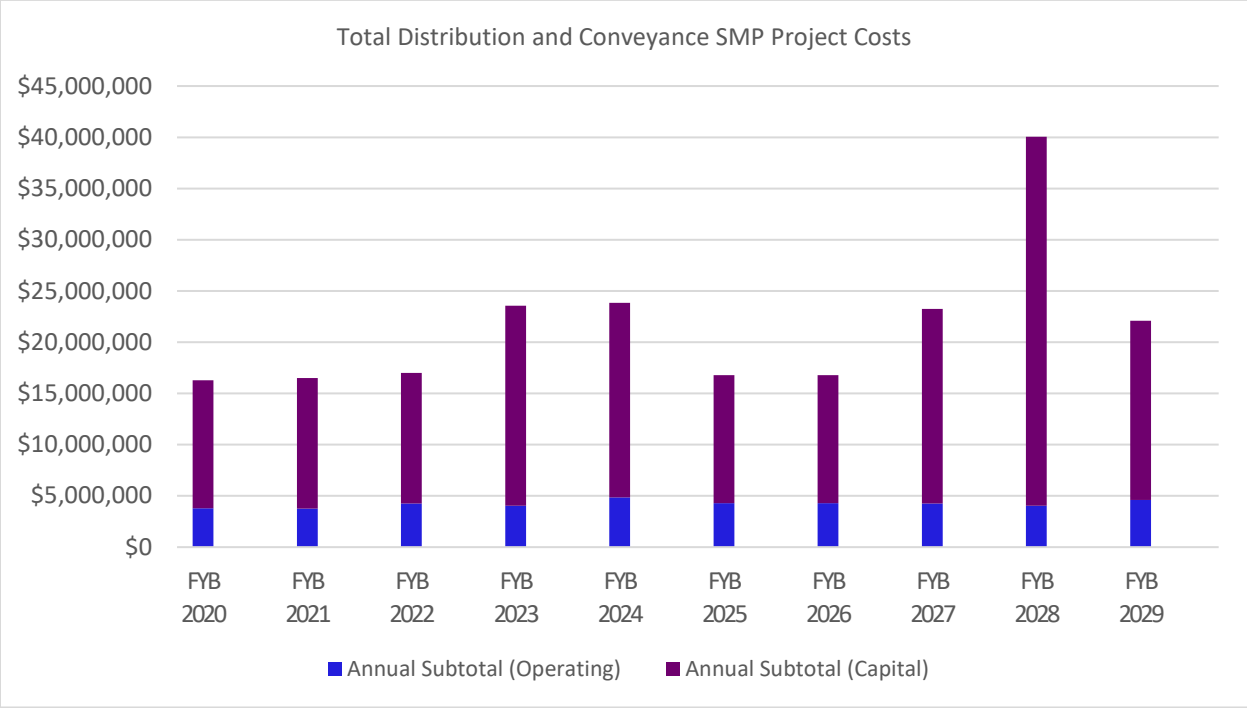


Exhibit 4-G. Financial Summary of all Distribution & Conveyance Projects in 10-year Implementation Period

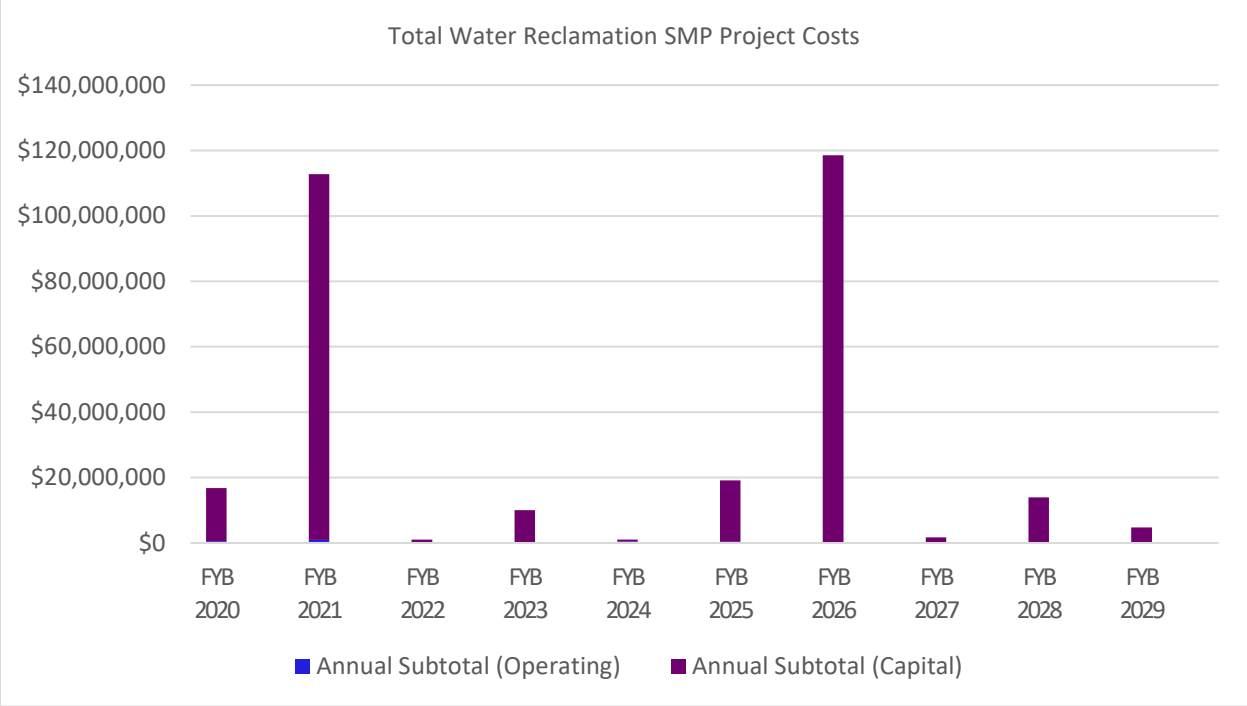


Exhibit 4-H. Financial Summary of all Water Reclamation Projects in 10-year Implementation Period

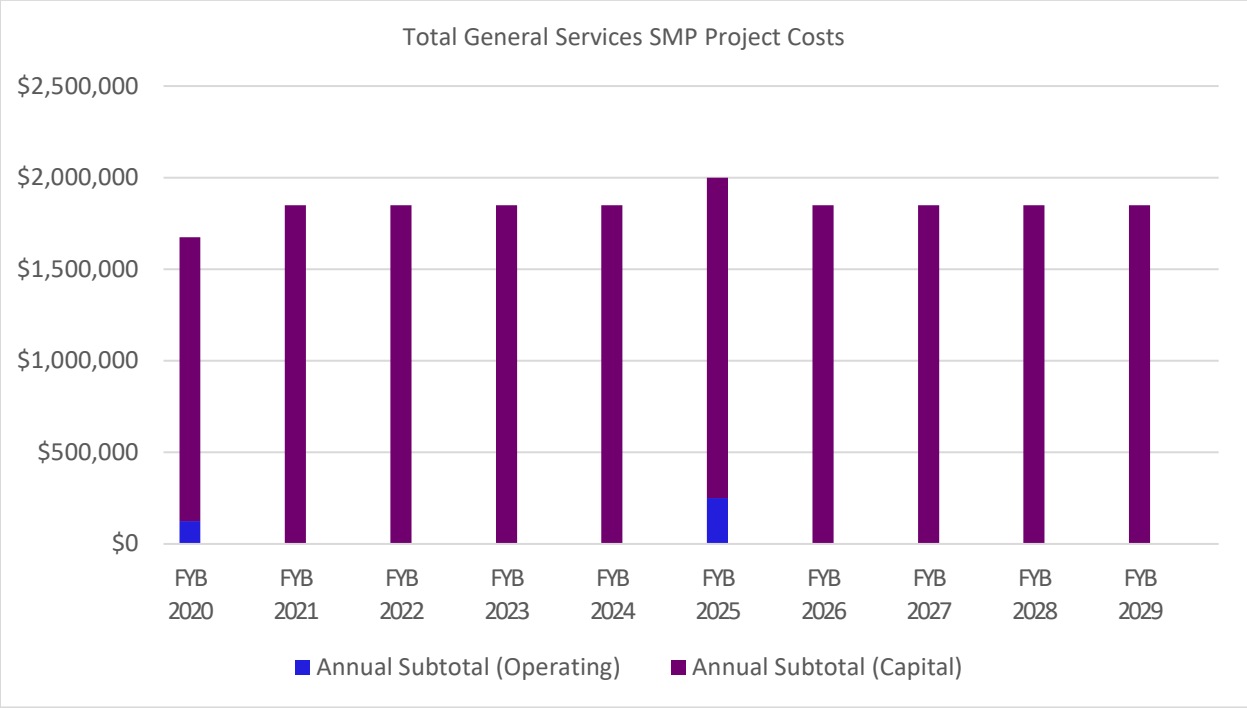


Exhibit 4-I. Financial Summary of all General Services Projects in 10-year Implementation Period

4.4 Conclusions and Path Forward

The 2020 CCWA strategic master-planning process resulted in 147 projects from FYB20 through FYB29 for an estimated cost of $677.7 million. Project lists provided in Appendix A outline the projects developed through this Strategic Master Plan that will allow CCWA to provide quality service and water while planning for future infrastructure needs during the next ten years.

One theme discussed throughout this project is the importance of checking actual water demands and wastewater flows against projected demands and flows. The timing of major water production and water reclamation facility upgrades may be delayed or advanced if actual values deviate from projected values.

A second theme considered throughout the development of the project lists was a reduction in the number of projects to a manageable level, for CCWA staff and their consultants. The consultants and CCWA worked hard to reduce the project list to only those most necessary projects which will continue the vision to provide "Quality Water, and Quality Service." Throughout the course of the master planning process, several projects were identified that were deemed to be projects that could be completed internally by CCWA staff, without the need for consultant resources. While these projects were neither priced nor scheduled, descriptions for each of these supplemental projects are listed in Appendix A.

A final theme when developing the project list was the incorporation of innovation into the process. Innovation was incorporated into the scoring process so those more innovative projects would rise to the top. Innovative projects will help to encourage the vision to provide "Quality Water, and Quality Service."

4.4.1 Utility-wide

The Utility-wide project list includes projects and funding to address requirements of the AWIA, and to continue to implement strategic asset management projects. Projects on the Utility-wide list also allow CCWA to improve all elements of the business through a continued focus on business continuity,

employee hiring and knowledge retention, and implementation of tools for business intelligence. Other projects to improve operations of the system include projects to optimize energy usage, reduce water loss in the system, and replace customer meters.

4.4.2 Information Technology

The IT project list includes projects and funding to ensure CCWA continues to focus on constantly changing technologies related to mobility of staff, cyber security, SCADA upgrades, software and hardware upgrades, and disaster recovery. During the project development workshops, a consistent theme discussed was the increase in staff mobility and the ability to perform both critical and non-critical functions from remote locations via the implementation of more mobile devices, applications and on-line capabilities.

4.4.3 Stormwater

The Stormwater project list includes a wide variety of projects such as an update to the stormwater development guidelines, stormwater inspection data optimization, and the development of a watershed master plan which is budgeted to occur three times during the 10-year period. The stormwater list included two large annual program projects, implementation of watershed improvement projects, and implementation of stormwater capital improvement projects each of which annual budgets identified. A consistent theme considered during the project identification workshop was public education and outreach which can be seen within certain projects on the list.

4.4.4 Water Production

CCWA has developed a comprehensive long-term plan that will maximize the value and lifespan of existing assets, optimize the water production efficiency, and gather critical source water data to enable sound decisions for decades to come.

As part of the Facility Evaluation Update, CCWA elected to proceed with evaluating the feasibility of the Status Quo A scenario, reiterated in Exhibit 4-J below.

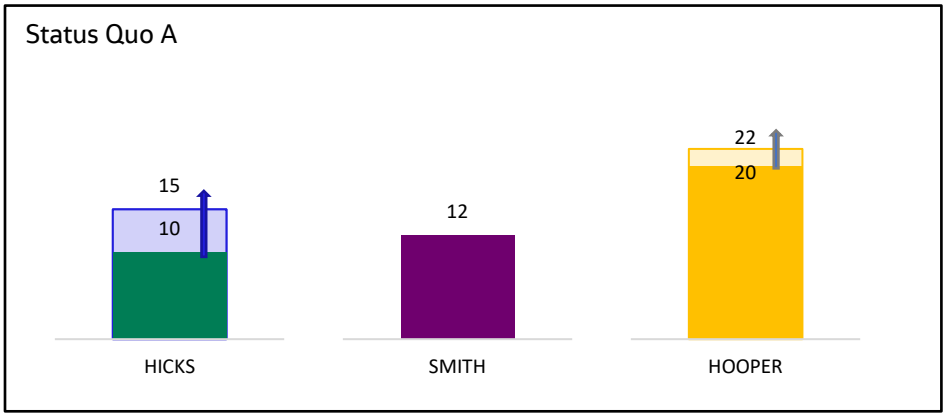


Exhibit 4-J. Summary of Status Quo A Scenario

To provide CCWA with the time required to perform the high-rating studies necessary to select the appropriate scenario, CCWA should consider the following three near-term solutions under all scenarios: (1) adding a third shift at the Smith WPP to increase capacity from 7-8 MGD to the plant's rated capacity of 12 MGD, (2) conducting an evaluation of improvements necessary to increase water production efficiency at all three plants (Project 20-313), and (3) upgrade the Hooper WPP through the construction of the two additional filters. It should be noted that the upgrades of the Hicks and Smith WPPs under all three scenarios do not occur until after the 2020 SMP implementation period.

If the high-rating study of the Hicks WPP (Project 20-300) determines it is not feasible to high-rate Hicks to 15 MGD, CCWA should perform the high-rate study for the Smith WPP (Project 20-305) to confirm the feasibility of high-rating it to 15 MGD. Using refined cost estimates from this high-rating study, CCWA should re-score the Status Quo B and Decommission Smith scenarios and revise the cost-benefit analysis.

As actual MDDs approach the current permitted raw water withdrawal of 49 MGD around 2050, CCWA will need to increase permitted raw water withdrawal through the implementation of additional raw water storage within the system. Through *Utility-wide Project 20-143 / Identification and Evaluation of Future Raw Water Storage Options,* CCWA will be able to identify several options for raw water storage to eventually increase permitted raw water withdrawal.

Other notable WPP projects include the Single Points-of-Failure Elimination Study and Implementation project (Project 20-309), which will mitigate an isolated failure taking the full plant offline and provide improved flexibility for maintenance operations, the Northwest/College Park Booster Pump Station Design and Construction (Project 20-312), and SCADA improvements to the re-pump stations (Project 20-321).

4.4.5 Distribution and Conveyance

The 2020 SMP project list for Distribution and Conveyance allows CCWA to focus on strategic asset management and pipeline replacement and rehabilitation. CCWA will continue to perform evaluations and prioritized inspections of the gravity sewer system, as well as continuing to develop and implement asset management strategies for its pressure sewer and distribution systems. Finally, continued hydraulic modeling will enable CWWA to ensure sewer capacities and to maintain distribution system pressures, assist with asset management, and confirm the timeline of necessary capital improvement projects.

The Distribution and Conveyance project list includes several on-going annual projects such as the Galvanized Water Main Replacement Program (Project 20-601), Uni-Directional Flushing Program (Project 20-605), Small and Large Diameter Sewer Rehabilitation and Replacement Program (Projects 20-607 and 20-608), and Pressure Sewer Assessment and Rehabilitation Program (Project 20-615). These projects will consider combining sewer rehabilitation projects into a multi-year package for a potential GEFA loan as a way to spread the project cost over several years via a low-interest loan, rather than using cash.

4.4.6 Water Reclamation

The 2020 Facility Evaluation Update confirmed the previous decision made in 2017 to decommission the Shoal Creek WRF. Based on updated flow projections, the total capacity needed at Casey WRRF in 2050 requires an upgrade to a 32 MGD facility to meet projected 2050 flows under both scenarios. Therefore, in order to defer the capital costs unique to the Decommission Shoal scenario, the CCWA project team decided that the decommissioning of Shoal Creek WRF would be deferred until 2030, when a Casey WRRF upgrade would be required regardless of taking on flows from the Shoal Creek basin. This will allow more time for planning the design and construction of a pump station and transmission main required to decommission the Shoal Creek WRF. In the meantime, CCWA will continue to monitor sewer basin flows, revise future projections, and refine project schedules as needed.

Water reclamation projects represent a significant capital investment – most significantly, the W.B. Casey WRRF upgrades. The project list developed for water reclamation will support the need for capacity increases while strategically staggering some projects to defer capital investment. The project schedule prioritizes the most urgent projects required to meet permit limits, and to replace major infrastructure that has reached the end of its useful life. At W.B. Casey WRRF, the most urgent projects include the Interim Pelletizing Improvements (Project 20-704) to address safety concerns, and the 24-MGD W.B. Casey Capacity Recovery Upgrades (Project 20-702 and 20-706) to address the aeration system and influent

pumping capacity deficiencies. Also urgent is the W.B. Casey Solid Facilities project (Project 20-703), which must begin soon to replace the existing facility which is currently at capacity and is at the end of its useful life.

Some upgrades to the Northeast WRF may be deferred if an interim permit limit is acceptable to GAEPD. If this project is ultimately determined unnecessary, CCWA may be able to reallocate these capital funds for other projects. For both W.B. Casey WRRF and Northeast, any changes in flow projections may change the required timing of infrastructure needs and should be carefully considered before further deferring any projects.

The Shoal Creek WRF projects list includes a UV Disinfection System Upgrade project (Project 20-705), Aeration System improvements (Project 20-720), and Screening upgrades (Project 20-721). The Shoal Creek WRF decommissioning project (Project 20-730) is slated to occur in FYB28-FYB29 for completion by 2030, which requires construction of a new Shoal Creek pump station (Project 20-727) in FYB27-FYB28.

4.4.7 General Services

The General Services project list is focused on both lift station evaluation and rehabilitation. The lift station evaluation and rehabilitation projects are a continuation from the 2015 SMP. A second focus of the General Services project list is the SCADA master plan and the implementation of the SCADA projects resulting from the master plan. The SCADA master plan is planned twice during the 10-year planning period, along with an annual estimate of funds for project implementation.

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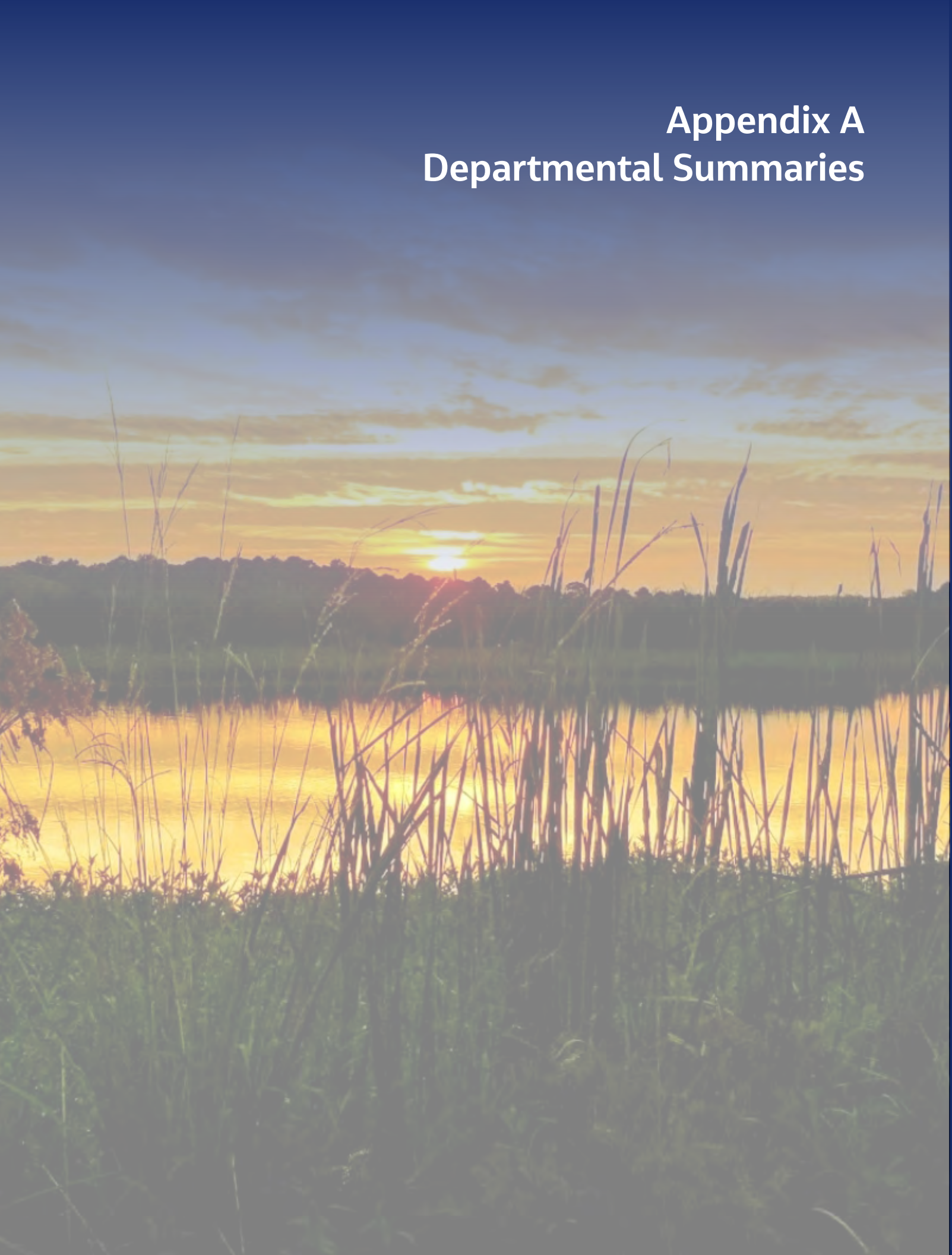
Appendix A
Departmental Summaries



Utility-wide

UTILITY-WIDE - PROJECT SCHEDULE

Project Name	Total Benefit Score	Planning Level Estimated Cost	Predecessors	Successors	FYB 2019	FYB 2020	FYB 2021	FYB 2022	FYB 2023	FYB 2024	FYB 2025	FYB 2026	FYB 2027	FYB 2028	FYB 2029
20-100 / Metrics Identification and Usage Improvement Strategy (SAMP-OS-10)	47.6*	$80,000		20-132											
20-101 / Warehouse and Inventory Management Improvement Initiative (SAMP-W-01)	38.6*	$500,000													
20-102 / Spare Parts Obsolescence Review and Disposal Strategy (SAMP-W-02)	29.4*	$150,000	W-01												
20-103 / Facility Asset Data Improvement Strategy (SAMP-F-01)	46.5*	$250,000		OS-11, F-03, OS-03, F-08											
20-105 / Organizational Assessment (SAMP-OS-07)	50.3*	$75,000	OS-10												
20-106 / Linear Asset Data Improvement Strategy (SAMP-L-01)	49.7*	$500,000		F-02, OS-11, L-03, OS-03											
20-107 / Facilities Asset Risk Management Improvement Strategy (SAMP-F-02)	49.2*	$200,000	F-01	OS-11, F-03, OS-03, F-08											
20-108 / Linear Asset Risk Management Improvement Strategy (SAMP-L-02)	46.7*	$120,000	L-01												
20-109 / Develop Career Development Ladders (SAMP-OS-04)	42.7*	$100,000		OS-11, L-03, OS-03											
20-110 / Develop Asset Contingency Plans (SAMP-OS-11)	60.9*	$150,000	F-01, F-02, L-01, L-02, W-01												
20-111 / Staff Training Improvement Strategy (SAMP-OS-09)	54*	$0	OS-4												
20-115 / Develop a Data Management Strategy (SAMP-OS-01)	54.4*	$100,000													
20-116 / Facilities Planning and Scheduling Improvement Strategy (SAMP-F-05)	52.1*	$50,000	OS-4, OS-9												
20-117 / Linear Planning and Scheduling Improvement Strategy (SAMP-L-05)	49.9*	$50,000	OS-4, OS-9												
20-118 / Develop Tactical Asset Management Plans (SAMP-OS-14)	51*	$510,000	F-01, F-02, L-01, L-02												
20-119 / Facilities Operations Optimization Initiative (SAMP-F-10)	48.2*	$100,000													
20-120 / Linear Maintenance Improvement Strategy (SAMP-L-03)	46.9*	$75,000	L-01, L-02												
20-121 / Linear Work Management Process Improvement (SAMP-L-04)	46.7*	$50,000													
20-122 / Facilities Maintenance Improvement Strategy (SAMP-F-03)	46*	$75,000	F-01, F-02												
20-123 / Asset Financial Planning Strategy (SAMP-OS-03)	45.2*	$200,000	L-01, L-02, F-01, F-02												
20-124 / Facilities Work Management Process Improvement (SAMP-F-04)	42.6*	$50,000													
20-125 / Facilities Asset Obsolescence Strategy (SAMP-F-07)	40.8*	$150,000													
20-126 / Facilities Configuration Control Policy Development (SAMP-F-09)	39.1*	$25,000													
20-127 / Facilities Bill of Materials Initiative (SAMP-F-08)	36.7*	$300,000	W-01, F-01, F-02												
20-128 / Facilities Lubrication Program Improvement (SAMP-F-06)	31*	$40,000													
20-129 / Space Management Strategy (SAMP-L-06)	29.1*	$20,000													
20-130 / Enterprise-wide Communications Strategy (includes Asset Management Communication Improvement Strategy (SAMP OS-02))	N/A	$100,000													
20-131 / Evaluate Next Generation of Meter Technologies	N/A	$150,000		20-147											
20-132 / Customer Meter Replacement Program (includes moving from AMR to AMI)	64.4	$25,000,000	20-146												
20-133 / Business Continuity	92.2	$175,000													
20-134 / Develop and Implement Emergency Operations and Disaster Recovery	90.7	$250,000													
20-135 / Implementation of Employee Hiring and Retention Strategy	79.9	$50,000													
20-136 / Project Management Manual (includes Contractor Management Strategy (SAMP OS-05) and Project Initiation Improvement Strategy (SAMP-OS-08))	68.0	$50,000													
20-137 / Business Process Evaluation and Improvement (includes Knowledge Retention Strategy (SAMP OS-06))	66.8	$150,000													
20-138 / Security Projects/Improvements	57.2	$700,000	AWIA Security Study												
20-139 / Comprehensive Safety Program	56.0	$100,000													
20-140 / Business Intelligence Tool Selection and Implementation (Phase 2 of SAMP OS-10)	53.2	$250,000	OS-10												
20-141 / Mobile Application Implementation Project	52.8	$130,000		20-152											
20-142 / Service Line Warranty Program	48.4	$40,000													
20-143 / Identification and Evaluation of Future Raw Water Storage Options	32.2	$100,000													
20-144 / Equipment Assessment and Obsolete Equipment Disposal Plan	31.8	$150,000													
20-145 / Implementation of Water Loss Reduction Strategy	24.4	$75,000													
20-146 / Payment Strategy Expansion	21.6	$25,000													
20-147 / CCWA Energy Optimization Analysis	21.2	$100,000													
20-148 / Identify Other Revenue Sources	17.6	$50,000													
20-149 / Obsolete Infrastructure Demolition and Disposal Plan	17.5	$50,000													

*SAMP project score (these SAMP projects were scored using different weights than the 2020 SMP)

LEGEND: 2020 Master Plan Projects Related Activities

UTILITY-WIDE - ANNUAL CASH FLOW

Project Name	Project Type	Budget Type	Start Year	Budgeted Length (Years)	FYB 2019	FYB 2020	FYB 2021	FYB 2022	FYB 2023	FYB 2024	FYB 2025	FYB 2026	FYB 2027	FYB 2028	FYB 2029
20-100 / Metrics Identification and Usage Improvement Strategy (SAMP-OS-10)	D	O	FYB 2019	1	$ 80,000										
20-101 / Warehouse and Inventory Management Improvement Initiative (SAMP-W-01)	D	O	FYB 2019	1	$ 500,000										
20-102 / Spare Parts Obsolescence Review and Disposal Strategy (SAMP-W-02)	D	O	FYB 2019	1	$ 150,000										
20-103 / Facility Asset Data Improvement Strategy (SAMP-F-01)	D	O	FYB 2020	1		$ 250,000									
20-105 / Organizational Assessment (SAMP-OS-07)	D	O	FYB 2020	1		$ 75,000									
20-106 / Linear Asset Data Improvement Strategy (SAMP-L-01)	D	O	FYB 2021	1			$ 500,000								
20-107 / Facilities Asset Risk Management Improvement Strategy (SAMP-F-02)	D	O	FYB 2021	1			$ 200,000								
20-108 / Linear Asset Risk Management Improvement Strategy (SAMP-L-02)	D	O	FYB 2022	1				$ 120,000							
20-109 / Develop Career Development Ladders (SAMP-OS-04)	D	O	FYB 2021	1			$ 100,000								
20-110 / Develop Asset Contingency Plans (SAMP-OS-11)	D	O	FYB 2023	1					$ 150,000						
20-111 / Staff Training Improvement Strategy (SAMP-OS-09)	D	O	FYB 2022	1				$ -							
20-115 / Develop a Data Management Strategy (SAMP-OS-01)	D	O	FYB 2023	1					$ 100,000						
20-116 / Facilities Planning and Scheduling Improvement Strategy (SAMP-F-05)	D	O	FYB 2024	1						$ 50,000					
20-117 / Linear Planning and Scheduling Improvement Strategy (SAMP-L-05)	D	O	FYB 2024	1						$ 50,000					
20-118 / Develop Tactical Asset Management Plans (SAMP-OS-14)	D	O	FYB 2024	4						$ 135,000	$ 125,000	$ 125,000	$ 125,000		
20-119 / Facilities Operations Optimization Initiative (SAMP-F-10)	D	O	FYB 2025	1							$ 100,000				
20-120 / Linear Maintenance Improvement Strategy (SAMP-L-03)	D	O	FYB 2025	1							$ 75,000				
20-121 / Linear Work Management Process Improvement (SAMP-L-04)	D	O	FYB 2026	1								$ 50,000			
20-122 / Facilities Maintenance Improvement Strategy (SAMP-F-03)	D	O	FYB 2026	1								$ 75,000			
20-123 / Asset Financial Planning Strategy (SAMP-OS-03)	D	O	FYB 2026	1								$ 200,000			
20-124 / Facilities Work Management Process Improvement (SAMP-F-04)	D	O	FYB 2027	1									$ 50,000		
20-125 / Facilities Asset Obsolescence Strategy (SAMP-F-07)	D	O	FYB 2027	1									$ 150,000		
20-126 / Facilities Configuration Control Policy Development (SAMP-F-09)	D	O	FYB 2027	1									$ 25,000		
20-127 / Facilities Bill of Materials Initiative (SAMP-F-08)	D	O	FYB 2028	1										$ 300,000	
20-128 / Facilities Lubrication Program Improvement (SAMP-F-06)	D	O	FYB 2028	1										$ 40,000	
20-129 / Space Management Strategy (SAMP-L-06)	D	C	FYB 2028	1										$ 20,000	
20-130 / Enterprise-wide Communications Strategy (includes Asset Management Communication Improvement Strategy (SAMP OS-02))	D	O	FYB 2023	1					$ 100,000						
20-131 / Evaluate Next Generation of Meter Technologies	R	C	FYB 2021	1			$ 150,000								
20-132 / Customer Meter Replacement Program (includes moving from AMR to AMI)	D	C	FYB 2022	4				$ 6,250,000	$ 6,250,000	$ 6,250,000	$ 6,250,000				
20-133 / Business Continuity	D	O	FYB 2021	1			$ 175,000								
20-134 / Develop and Implement Emergency Operations and Disaster Recovery	D	O	FYB 2021	1			$ 250,000								
20-135 / Implementation of Employee Hiring and Retention Strategy	D	O	FYB 2021	1			$ 50,000								
20-136 / Project Management Manual (includes Contractor Management Strategy (SAMP OS-05) and Project Initiation Improvement Strategy (SAMP-OS-08))	D	O	FYB 2022	1				$ 50,000							
20-137 / Business Process Evaluation and Improvement (includes Knowledge Retention Strategy (SAMP OS-06))	D	O	FYB 2020	1		$ 150,000									
20-138 / Security Projects/Improvements	A	C	FYB 2020	10		$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000
20-139 / Comprehensive Safety Program	D	O	FYB 2023	1					$ 100,000						
20-140 / Business Intelligence Tool Selection and Implementation (Phase 2 of SAMP OS-10)	D	C	FYB 2020	1		$ 250,000									
20-141 / Mobile Application Implementation Project	D	C	FYB 2022	1				$ 130,000							
20-142 / Service Line Warranty Program	D	O	FYB 2025	1							$ 40,000				
20-143 / Identification and Evaluation of Future Raw Water Storage Options	D	O	FYB 2025	1							$ 100,000				
20-144 / Equipment Assessment and Obsolete Equipment Disposal Plan	D	O	FYB 2026	1								$ 150,000			
20-145 / Implementation of Water Loss Reduction Strategy	D	O	FYB 2026	1								$ 75,000			
20-146 / Payment Strategy Expansion	D	O	FYB 2027	1									$ 25,000		
20-147 / CCWA Energy Optimization Analysis	D	C	FYB 2027	1									$ 100,000		
20-148 / Identify Other Revenue Sources	D	O	FYB 2028	1										$ 50,000	
20-149 / Obsolete Infrastructure Demolition and Disposal Plan	D	O	FYB 2028	1										$ 50,000	

Note (Budget Type): O = Operating Budget, C = Capital Budget

Note (Project Type): R = Regulatory/Capacity, A = Annual Program, D = Discretionary/Other

	FYB 2019	FYB 2020	FYB 2021	FYB 2022	FYB 2023	FYB 2024	FYB 2025	FYB 2026	FYB 2027	FYB 2028	FYB 2029
Annual Total (Utility-Wide Projects)	$1,725,000	$2,425,000	$7,550,000	$7,700,000	$7,485,000	$7,690,000	$1,675,000	$1,475,000	$1,460,000	$1,000,000	
Annual (Operating)	$475,000	$1,275,000	$170,000	$450,000	$235,000	$440,000	$675,000	$375,000	$440,000	$0	
Annual (Capital)	$1,250,000	$1,150,000	$7,380,000	$7,250,000	$7,250,000	$7,250,000	$1,000,000	$1,100,000	$1,020,000	$1,000,000	

10-year Total (Utility-Wide Projects)	$40,185,000
10-year (Operating)	$4,535,000
10-year (Capital)	$35,650,000

2020 SMP Project Number	Project Type	Project Name	Functional Area	Planning Level Estimated Cost	Total Benefit Score	Estimated Duration (years)	Project Lead	Project Description
20-100	SAMP	20-100 / Metrics Identification and Usage Improvement Strategy (SAMP-OS-10)	Utility-Wide	$ 80,000	47.6*	1 years	Program Management & Engineering Director and Customer Services Director	The goal of this project is to expand existing asset management, maintenance and reliability, and regulatory reporting key performance indicators (KPIs) to include those that also inform asset management decision-making. Further, this project will align and build in metrics to individual staff performance reviews to support advancement of CCWA's vision.
20-101	SAMP	20-101 / Warehouse and Inventory Management Improvement Initiative (SAMP-W-01)	Utility-Wide	$ 500,000	38.6*	1 year	Procurement/Risk Management/Warehouse Director	The goal of this project is to implement improvements to inefficiencies identified for warehouse operations.
20-102	SAMP	20-102 / Spare Parts Obsolescence Review and Disposal Strategy (SAMP-W-02)	Utility-Wide	$ 150,000	29.4*	1 year	Procurement/Risk Management/Warehouse Director	The goals of this project are to 1) perform an evaluation of all inventory records for identification of obsolete or unused spare parts and remove excess unnecessary inventory from the supporting software system, and 2) free up valuable warehouse space that is currently used for unused parts. This will also include selecting the most appropriate method for removing parts from the warehouse (sell, dispose of, recycle, etc.) in accordance with CCWA's current policies and procedures and storing them in an appropriate location until they are physically removed.
20-103	SAMP	20-103 / Facility Asset Data Improvement Strategy (SAMP-F-01)	Utility-Wide	$ 250,000	46.5*	1 year	Program Management & Engineering Director & IT Director	The goal of this project is to conduct a comprehensive drawing review, field verification, identification, documentation and visual condition assessment of all/relevant facility assets. All assets within the current JDE system (asset and equipment records) will be confirmed they are labeled as existing/in service, existing/out of service, or non-existing. Additionally, all assets currently installed, but not currently listed in JDE, will be documented for addition to JDE as well as a process outlined to ensure all data required for data analysis is gathered and has a place in JDE to log key attribute information. It is critical to fully understand the existence, location, and condition of operational assets to effectively manage and maintain those assets.
20-105	SAMP	20-105 / Organizational Assessment (SAMP-OS-07)	Utility-Wide	$ 75,000	50.3*	1 year	Assistant General Manager - Support Services	The goal of this project is to identify and establish the optimal organizational structure that promotes improvements to the way CCWA manages its assets through the identification of key roles and designation of key asset management responsibilities to staff. Another goal of this project is to identify the optimal number of staff required to perform asset management work across the organization and meet level of service goals.
20-106	SAMP	20-106 / Linear Asset Data Improvement Strategy (SAMP-L-01)	Utility-Wide	$ 500,000	49.7*	1 year	Program Management & Engineering Director & IT Director	The goal of this project is to conduct a comprehensive field verification, identification, documentation and visual condition assessment of all linear assets. All linear assets within GIS/Cityworks will be confirmed they are labeled as existing/in service, existing/out of service, or non-existing. Additionally, all assets currently installed, but not currently listed in GIS/Cityworks, will be documented for addition to the GIS/Cityworks as well as a process outlined to ensure all data required for data analysis is gathered and has a place in Cityworks to log key attribute information. It is critical to fully understand the existence, location, and condition of operational assets to effectively manage and maintain those assets.
20-107	SAMP	20-107 / Facilities Asset Risk Management Improvement Strategy (SAMP-F-02)	Utility-Wide	$ 200,000	49.2*	1 year	Program Management & Engineering Director & IT Director	The goals of this project are to define criticality, assess quality and completeness of existing criticality/risk models and data, standardize how critical assets are identified across all asset types, and ensure a continuous process is in place to revisit results annually and upload critical asset identifications into the JDE master inventory database.
20-108	SAMP	20-108 / Linear Asset Risk Management Improvement Strategy (SAMP-L-02)	Utility-Wide	$ 120,000	46.7*	1 year	Program Management & Engineering Director & IT Director	The goals of this project are to define criticality, assess quality and completeness of existing criticality/risk models and data, standardize how critical assets are identified across all asset types, and ensure a continuous process is in place to revisit results annually and upload critical asset identifications into GIS for by Cityworks.
20-109	SAMP	20-109 / Develop Career Development Ladders (SAMP-OS-04)	Utility-Wide	$ 100,000	42.7*	1 year	Assistant General Manager - Support Services	The goal of this project is to clarify and document the skills and competencies required by staff to progress in their career and align them under specific career paths that support CCWA's asset management strategic goals. Identify cross-training opportunities important to the organization and opportunities to laterally cross over into parallel career ladders.
20-110	SAMP	20-110 / Develop Asset Contingency Plans (SAMP-OS-11)	Utility-Wide	$ 150,000	60.9*	1 year	General Services Director	The goal of this project is to ensure staff are standardized in how they respond to asset failures and that contingency plans are in place to minimize disruption to service.
20-111	SAMP	20-111 / Staff Training Improvement Strategy (SAMP-OS-09)	Utility-Wide	$ -	54*	1 year	Assistant General Manager - Support Services	The goal of this project is to enhance and expand the existing CCWA Training Program to support achievement of CCWA's asset management goals. Identify and define training certifications, peer exchanges, recognition programs, and provide technical training in industry best practice maintenance and asset management practices to further develop CCWA's staff and improve the way assets are maintained and managed.
20-115	SAMP	20-115 / Develop a Data Management Strategy (SAMP-OS-01)	Utility-Wide	$ 100,000	54.4*	1 year	Program Management & Engineering Director & IT Director	The goal of this project is to identify data collected in each supporting IT system and designate which system contains the master records, define improvement processes and controls around data collection and document management, and ensure that collected data can be used to calculate key metrics that assist CCWA with reporting on progress towards asset management goals.
20-116	SAMP	20-116 / Facilities Planning and Scheduling Improvement Strategy (SAMP-F-05)	Utility-Wide	$ 50,000	52.1*	1 year	Distribution & Conveyance Director and Water Production Director	The goal of this project is to create a formal dedicated Planning and Scheduling group and to develop a standard set of strategies across like asset types to expand the use of the Planning and Scheduling role. It is also intended to explore and activate the planning and scheduling functionality in JDE and enhance existing procedures to proactively plan for required materials and equipment required to perform work and to inform requestors when work will be completed.
20-117	SAMP	20-117 / Linear Planning and Scheduling Improvement Strategy (SAMP-L-05)	Utility-Wide	$ 50,000	49.9*	1 year	Distribution & Conveyance Director and Water Production Director	The goal of this project is to create a formal dedicated Planning and Scheduling group and to develop a standard set of strategies across linear assets to expand the use of the Planning and Scheduling role. It is also intended to explore and activate the planning and scheduling functionality in Cityworks and enhance existing procedures to proactively plan for required materials and equipment required to perform work and to inform requestors when work will be completed.
20-118	SAMP	20-118 / Develop Tactical Asset Management Plans (SAMP-OS-14)	Utility-Wide	$ 510,000	51*	1 year	General Services Director	The goal of this project is to create Tactical Asset Management Plans for each asset type managed by CCWA including: • Water production plants (WPPs) • Water reclamation facilities (WRFs) • Lift Stations • Repump Stations • Distribution system • Conveyance system • Stormwater system
20-119	SAMP	20-119 / Facilities Operations Optimization Initiative (SAMP-F-10)	Utility-Wide	$ 100,000	48.2*	1 year	Assistant General Manager - Operations & Water Reclamation Director	The goal of this project is to improve overall operational performance of WPP and WRF, lift stations and repump stations.

2020 SMP Project Number	Project Type	Project Name	Functional Area	Planning Level Estimated Cost	Total Benefit Score	Estimated Duration (years)	Project Lead	Project Description
20-120	SAMP	20-120 / Linear Maintenance Improvement Strategy (SAMP-L-03)	Utility-Wide	$ 75,000	46.9*	1 year	General Services Director	The goals of this project are to identify and implement improvements to the overall maintenance and reliability strategy that will reduce costs and improve reliability of linear assets (distribution, conveyance and stormwater) and respond better to customers who have requests about assets.
20-121	SAMP	20-121 / Linear Work Management Process Improvement (SAMP-L-04)	Utility-Wide	$ 50,000	46.7*	1 year	Stormwater Program Director	The goal of this project is to standardize and implement improvements to the way asset inspections and preventive and corrective maintenance are managed across the linear asset groups (distribution, conveyance and stormwater).
20-122	SAMP	20-122 / Facilities Maintenance Improvement Strategy (SAMP-F-03)	Utility-Wide	$ 75,000	46*	1 year	General Services Director	The goal of this project is to identify improvements to the overall maintenance and reliability strategy that will reduce costs and improve reliability of WPPs, WRFs, lift stations and repump stations.
20-123	SAMP	20-123 / Asset Financial Planning Strategy (SAMP-OS-03)	Utility-Wide	$ 200,000	45.2*	1 year	Assistant General Manager - Support Services	The goal of this project is to improve understanding of future asset repair and replacement needs, prioritize those investments, and create a 1-10 year look ahead of needed funds. Another goal is to align asset hierarchies among supporting software (JD Edwards [JDE] and GIS) to allow for easier reporting on asset values and cost of service on those assets.
20-124	SAMP	20-124 / Facilities Work Management Process Improvement (SAMP-F-04)	Utility-Wide	$ 50,000	42.6*	1 year	Stormwater Program Director	The goal of this project is to standardize and implement improvements to the way all work activities are managed across the facility asset group (WRFs, WPPs, lift stations and repump stations). The work management policy should cover all work to include Identification, Planning, Scheduling, Execution, Completion, and Analysis (IPSECA).
20-125	SAMP	20-125 / Facilities Asset Obsolescence Strategy (SAMP-F-07)	Utility-Wide	$ 150,000	40.8*	1 year	General Services Director	The goals of this project are to identify areas of increased risk due to operation of assets that are currently obsolete or becoming obsolete and to develop a countermeasure to mitigate that risk.
20-126	SAMP	20-126 / Facilities Configuration Control Policy Development (SAMP-F-09)	Utility-Wide	$ 25,000	39.1*	1 year	Program Management & Engineering Director & IT Director	The goal of this project is to establish a formal process and policy that ensures all modifications to the physical facility, whether through capital improvements or maintenance activities, are documented accurately and all databases and O&M programs impacting the asset are updated accordingly. This may include operating procedures, maintenance plans, spare parts inventory, drawings, CMMS records, etc.
20-127	SAMP	20-127 / Facilities Bill of Materials Initiative (SAMP-F-08)	Utility-Wide	$ 300,000	36.7*	1 year	Program Management & Engineering Director & IT Director	The goal of this project is to identify which facility assets will benefit the greatest from having bill of materials (BOMs) and then to develop the BOMs within JDE. The BOM effort is closely linked to the warehouse spare parts inventory improvement efforts as each part on a BOM must have an associated inventory item record.
20-128	SAMP	20-128 / Facilities Lubrication Program Improvement (SAMP-F-06)	Utility-Wide	$ 40,000	31*	1 year	General Services Director	The goal of this project is to elevate the quality of the lubrication program from current practice to best practice across all WPPs and WRFs. The areas of the program to be evaluated should include: 1. Lubricant purchasing, selection and quality assurance 2. Lubricant storage, handling and dispensing 3. Lubricant application practices 4. Equipment maintainability and contamination control 5. Oil sampling practices 6. Oil analysis and basic inspections 7. Lubrication PM optimization 8. Training and education 9. Lubrication scheduling, tracking and reporting metrics 10. Leakage control, safe lubricant handling practices and environmental compliance
20-129	SAMP	20-129 / Space Management Strategy (SAMP-L-06)	Utility-Wide	$ 20,000	29.1*	1 year	Assistant General Manager - Support Services	The goal of this project is to improve the space and headquarters accommodations and grouping of staff for work purposes. The intent is to improve staff morale and working collaboration.
20-130	D	20-130 / Enterprise-wide Communications Strategy (includes Asset Management Communication Improvement Strategy (SAMP OS-02))	Utility-Wide	$ 100,000	N/A	1 year	Assistant General Manager - Support Services and Communications & Community Relations Manager	An internal and external communications strategy/plan should be developed for customers and key stakeholders that will address areas identified for improvement from the 2018 Customer Satisfaction Survey (presence and involvement in the community, water taste and quality, customer understanding of infrastructure responsibility) along with a crisis communications plan should a major event occur, etc. This would include a review of current practices and educational activities conducted and identification of areas to expand and improve the existing public education/outreach program with a focus on social media communication. Create and Implement an External Customer Satisfaction Survey. Investigate the mechanisms to implement the survey such as phone, in-person, walk-in and bill mailers. Also includes Asset Management Communication Improvement Strategy (OS-02): • Enhance the existing Communications Strategy by developing a targeted audience and messaging campaign about development of the SAMP and how CCWA is going to keep internal and external stakeholders posted about asset management activities at CCWA and a focused approach on change management and supporting staff with understanding and communicating ideas to management. • Focus communications to Operations and Maintenance staff and improving the flow and transference of knowledge and understanding of what is occurring at the Management level. • Facilitate communication between Divisions (i.e. Customer Service going into the field with maintenance staff to generate greater understanding of field activities)
20-131	R	20-131 / Evaluate Next Generation of Meter Technologies	Utility-Wide	$ 150,000	N/A	1 year	Assistant General Manager - Support Services & Customer Services Director	CCWA is currently 100% AMR. The authority has completed piloting Badger's Beacon Advanced Metering Analytics (AMA) / Orion Advanced Metering Infrastructure (AMI) system to determine benefits for both CCWA and customers. This project will summarize the results of the evaluation and provide recommendations on the path forward and timing for moving to the next generation of system. (Project 115 from the 2015 SMP)

2020 SMP Project Number	Project Type	Project Name	Functional Area	Planning Level Estimated Cost	Total Benefit Score	Estimated Duration (years)	Project Lead	Project Description
20-132	D	20-132 / Customer Meter Replacement Program (includes moving from AMR to AMI)	Utility-Wide	$ 25,000,000	64.4	4 years	Assistant General Manager - Support Services & Customer Services Director	This project will replace all customer meters with AMI meters to reduce the time needed to read meters and will help identify leaks. (Project 116 from the 2015 SMP)
20-133	D	20-133 / Business Continuity	Utility-Wide	$ 175,000	92.2	1 year	Risk Management Director	Business continuity planning (BCP) is the process involved in creating a system of prevention and recovery from potential threats to a company. A BCP ensures that personnel and assets are protected and are able to function quickly in the event of a disaster.The purpose of a Business Continuity Plan (BCP) is to serve as a guide for management and administrative staff that can be used following the occurrence of an incident that impacts a business administration activity required to support mission essential functions of the CCWA. The BCP is designed to assist management and administrative staff during these times by outlining alternative business processes and by providing information on how to access critical resources during an emergency through to recovery.
20-134	D	20-134 / Develop and Implement Emergency Operations and Disaster Recovery	Utility-Wide	$ 250,000	90.7	1 year	Risk Management Director	An emergency operations plan (EOP) is a document that outlines how a facility will respond to an emergency at an asset level. The EOP sets guidelines to manage a disaster in an effective, efficient, and timely manner. The EOP focuses on company-wide security emergency operations and disaster recovery efforts at an asset level with a plan to include training and exercising of staff based on a variety of events that could occur.
20-135	D	20-135 / Implementation of Employee Hiring and Retention Strategy	Utility-Wide	$ 50,000	79.9	1 year	Human Resources Director and General Manager	Create an internal team of CCWA staff to develop a strategy to increase hiring and employee retention. Connect with national organizations which have resources and case studies from other local, regional and national utilities. Identify creative approaches to increase and retain quality staff. Include with the strategy a process to announce new hires (internal only, external, entire CCWA customer base, etc.)
20-136	D	20-136 / Project Management Manual (includes Contractor Management Strategy (SAMP OS-05) and Project Initiation Improvement Strategy (SAMP-OS-08))	Utility-Wide	$ 50,000	68.0	1 year	Assistant General Manager - Support Services	Create a project management manual which can be used across the organization by all project managers for all projects. The project management manual should include a comprehensive overview of all CCWA project management processes including the following. CCWA Project Management Resources (PMR) will establish and drive a consistent use of processes, tools, software, training/certifications, reporting and a common methodology based on industry standards. The project management manual should include documentation of project management processes and business rules and identification and refinement of supporting technology for tracking project scope, budget and schedule. •Best Value Procurement - Create a process whereby CCWA receives the overall best value for all procurement projects and not just the lowest price. Develop detailed criteria which will assure that CCWA receives the best overall value when competitively bidding work. •Project Initiation Improvement Strategy (OS-08) - Improve awareness, understanding for, and communication about projects amongst CCWA staff from all parts of the organization at the beginning of each project to expand awareness and action in all parts of the organization that will be impacted. Specifically, document the current project initiation business process for all project types; document an improved business process to reflect how projects should be initiated within the organization to include communication and involvement of all staff groups (e.g. GIS, IT, Public Relations and Operators and Maintenance staff for plant configurations and designs) as appropriate; ensure controls are reflected in the improved business process to ensure communications take place; review the current capital project design process for opportunities to include maintenance and operations personnel in design and purchasing decisions; identify metrics to track adherence to the Project Initiation Process; and inform and train staff of the improved Project Initiation Process. •Contractor Management Strategy (OS-05) - Improve support from and access to contractors and consultants and standardize the way CCWA staff manage work and interact with these resources. Includes ensuring contractor work is tracked in the supporting technology (JDE and Cityworks) and defining rules and business processes for how Project Managers across the organization manage contractors in the same manner from scoping and authorizing work to verifying work, to paying invoices. Opportunity to identify process to rate and score contractor performance.
20-137	D	20-137 / Business Process Evaluation and Improvement (includes Knowledge Retention Strategy (SAMP OS-06))	Utility-Wide	$ 150,000	66.8	1 year	Assistant General Manager - Support Services	CCWA performed a business process evaluation project across several departments via Grant Thornton. This project identified and prioritized key business processes (customer service, JDE, Cityworks, budget process automation, procurement automation and asset tracking) that could be streamlined, improved or have broader impacts across departments. This project will revisit the Grant Thornton project and re-evaluate these business processes. Gain appropriate buy-in from staff on the evaluation process and Identify and understand the business processes that requires collaboration. Determine how the collaboration capabilities are embedded into the business processes and how tightly are they integrated. Following the initial business process evaluation, selected critical processes that will be documented and recommend improvements that will be identified. (Project 117 from the 2015 SMP). This project includes Knowledge Retention Strategy (SAMP-OS-06). The goal of this project is to ensure documentation of the business processes and standard operating procedures (SOPs) on all asset types in order to document knowledge of senior personnel prior to their leaving the utility.
20-138	A	20-138 / Security Projects/Improvements	Utility-Wide	$ 700,000	57.2	10 years	Risk Management Director	Security projects that result from the AWIA Risk and Resiliency Assessment and Emergency Response Plan. These projects are not related to cybersecurity or SCADA security, but inlcude physical security projects. This also includes implementation of other utility-wide security projects. This includes the cost of annual/ongoing security improvements and the cost of implementing and maintaining a Security Command Center that is manned 24/7
20-139	D	20-139 / Comprehensive Safety Program	Utility-Wide	$ 100,000	56.0	1 year	Risk Management Director	Create a system-wide and department specific safety program: (1) address program development needs and establishment of standards, (2) document training and safety compliance, and (3) coordinate safety drills, exercises and safety audits. Also includes AED devices, maintenance and training and a focus on air quality and sound testing across the utility. (Project 107 from the 2015 SMP)
20-140	D	20-140 / Business Intelligence Tool Selection and Implementation (Phase 2 of SAMP OS-10)	Utility-Wide	$ 250,000	53.2	1 year	Assistant General Manager - Support Services & IT Director	The goal of this project is to identify and select a Business Intelligence (BI) tool. This project uses the output of the Metrics Identification and Usage Improvement Strategy project being implemented in 2019. The specific output of this project is a configuration documentation that can be provided to the selected software/implementor. IT will focus on the overall BI architecture, establish and document BI architecture standards. The project will lead to an increased capability to provide business intelligence for strategic and operational reporting/analysis as all major components of data. Determine what appropriate tools and software that meets the reporting and analytical needs. The LOS targets should be analyzed as well as automation of reporting of metrics and use of real time displays for progress reporting. Analyze needs for data mining, ad-hoc reporting, and predictive and retrospective analysis. Analyze tools, infrastructure, and overall BI architecture to support enterprise level business analytics and what self service functions will exist. Document architecture and standards.

2020 SMP Project Number	Project Type	Project Name	Functional Area	Planning Level Estimated Cost	Total Benefit Score	Estimated Duration (years)	Project Lead	Project Description
20-141	D	20-141 / Mobile Application Implementation Project	Utility-Wide	$ 130,000	52.8	1 year	IT Director and Distribution & Conveyance Director	Promote increased use of mobile applications for daily use by CCWA staff. Mobile applications will advance the technology of the utility and allow for increased mobility of the staff. Evaluation of available technologies in the marketplace and implementation of selected mobile technology. This project includes the integration of AVL into Cityworks.
20-142	D	20-142 / Service Line Warranty Program	Utility-Wide	$ 40,000	48.4	1 year	Assistant General Manager - Support Services & Customer Services Director	Determine the approach to implementing a Service Line Warranty Program. This program will not only generate a new revenue stream for CCWA, but also provide a valuable service to CCWA customers.
20-143	D	20-143 / Identification and Evaluation of Future Raw Water Storage Options	Utility-Wide	$ 100,000	32.2	1 year	Water Production Director	Evaluation to identify future raw water storage options for the utility.
20-144	D	20-144 / Equipment Assessment and Obsolete Equipment Disposal Plan	Utility-Wide	$ 150,000	31.8	1 year	Assistant General Manager - Operations	Perform an equipment assessment to determine what equipment should be upgraded and/or replaced. Assessment should identify the equipment, an estimated cost and a schedule for upgrade and/or replacement. This project will categorize equipment into one of the following categories: replacement via capital project, inhouse replacement, detailed assessment needed, reassess in 5 years. In addition, there will be specific valve and pump evaluations. • Valve Evaluation and Replacement: This project involves an evaluation of valves throughout the WPPs. Several are aged and not in working condition. Project will evaluate and replace, as needed. • Pump Reliability Evaluation: WPP staff have noticed chronic malfunctions of pumps at the plants. This project would evaluate the remaining useful life of all pumps and make recommendations for upgrades and replacement. Utility-wide disposal, repurpose and recycling plan. Perform an analysis of the equipment to be disposed of throughout CCWA, with a focus on things like fleet vehicles, pumps, computers and other equipment. Create an inventory business process with established rules to dispose of equipment.
20-145	D	20-145 / Implementation of Water Loss Reduction Strategy	Utility-Wide	$ 75,000	24.4	1 year	Customer Services Director & Distribution and Conveyance Director	Implement recommendations from within the water loss audit process. Incorporate activities to combat real and apparent water loss.
20-146	D	20-146 / Payment Strategy Expansion	Utility-Wide	$ 25,000	21.6	1 year	Customer Service Director	Investigate different payment strategies to determine if CCWA employs the most comprehensive suite of payment options. Investigate other utilities to determine is whether additional payment options could be offered to CCWA customers such as ATM kiosks, payment apps (Vemno, etc) and other mobile payment options. This project will investigate all potential forms of payment to CCWA, not just monthly utility bill payment.
20-147	D	20-147 / CCWA Energy Optimization Analysis	Utility-Wide	$ 100,000	21.2	1 year	Assistance General Manager - Operations	Perform a utility-wide energy optimization analysis. This analysis should be wide reaching and include: Evaluations such as solar implementation across the utility including property connected with decommissioned facilities; utility-wide lighting retrofit analysis to determine where lighting can be replaced to save energy; micro-turbine energy production analysis to determine the applicability of micro-turbine energy production throughout the utility; other innovative ideas which could help to reduce CCWA's annual electric expenses such as incorporating energy optimization into future design projects. (Project 114 from the 2015 SMP)
20-148	D	20-148 / Identify Other Revenue Sources	Utility-Wide	$ 50,000	17.6	1 year	Finance Director	Investigate other sources of revenue to the utility. Some ideas could be, but may not be limited to, increasing the sale of pellets at the Casey WRRF, biogas generation, sale and park fees at wetlands, increased timber sales and digital signage on water tanks that are cost prohibitive to remote.
20-149	D	20-149 / Obsolete Infrastructure Demolition and Disposal Plan	Utility-Wide	$ 50,000	17.5	1 year	Assistant General Manager - Operations	Utility-wide demolition, disposal, repurpose and recycling plan. Perform an analysis of the structures to be demolished throughout CCWA. Determine what structures could be repurposed, sold or recycled. Budget should include demolition plan and funds for construction observation. Asbestos and lead removal may also need to be addressed in some properties. Consider packaging several demolition projects under one procurement. Infrastructure identified at department-specific workshops include: Huie Pond Complex Pump Station, Forest Ave pump station, Rivers Edge Booster Pump Station, and several structures at the Shoal Creek WRF.

Note (Project Type): R = Regulatory/Capacity, A = Annual Program, D = Discretionary/Other

Information Technology

INFORMATION TECHNOLOGY - PROJECT SCHEDULE

Project Name	Total Benefit Score	Planning Level Estimated Cost	Predecessors	Successors	FYB 2019	FYB 2020	FYB 2021	FYB 2022	FYB 2023	FYB 2024	FYB 2025	FYB 2026	FYB 2027	FYB 2028	FYB 2029
20-152 / Mobility Strategy	52.8	$300,000	135												
20-155 / Software Application Upgrade & Technology Refresh	N/A	$7,000,000													
20-161 / Refresh Disaster Recovery - Data Center	N/A	$675,000		167											
20-164 / Sourcing Strategy - Cloud	24.6	$275,000													
20-165 / SCADA Security	N/A	$825,000		166											
20-166 / SCADA Hardware Replacement and Refresh	N/A	$910,000	165												
20-167 / Cyber Security	N/A	$790,000	161												
20-168 / Network Switching and Cabling	N/A	$700,000													

LEGEND: 2020 Information Technology Master Plan Projects

INFORMATION TECHNOLOGY - ANNUAL CASH FLOW

Project Name	Project Type	Budget Type	Start Year	Budgeted Length (Years)	FYB 2019	FYB 2020	FYB 2021	FYB 2022	FYB 2023	FYB 2024	FYB 2025	FYB 2026	FYB 2027	FYB 2028	FYB 2029
20-152 / Mobility Strategy	D	O	FYB 2021	6			$ 50,000		$ 50,000	$ 50,000		$ 50,000	$ 50,000		$ 50,000
20-155 / Software Application Upgrade & Technology Refresh	A	O	FYB 2020	10		$ 700,000	$ 700,000	$ 700,000	$ 700,000	$ 700,000	$ 700,000	$ 700,000	$ 700,000	$ 700,000	$ 700,000
20-161 / Refresh Disaster Recovery - Data Center	R	C	FYB 2021	5			$ 125,000			$ 150,000	$ 125,000		$ 150,000	$ 125,000	
20-164 / Sourcing Strategy - Cloud	D	O	FYB 2021	2			$ 150,000	$ 125,000							
20-165 / SCADA Security	A	C	FYB 2020	10		$ 300,000	$ 125,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000
20-166 / SCADA Hardware Replacement and Refresh	A	C	FYB 2020	10		$ 250,000	$ 30,000	$ 30,000	$ 30,000	$ 200,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 250,000
20-167 / Cyber Security	A	C	FYB 2020	10		$ 250,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000
20-168 / Network Switching and Cabling	A	C	FYB 2021	9			$ 150,000	$ 125,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 150,000	$ 125,000	$ 30,000
Annual Total (ITProjects)						$1,500,000	$1,390,000	$1,090,000	$920,000	$1,240,000	$995,000	$920,000	$1,190,000	$1,090,000	$1,140,000
Annual (Operating)						$700,000	$900,000	$825,000	$750,000	$750,000	$700,000	$750,000	$750,000	$700,000	$750,000
Annual (Capital)						$800,000	$490,000	$265,000	$170,000	$490,000	$295,000	$170,000	$440,000	$390,000	$390,000

Note (Budget Type): O = Operating Budget, C = Capital Budget

Note (Project Type): R = Regulatory/Capacity, A = Annual Program, D = Discretionary/Other

10-year Total (IT Projects)	$11,475,000
10-year (Operating)	$7,575,000
10-year (Capital)	$3,900,000

2020 SMP Project Number	Project Type	Project Name	Functional Area	Planning Level Estimated Cost	Total Benefit Score	Estimated Duration (years)	Project Lead	Project Description
20-152	D	20-152 / Mobility Strategy	Information Technology	$ 300,000	52.8	6 years	Information Technology Director	Develop and agree with business units a strategy for supporting mobility. Mobility will cover, but is not limited to, wireless access within CCWA, remote access to data and applications, smart phones, tablets, and access to email and defined applications from anywhere. Mobility Strategy will assist in defining what is supported by Information Technology as well as defining response priorities. This project is an extension of 135 / Mobile Application Implementation that concentrates on the devices and accessibility from anywhere.
20-155	A	20-155 / Software Application Upgrade & Technology Refresh	Information Technology	$ 7,000,000	N/A	10 years	Information Technology Director	The purpose of the CCWA software application upgrade / technology refresh program is to avoid putting the company at operational risk by retaining older, less reliable, and/or unsupported hardware and software. The upgrade cycle will typically be on a 3-year cycle to keep up to date on technology and avoid obsolete software and hardware. Upgrade software by moving from one major software release to another (i.e. upgrade from JDE). Replace end-of-life hardware and develop an infrastructure plan that standardizes replacement schedules, notes exceptions to standards, and estimates annual needs based on business goals and desired outcomes. The plan should cover key infrastructure components (i.e. servers, large printers, desktops, and networking equipment). Plan must be reviewed annually based on business needs and goals. Plan should also address the maximum life of equipment and ensures that the business has the right mix of equipment to meet business outcomes at an appropriate level of investment.
20-161	R	20-161 / Refresh Disaster Recovery - Data Center	Information Technology	$ 675,000	N/A	5 years	Information Technology Director	Review data center & cyber security strategy relative to DR, flexibility, growth, etc. It is taking action to understand what risks to take and what paths will align with the current disaster recovery plan and align with current hosted infrastructure. Work with business units and CCWA stakeholders to ensure that current Recovery Point Objectives (RPOs) and Recovery Time Objectives (RTOs) are in alignment. Where alignment does not exist, develop options that will meet the desired RTOs/RPOs with cost breakdowns for presentation to Executive Management. The DR strategy consists of three main components, risk mitigation, cost management and testing. Inclusive to the DR strategy is evaluating redundancy of application, what applications are hosted internally, evaluation for use of cloud services for DR.
20-164	D	20-164 / Sourcing Strategy - Cloud	Information Technology	$ 275,000	24.6	2 years	Information Technology Director	Based on Business Direction and Goals, develop an Information Technology Sourcing Strategy that outlines where IT equipment and services will be obtained. Focus will be on the question of in-house support/development versus outsourcing the work when appropriate and where and when to use Cloud solutions. Sourcing will follow naturally from the service catalog which defines what IT services are provided. Sourcing strategy should include Return of Investment (ROI) and Total Cost of Ownership (TCO) for CCWA as basis of sourcing decisions.
20-165	A	20-165 / SCADA Security	Information Technology	$ 825,000	N/A	10 years	Information Technology Director	Project to ensure that our SCADA systems stay secure. Project includes purchasing firewalls and/or event monitoring software specific to SCADA.
20-166	A	20-166 / SCADA Hardware Replacement and Refresh	Information Technology	$ 910,000	N/A	10 years	Information Technology Director	Replace the server, network, and storage equipment that is nearing end of life at all the SCADA facilities.
20-167	A	20-167 / Cyber Security	Information Technology	$ 790,000	N/A	10 years	Information Technology Director	Project to cover all things related to Cyber Security. This may include pen testing, new hardware, new software, evaluating monitoring services, and other associated projects and equipment.
20-168	A	20-168 / Network Switching and Cabling	Information Technology	$ 700,000	N/A	9 years	Information Technology Director	As part of ongoing efforts to provide effective connectivity to our users, we will need to periodically replace, refresh, or upgrade various components of our network, including switches and cabling – both fiber and ethernet.

Note (Project Type): R = Regulatory/Capacity, A = Annual Program, D = Discretionary/Other

Stormwater

STORMWATER & WATERSHEDS - PROJECT SCHEDULE

Project Name	Total Benefit Score	Planning Level Estimated Cost	Predecessors	Successors	FYB 2019	FYB 2020	FYB 2021	FYB 2022	FYB 2023	FYB 2024	FYB 2025	FYB 2026	FYB 2027	FYB 2028	FYB 2029
20-200 / Update Stormwater Development Guidelines, Plan Review & Inspection Procedures	36.0	$120,000		20-201, 20-206, 20-207											
20-201 / Develop Watershed Master Plan	37.4	$600,000	20-200												
20-202 / Green Infrastructure Program Development	39.0	$200,000	20-201, 20-205												
20-203 / Stormwater Public Education Plan and Coordination with Cities and County	38.2	$50,000	20-200												
20-204 / Stormwater Inspection Data Optimization	63.2	$500,000													
20-205 / Data-Driven Decision Tools	61.4	$1,000,000		20-202											
20-206 / Implement Watershed Improvement Projects	N/A	$5,000,000	20-201, 20-202												
20-207 / Implement Stormwater Capital Improvement Projects	N/A	$35,000,000	20-201												

LEGEND: 2020 Stormwater Master Plan Projects

STORMWATER & WATERSHEDS - ANNUAL CASH FLOW

Project Name	Project Type	Budget Type	Start Year	Budgeted Length (Years)	FYB 2019	FYB 2020	FYB 2021	FYB 2022	FYB 2023	FYB 2024	FYB 2025	FYB 2026	FYB 2027	FYB 2028	FYB 2029
20-200 / Update Stormwater Development Guidelines, Plan Review & Inspection Procedures	D	O	FYB 2020	1		$120,000									
20-201 / Develop Watershed Master Plan	D	O	FYB 2023	3					$200,000			$200,000			$200,000
20-202 / Green Infrastructure Program Development	D	O	FYB 2021	1			$200,000								
20-203 / Stormwater Public Education Plan and Coordination with Cities and County	D	O	FYB 2021	1			$50,000								
20-204 / Stormwater Inspection Data Optimization	D	O	FYB 2022	1				$500,000							
20-205 / Data-Driven Decision Tools	D	O	FYB 2024	1						$1,000,000					
20-206 / Implement Watershed Improvement Projects	A	C	FYB 2021	5			$1,000,000		$1,000,000		$1,000,000		$1,000,000		$1,000,000
20-207 / Implement Stormwater Capital Improvement Projects	A	C	FYB 2020	10		$3,500,000	$3,500,000	$3,500,000	$3,500,000	$3,500,000	$3,500,000	$3,500,000	$3,500,000	$3,500,000	$3,500,000

Note (Budget Type): O = Operating Budget, C = Capital Budget

Note (Project Type): R = Regulatory/Capacity, A = Annual Program, D = Discretionary/Other

	FYB 2020	FYB 2021	FYB 2022	FYB 2023	FYB 2024	FYB 2025	FYB 2026	FYB 2027	FYB 2028	FYB 2029
Annual Total (Stormwater Projects)	$3,620,000	$4,750,000	$4,000,000	$4,700,000	$4,500,000	$4,500,000	$3,700,000	$4,500,000	$3,500,000	$4,700,000
Annual (Operating)	$120,000	$250,000	$500,000	$200,000	$1,000,000	$0	$200,000	$0	$0	$200,000
Annual (Capital)	$3,500,000	$4,500,000	$3,500,000	$4,500,000	$3,500,000	$4,500,000	$3,500,000	$4,500,000	$3,500,000	$4,500,000

10-year Total (Stormwater Projects)	$42,470,000
10-year (Operating)	$2,470,000
10-year (Capital)	$40,000,000

2020 SMP Project Number	Project Type	Project Name	Functional Area	Planning Level Estimated Cost	Total Benefit Score	Estimated Duration (years)	Project Lead	Project Description
20-200	D	20-200 / Update Stormwater Development Guidelines, Plan Review & Inspection Procedures	Stormwater & Watershed	$ 120,000	36.0	1 year	Stormwater Program Director	Review of existing Stormwater development guidelines and optimization of existing plan review practices will make operations more efficient and improve coordination with the county and cities. This project will include the following: evaluate development guidelines and plan review best practices, identify opportunities to streamline plan reviews or inspections internally, identify standards for document control, improve coordination with the county and cities, review regulatory review guidance (LOMR, CLOMR, LOMA, No-Rise). Areas to align the stormwater guidelines with the water and sewer guidelines will be considered.
20-201	D	20-201 / Develop Watershed Master Plan	Stormwater & Watershed	$ 600,000	37.4	3 years	Stormwater Program Director	CCWA will continue to develop basin-specific watershed master plans. These plans will be designed to meet several objectives: (1) use existing information and supplemental targeted field studies to identify and characterize watershed stressors, (2) develop recommended actions to address watershed stressors, resulting in improved (or maintained) water quality, enhanced physical stream conditions, flood control, and proper/safe infrastructure operation, (3) relate the study to goals of the enterprise-wide CCWA master planning efforts, and (4) anticipate and comply with regulatory requirements (e.g. Metro District, TMDLs, nutrient standards, MS4 Phase I). Projects will be recommended as a result of these studies and will be considered for implementation under the Stormwater Capital Improvement and Watershed Improvement programs.
20-202	D	20-202 / Green Infrastructure Program Development	Stormwater & Watershed	$ 200,000	39.0	1 year	Stormwater Program Director	CCWA will develop a detailed Green Infrastructure Implementation Strategy Document, to facilitate creating and putting into place GI in Clayton County. This Strategy Document will build upon the GI/LID Program developed as part of the Phase I MS4 permit requirements, which includes the feasibility, legal authority, and inspection and maintenance responsibilities specific to GI. The Strategy Document will focus more on the successful implementation of a GI Program, including stakeholder approval, funding, prioritization of project areas, partnerships, etc. The intended audience of the Strategy Document will be CCWA customers, elected officials, community leadership, and stakeholders. The Strategy Document will outline the benefits of GI, CCWA's GI Program goals and objectives, and specific action items to successfully implement the program.
20-203	D	20-203 / Stormwater Public Education Plan and Coordination with Cities and County	Stormwater & Watershed	$ 50,000	38.2	1 year	Stormwater Program Director	The 2012 Public Education Campaign Plan is in need of updating. A revised Public Education Plan (Plan) will focus on ways to clarify and educate the public on the Stormwater Utility's extent of service (EOS) as defined in the Stormwater Utility Guidebook. The Plan would identify ways to educate the public on customer and private property owner responsibilities, as well as CCWA's legal right to enter private property to work on publicly-owned infrastructure within an easement. The Plan will consider how social media can be leveraged to help the Stormwater Utility reach its LOS and program goals. The Plan may also include updates/clarification related to: Stormwater Utility Fees, Floodplain Mapping, Stormwater Ordinances, Educational Videos, and Levels and Extent of Service. The success of CCWA's stormwater program is linked to activities that are conducted by the cities and county, such as communications with individual citizens and ordinance enforcement. As such, the Plan will also include a communications plan to promote an understanding of CCWA's stormwater program, targeted for city and county staff, as well as elected officials. This information must be tracked by CCWA and included in annual compliance reporting to GAEPD.
20-204	D	20-204 / Stormwater Inspection Data Optimization	Stormwater & Watershed	$ 500,000	63.2	1 year	Stormwater Program Director	CCWA will develop a data optimization process with the following goals: 1. Improve our understanding of the inspection data we collect and the work that results from them. 2. Use our data to direct future inspections. 3. Understand how effective our current inspections are in finding illicit discharges and identifying repairs/work to be completed. 4. Identify improvements to be made (process, inspection procedures and reporting) 5. Provide information that can inform development of a Stormwater Asset Management Plan 6. Improve understanding of how much repair work is really out there so we can better understand the extent of our capital needs long term. 7. Develop Standard Operating Procedure (SOP) for this data optimization process. The project will include follow-on GIS and CityWorks analysis to develop a usable dashboard.
20-205	D	20-205 / Data-Driven Decision Tools	Stormwater & Watershed	$ 1,000,000	61.4	1 year	Stormwater Program Director	CCWA will develop data-driven tools to help make more informed decisions related to flood and stormwater management. These tools will include a stream flow monitoring and predictive modeling program that will install a series of stream flow monitors throughout the County. The predictive model will be developed to identify upcoming flooding events. CCWA will also develop a County-wide GIS-based model for assessing the suitability of implementing GI/LID.
20-206	A	20-206 / Implement Watershed Improvement Projects	Stormwater & Watershed	$ 5,000,000	N/A	5 years	Stormwater Program Director	The watershed master plans will recommend projects to address watershed stressors and concerns. One project may include a combination of green infrastructure/low impact development (GI/LID), stream restoration, flood control, drainage improvements, and new or retrofits to traditional stormwater best management practices (BMPs). CCWA will implement a watershed improvement project once every 2 years. The estimated budget includes design, permitting, and construction, as well as effort to provide some public marketing of each watershed improvement project to market the project benefits to the public.
20-207	A	20-207 / Implement Stormwater Capital Improvement Projects	Stormwater & Watershed	$ 35,000,000	N/A	10 years	Stormwater Program Director	CCWA is currently completing a variety of infrastructure rehabilitation and replacement projects, primarily based on complaint response and inspections in the field. Infrastructure projects identified in the watershed master plans are also considered. This project will continue this process for implementation of a variety of capital improvements to be completed over the ten-year planning period.

Note (Project Type): R = Regulatory/Capacity, A = Annual Program, D = Discretionary/Other

Water Production

WATER PRODUCTION - PROJECT SCHEDULE

Project Name	Total Benefit Score	Planning Level Estimated Cost	Predecessors	Successors	FYB 2019	FYB 2020	FYB 2021	FYB 2022	FYB 2023	FYB 2024	FYB 2025	FYB 2026	FYB 2027	FYB 2028	FYB 2029
20-300 / Hicks WPP High-Rate Analysis and Filter Implementation	N/A	$625,000													
20-301 / Hicks WPP Liquid Lime Feed System	67.0	$1,500,000													
20-302 / UV Disinfection Improvement Implementation	68.2	$1,900,000													
20-303 / Wetlands Center Education Building Renovation	N/A	$600,000													
20-304 / Hooper GAC Filter Retrofit and Plant High Rating	60.2	$13,800,000													
20-305 / Smith WPP High-Rate Analysis	N/A	$175,000													
20-306 / Smith Reservoir Water Quality Assessment	46.0	$325,000													
20-307 / Hicks WPP Blower Upgrades	56.2	$570,000													
20-308 / WPP Chemical Feed System Storage Replacement	67.0	$2,420,000													
20-309 / Single Points-of-Failure Elimination Study and Implementation	59.2	$3,150,000													
20-310 / Enhanced Source Water Monitoring Program	37.8	$75,000													
20-311 / Back-up Generators at Jonesboro and Noah's Ark Re-pump Stations	63.4	$3,000,000													
20-312 / Northwest/College Park Booster Pump Station Design and Construction	65.0	$2,500,000													
20-313 / WPP Efficiency Improvements Evaluation	N/A	$100,000													
20-314 / WPP Efficiency Improvements Implementation	N/A	$1,500,000		20-238											
20-315 / Bar Screen Replacement (Flint River Pump Station)	45.2	$1,010,000													
20-316 / Partnership for Safe Water - Treatment	64.0	$50,000													
20-317 / Operability and Safety Improvement Plan	48.0	$50,000													
20-318 / Noah's Ark and Jonesboro Re-pump Stations VFDs	39.4	$1,000,000													
20-319 / Flood Proofing Evaluation (Smith)	43.8	$75,000		20-322											
20-320 / Hicks Solids Handling Improvements	N/A	$610,000													
20-321 / Re-Pump Station - SCADA Upgrades and Instrumentation	61.4	$350,000													
20-322 / Smith Plant Improvements - Phase 2	43.6	$2,960,000													
20-323 / Abandon and Demolish Elevated Storage Tanks	54.2	$1,000,000													
20-324 / Flood Proofing Implementation (Smith)	54.8	$500,000	20-317												
20-325 / Process Optimization/Evaluation	62.2	$250,000													
20-326 / Smith Reservoir Oxygenation System	N/A	$2,000,000													
20-327 / Hooper Belt Filter Press Evaluation	32.0	$75,000													
20-328 / Forest Ave Booster Pump Design and Construction	53.0	$2,100,000													
20-329 / Morrow Re-Pump Station Improvements	40.0	$3,200,000													

LEGEND: 2020 Master Plan Projects

WATER PRODUCTION - ANNUAL CASH FLOW

Project Name	Project Type	Budget Type	Start Year	Budgeted Length (Years)	FYB 2019	FYB 2020	FYB 2021	FYB 2022	FYB 2023	FYB 2024	FYB 2025	FYB 2026	FYB 2027	FYB 2028	FYB 2029
20-300 / Hicks WPP High-Rate Analysis and Filter Implementation	R	C	FYB 2020	2		$375,000	$250,000								
20-301 / Hicks WPP Liquid Lime Feed System	D	C	FYB 2020	1		$1,500,000									
20-302 / UV Disinfection Improvement Implementation	D	C	FYB 2020	2		$600,000	$1,300,000								
20-303 / Wetlands Center Education Building Renovation	D	C	FYB 2020	2		$300,000	$300,000								
20-304 / Hooper GAC Filter Retrofit and Plant High Rating	D	C	FYB 2021	2			$1,300,000	$12,500,000							
20-305 / Smith WPP High-Rate Analysis	R	C	FYB 2021	1			$175,000								
20-306 / Smith Reservoir Water Quality Assessment	D	O	FYB 2021	2			$250,000	$75,000							
20-307 / Hicks WPP Blower Upgrades	D	C	FYB 2021	1			$570,000								
20-308 / WPP Chemical Feed System Storage Replacement	D	C	FYB 2021	3			$820,000			$800,000			$800,000		
20-309 / Single Points-of-Failure Elimination Study and Implementation	D	C	FYB 2021	1			$3,150,000								
20-310 / Enhanced Source Water Monitoring Program	D	O	FYB 2021	1			$75,000								
20-311 / Back-up Generators at Jonesboro and Noah's Ark Re-pump Stations	D	C	FYB 2021	2			$1,500,000					$1,500,000			
20-312 / Northwest/College Park Booster Pump Station Design and Construction	D	C	FYB 2021	2			$100,000		$2,400,000						
20-313 / WPP Efficiency Improvements Evaluation	R	C	FYB 2021	1			$100,000								
20-314 / WPP Efficiency Improvements Implementation	R	C	FYB 2022	1				$1,500,000							
20-315 / Bar Screen Replacement (Flint River Pump Station)	D	C	FYB 2022	1				$1,010,000							
20-316 / Partnership for Safe Water - Treatment	D	O	FYB 2022	1				$50,000							
20-317 / Operability and Safety Improvement Plan	D	O	FYB 2022	1				$50,000							
20-318 / Noah's Ark and Jonesboro Re-pump Stations VFDs	D	C	FYB 2023	1					$1,000,000						
20-319 / Flood Proofing Evaluation (Smith)	D	O	FYB 2023	1					$75,000						
20-320 / Hicks Solids Handling Improvements	R	C	FYB 2023	1					$610,000						
20-321 / Re-Pump Station - SCADA Upgrades and Instrumentation	D	C	FYB 2023	1					$350,000						
20-322 / Smith Plant Improvements - Phase 2	D	C	FYB 2024	1						$2,960,000					
20-323 / Abandon and Demolish Elevated Storage Tanks	D	O	FYB 2024	5						$200,000	$200,000	$200,000	$200,000	$200,000	
20-324 / Flood Proofing Implementation (Smith)	D	C	FYB 2025	1							$500,000				
20-325 / Process Optimization/Evaluation	D	C	FYB 2026	1								$250,000			
20-326 / Smith Reservoir Oxygenation System	D	C	FYB 2027	1									$2,000,000		
20-327 / Hooper Belt Filter Press Evaluation	D	C	FYB 2029	1											$75,000
20-328 / Forest Ave Booster Pump Design and Construction	D	C	FYB 2029	1											$2,100,000
20-329 / Morrow Re-Pump Station Improvements	D	C	FYB 2029	1											$3,200,000

Note (Budget Type): O = Operating Budget, C = Capital Budget

Note (Project Type): R = Regulatory/Capacity, A = Annual Program, D = Discretionary/Other

Annual Total (Water Production Projects)	$2,775,000	$9,890,000	$15,185,000	$4,435,000	$3,960,000	$700,000	$1,950,000	$3,000,000	$200,000	$5,375,000
Annual (Operating)	$0	$325,000	$175,000	$75,000	$200,000	$200,000	$200,000	$200,000	$200,000	$0
Annual (Capital)	$2,775,000	$9,565,000	$15,010,000	$4,360,000	$3,760,000	$500,000	$1,750,000	$2,800,000	$0	$5,375,000

10-year Total (Water Production Projects)	$47,470,000
10-year (Operating)	$1,575,000
10-year (Capital)	$45,895,000

2020 SMP Project Number	Project Type	Project Name	Functional Area	Planning Level Estimated Cost	Total Benefit Score	Estimated Duration (years)	Project Lead	Project Description
20-300	R	20-300 / Hicks WPP High-Rate Analysis and Filter Implementation	Water Production - Hicks	$ 625,000	N/A	2 years	Water Production Director	High rating study will look at each element of the facility and determine the cost to increase raw water pumping, treatment and high service pumping from 10 mgd to 12 and 15 mgd. In addition, the project will perform a filter underdrain & media evaluation to determine the need for and replacing the filter media, while concurrently evaluating the physical condition of the existing underdrain system. This project will also include filter rehab implementation.
20-301	D	20-301 / Hicks WPP Liquid Lime Feed System	Water Production - Hicks	$ 1,500,000	67.0	1 year	Water Production Director	Design and construction of a new liquid lime feed system (similar to the systems installed at Hooper WPP and Smith WPP) to replace the existing hydrated lime system for the control of pH and alkalinity during treatment and in the finished water. The current hydrated lime system periodically creates operational and maintenance problems. A new liquid lime system will minimize costs and will provide a feed system similar to those at the other WPPs.
20-302	D	20-302 / UV Disinfection Improvement Implementation	Water Production - All Plants	$ 1,900,000	68.2	2 years	Water Production Director	This project will include developing and implementing a UV disinfection energy savings strategy, that will allow CCWA to maintain the same functionality while optimizing energy usage. This project will also provide training for the current staff on the UV system, itemize the areas of the system that need to be refurbished, integrate the UV into the overall disinfection strategy, and project the remaining useful life.
20-303	D	20-303 / Wetlands Center Education Building Renovation	Water Production	$ 600,000	N/A	2 years	Water Production Director	Renovation of the Wetlands Center Education Building
20-304	D	20-304 / Hooper GAC Filter Retrofit and Plant High Rating	Water Production - Hooper	$ 13,800,000	60.2	2 years	Water Production Director	Design and construction of the recommendation from 2015 SMP Project 303 / Treatment Technology Evaluation, which was conducted to evaluate advanced treatment processes to address Taste and Odor compounds, as well as other water quality concerns. The recommendation was to retrofit the existing filters to perform as GAC filters. This would include replacement of the underdrains, replacement of backwash troughs, replacement of filter media, and installation of blowers for air scour. This project will also implement the other changes needed to increase the full treatment plant to 22 mgd. This project will evaluate the potential energy and cost savings by installing VFDs at all pumps. Prioritization of VFD installation will be based on energy savings. In addition, pump sizes will be evaluated to ensure they match current and future operations.
20-305	R	20-305 / Smith WPP High-Rate Analysis	Water Production - Smith	$ 175,000	N/A	1 year	Water Production Director	Smith WPP filters are currently permitted for 2 gpm/sf and may potentially be able to high rate to 4 gpm/sf. Complete a high-rate analysis to increase the capacity of the plant with additional infrastructure needs. This project will evaluate the potential energy and cost savings by installing VFDs at all pumps. Prioritization of VFD installation will be based on energy savings. In addition, pump sizes will be evaluated to ensure they match current and future operations.
20-306	D	20-306 / Smith Reservoir Water Quality Assessment	Water Production - Smith	$ 325,000	46.0	2 years	Water Production Director	This project will select and implement a water quality improvement plan for the Smith Reservoir with a focus on preventing high manganese levels at turnover and preventing future taste and odor issues. This project will implement a website portal and vertical profiler.
20-307	D	20-307 / Hicks WPP Blower Upgrades	Water Production - Hicks	$ 570,000	56.2	1 year	Water Production Director	The blowers at the Hicks WPP are at the end of their useful life and should be replaced. This project will replace the existing blower and add a redundant blower to prevent downtime on this critical system.
20-308	D	20-308 / WPP Chemical Feed System Storage Replacement	Water Production - All WPP	$ 2,420,000	67.0	3 years	Water Production Director	This project will replace the chemical feed system tanks (Alum, Bleach, PAC, Ortho Phosphate, Flouride, Chlorine Dioxide, Sulfuric Acid) at each WPP. This program will replacement all tanks and hose pumps at all three WPP over the 10-year master plant period.
20-309	D	20-309 / Single Points-of-Failure Elimination Study and Implementation	Water Production - All Plants	$ 3,150,000	59.2	1 year	Water Production Director	Each WPP contains know single points of failure that will limit future maintenance activities and also poses an operational risk. This project will systematically identify all the single points of failure with each WPP, develop cost estimate for each project and an implementation schedule.
20-310	D	20-310 / Enhanced Source Water Monitoring Program	Water Production - All Plants	$ 75,000	37.8	1 year	Water Production Director	Develop a monitoring program that will enable CCWA to develop a baseline of existing contaminants of concern (CECs, EDCs, PFAS, Cyanotoxins). This baseline monitoring and trending will provide an early warning of changes in the target compounds that will trigger the need for treatment and provide historical influent range if treatment is needed.
20-311	D	20-311 / Back-up Generators at Jonesboro and Noah's Ark Re-pump Stations	Re-Pumps	$ 3,000,000	63.4	2 years	Water Production Director	Add back-up generators at the Jonesboro and Noah's Ark re-pump stations.
20-312	D	20-312 / Northwest/College Park Booster Pump Station Design and Construction	Re-Pumps	$ 2,500,000	65.0	2 years	Water Production Director	Hydraulic analysis verified the need for a new booster pump station to service the Northwest and College Park service areas. The booster pump will increase pressure in this area and allow the pumps at the Morrow Re-Pump station to operate at a lower pressure, which in turn will help to reduce system pressure in the Central portion of the water system. $100,000 in FYB 2021 for site selection and $2.4M in FYB 2023 for desgin and construction of the booster pump station.
20-313	R	20-313 / WPP Efficiency Improvements Evaluation	Water Production - All Plants	$ 100,000	N/A	1 year	Water Production Director	Evaluation of potential improvements at all three water plants to increase water production efficiency to help maximize allocated raw water withdrawal. This may include recycling of plant backwash or recycling of gravity thickener overflow.
20-314	R	20-314 / WPP Efficiency Improvements Implementation	Water Production - All Plants	$ 1,500,000	N/A	1 year	Water Production Director	Design and construction of improvements recommended in Project 20-328.
20-315	D	20-315 / Bar Screen Replacement (Flint River Pump Station)	Water Production - Smith	$ 1,010,000	45.2	1 year	Water Production Director	This project will replace the existing bar screens at the Flint River intake and raw water pump stations with an automated mechanical bar screen and necessary safety improvements to allow maintenance worker access. Plant staff has noted issues related to debris entering the pump station. These improvements will mitigate these issues. This project would eliminate the manual cleaning that is currently required.
20-316	D	20-316 / Partnership for Safe Water - Treatment	Water Production	$ 50,000	64.0	1 year	Water Production Director	This project would involve obtaining the Partnership for Safe Water – Treatment designation from the American Water Works Association. The self-assessment procedure will result in a systemic analysis, identification, and correction of factors which could limit the performance of the treatment system. This designation will further define CCWA's brand as "best-in-class."
20-317	D	20-317 / Operability and Safety Improvement Plan	Water Production - All Plants	$ 50,000	48.0	1 year	Water Production Director	An evaluation of daily, chronic, and infrequent operation and maintenance activities to identify unsafe conditions at all WPPs.
20-318	D	20-318 / Noah's Ark and Jonesboro Re-pump Stations VFDs	Re-Pumps	$ 1,000,000	39.4	1 year	Water Production Director	Add VFDs at the Noah's Ark and Jonesboro re-pump stations. This amount includes money to upgrade the electrical cabinets, if it is determined to be necessary. Jonesboro in FYB 2021 and Noah's Ark in FYB 2026.

2020 SMP Project Number	Project Type	Project Name	Functional Area	Planning Level Estimated Cost	Total Benefit Score	Estimated Duration (years)	Project Lead	Project Description
20-319	D	20-319 / Flood Proofing Evaluation (Smith)	Water Production - Smith	$ 75,000	43.8	1 year	Water Production Director	Based on large storm events, recent updates to county-wide floodplain modeling and mapping, coupled with the need for J.W. Smith WPP improvements such as flood proofing, this project will conduct a cost benefit study and implement selected recommendations to replace and or reposition the overflow pipe to meet overflow requirements while minimizing the risk of contaminating the potable water supply with flood waters from the Flint River. Options for consideration to prevent flooding at the Smith WPP include: • Build an engineered barrier at the river • Replace the clearwell overflow flap valve with a positive shut off valve • Consider the elevation of storm drains that would need to be pumped out over the engineered barrier • Consider the relative low position of electrical conduits
20-320	R	20-320 / Hicks Solids Handling Improvements	Water Production - Hicks	$ 610,000	N/A	1 year	Water Production Director	The Hicks residuals system will need refurbishment within the planning horizon. This project will replace all the residuals pumps and a condition assessment will be performed on the centrifuge. Concrete repair will be performed on the filter backwash tank and the solids thickener.
20-321	D	20-321 / Re-Pump Station - SCADA Upgrades and Instrumentation	Re-Pumps	$ 350,000	61.4	1 year	Water Production Director	Evaluate and implement a pump station SCADA notification system which would provide notification for such things as: pump failure, temperature issues, monitor pump speed, equipment diagnostic and pump vibration.
20-322	D	20-322 / Smith Plant Improvements - Phase 2	Water Production - Smith	$ 2,960,000	43.6	1 year	Water Production Director	This project is focused on improving areas at the Smith WPP that were not addressed in Phase 1 improvements. The plant staff has identified: • Replacement of the existing flocculators • Solids handling improvements.
20-323	D	20-323 / Abandon and Demolish Elevated Storage Tanks	Re-Pumps	$ 1,000,000	54.2	5 years	Water Production Director	Abandon and demolish all (eight) elevated storage tanks in the distribution system. The Crystal Lake elevated tank should remain in operation until the new Northwest/College Park Booster Pump Station is in operation. This should not be done until emergency power is installed at the Jonesboro Re-Pump Station. Emergency power at all repumping stations should be operable before elevated tanks are removed. The eight elevated tanks include Barnett (500,000 gallons), Riverdale (500,000 gallons), Highway 138E (1 million gallons), Highway 138W (1 million gallons), Conley Road (500,000 gallons), Crystal Lake (500,000 gallons), Lovejoy (500,000 gallons) and Grant Road (1 million gallons).
20-324	D	20-324 / Flood Proofing Implementation (Smith)	Water Production - Smith	$ 500,000	54.8	1 year	Water Production Director	Based on the results of the Flood Proofing Evaluation this project will implement the recommended option.
20-325	D	20-325 / Process Optimization/Evaluation	Water Production - All Plants	$ 250,000	62.2	1 year	Water Production Director	The objective of the operational optimization study is to enable each plant can produce the best water quality possible at the lowest cost. The tradeoffs between water quality and cost will be clearly identified. Each chemical at each plant will be evaluated via table top, jar testing, or and full-scale demonstration to confirm that existing operations are at optimal level. Alternative chemicals (ACH vs Alum) will also be evaluated. The study will also include and evaluation of potential instrument enhancements to improve process reliability based on commercially available products. Potential process monitoring upgrades may include: • Filter to waste turbidimeter to determine if current filter to waste duration is optimal • Online manganese monitors pre and post sedimentation and post filtration to get better understanding of removal efficiencies. • Evaluate potential of DAF technology implementation in Hooper Reservoir. • Minimize water loss to maximize plant production. • Optimize Filtracone performance at high and low flow including an analysis of solids withdrawal from cones.
20-326	D	20-326 / Smith Reservoir Oxygenation System	Water Production - Smith	$ 2,000,000	N/A	1 year	Water Production Director	This project will evaluate and install a reservoir oxyganation system.
20-327	D	20-327 / Hooper Belt Filter Press Evaluation	Water Production - Hooper	$ 75,000	32.0	1 year	Water Production Director	The belt filter presses at Hooper WPP are 15 years old and are currently in good condition. This project will evaluate the condition of the existing belt filter presses, develop solids inventory, and make a recommendation for the optimal solids dewatering process.
20-328	D	20-328 / Forest Ave Booster Pump Design and Construction	Re-Pumps	$ 2,100,000	53.0	1 year	Water Production Director	The Forest Avenue tanks (2 concrete, 1 steel) will be demolished. A hydarulic analysis verified the need for a booster pump station to supply the North Service Area. The existing booster station should be demolished to accommodate the new in-line booster pump station.
20-329	D	20-329 / Morrow Re-Pump Station Improvements	Re-Pumps	$ 3,200,000	40.0	1 year	Water Production Director	Morrow re-pump station upgrades to improve reliability and redundancy. Upgrades include SCADA upgrades and the installation of a redundant discharge header pipe.
Supplemental Projects								
N/A	N/A	Smith Plant Improvements	Water Production - Smith	N/A	N/A	N/A	Water Production Director	Smith WPP improvements include: 1. Lightning Protection Evaluation - Perform a lightning protection evaluation and implement lightning protection equipment and/or structures to reduce lightning damage and 2. Replacement of chemical feed lines.
N/A	N/A	Hooper reservoir dredging	Water Production - Hooper	N/A	N/A	N/A	Water Production Director	Dredging the Hooper reservior
N/A	N/A	Hicks WPP Isolation Valve Installation	Water Production - Hicks	N/A	N/A	N/A	Water Production Director	This project would involve the evaluation, design and installation of isolation valves to allow plant staff to perform maintenance on low demand days without taking the Hicks WPP completely offline.

Note (Project Type): R = Regulatory/Capacity, A = Annual Program, D = Discretionary/Other

Distribution and Conveyance

DISTRIBUTION & CONVEYANCE - PROJECT SCHEDULE

Project Name	Total Benefit Score	Planning Level Estimated Cost	Predecessors	Successors	FYB 2019	FYB 2020	FYB 2021	FYB 2022	FYB 2023	FYB 2024	FYB 2025	FYB 2026	FYB 2027	FYB 2028	FYB 2029
20-600 / Partnership for Safe Water - Distribution	64.0	$50,000					■								
20-601 / Galvanized Water Main Replacement Program	N/A	$20,000,000				■	■	■	■	■	■	■	■	■	■
20-602 / Commercial Meter Replacement and Fire Metering Program	N/A	$5,000,000	608 (2015)			■	■	■	■	■	■	■	■	■	■
20-603 / Distribution System Risk Assessment & Prioritization Strategy	66.6	$500,000								■	■				
20-604 / Water Distribution Model Update	N/A	$700,000								■					■
20-605 / Uni-Directional Flushing Program	N/A	$3,150,000					■	■	■	■	■	■	■	■	■
20-606 / Sewer Condition Assessment Program	N/A	$19,500,000		20-607, 20-608		■	■	■	■	■	■	■	■	■	■
20-607 / Small Diameter Sewer Rehabilitation and Replacement Program	N/A	$20,000,000	20-606			■	■	■	■	■	■	■	■	■	■
20-608 / Large Diameter Sewer Rehabilitation and Replacement Program	N/A	$60,000,000	20-606			■	■	■	■	■	■	■	■	■	■
20-609 / Expand Sewer Service to Key Unsewered (Septic Tank) Areas	22.2	$5,000,000													■
20-610 / Sewer Model Update (Casey Basin; DeKalb/Northeast/Shoal Basins)	N/A	$800,000						■		■			■		■
20-611 / Develop WATS Model	48.6	$150,000		20-612		■									
20-612 / Design & Implement Selected Odor and Corrosion Control Technologies	39.6	$250,000	20-611				■								
20-613 / Conveyance Modifications to Accept DeKalb County Flows	23.8	$13,500,000							■	■					
20-614 / College Park Contract Wastewater Flows	25.2	$8,500,000											■	■	
20-615 / Pressure Sewer Assessment and Rehabilitation Program	N/A	$16,300,000	638 (2015)			■	■	■	■	■	■	■	■	■	■
20-616 / Cathodic Protection Evaluation	36.2	$250,000										■			
20-617 / GDOT Projects	N/A	$20,000,000				■	■	■	■	■	■	■	■	■	■
20-618 / Shoal Creek WRF to Casey WRRF Forcemain Conveyance Design	N/A	$2,000,000											■		
20-619 / Shoal Creek WRF to Casey WRRF Forcemain Conveyance Construction	N/A	$19,500,000	20-618, 20,716, 20-717											■	

LEGEND: ■ 2020 Master Plan Projects

DISTRIBUTION & CONVEYANCE - ANNUAL CASH FLOW

Project Name	Project Type	Budget Type	Start Year	Budgeted Length (Years)	FYB 2019	FYB 2020	FYB 2021	FYB 2022	FYB 2023	FYB 2024	FYB 2025	FYB 2026	FYB 2027	FYB 2028	FYB 2029
20-600 / Partnership for Safe Water - Distribution	D	O	FYB 2021	1			$50,000								
20-601 / Galvanized Water Main Replacement Program	A	C	FYB 2020	10		$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000
20-602 / Commercial Meter Replacement and Fire Metering Program	A	C	FYB 2020	10		$500,000	$500,000	$500,000	$500,000	$500,000	$500,000	$500,000	$500,000	$500,000	$500,000
20-603 / Distribution System Risk Assessment & Prioritization Strategy	D	O	FYB 2024	2						$250,000	$250,000				
20-604 / Water Distribution Model Update	A	O	FYB 2024	2						$350,000					$350,000
20-605 / Uni-Directional Flushing Program	A	O	FYB 2021	9			$350,000	$350,000	$350,000	$350,000	$350,000	$350,000	$350,000	$350,000	$350,000
20-606 / Sewer Condition Assessment Program	A	O	FYB 2020	10		$1,500,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000
20-607 / Small Diameter Sewer Rehabilitation and Replacement Program	A	C	FYB 2020	10		$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000
20-608 / Large Diameter Sewer Rehabilitation and Replacement Program	A	C	FYB 2020	10		$6,000,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000
20-609 / Expand Sewer Service to Key Unsewered (Septic Tank) Areas	D	C	FYB 2029	1											$5,000,000
20-610 / Sewer Model Update (Casey Basin; DeKalb/Northeast/Shoal Basins)	A	O	FYB 2022	4				$200,000		$200,000			$200,000		$200,000
20-611 / Develop WATS Model	D	O	FYB 2020	1		$150,000									
20-612 / Design & Implement Selected Odor and Corrosion Control Technologies	D	C	FYB 2021	1			$250,000								
20-613 / Conveyance Modifications to Accept DeKalb County Flows	D	C	FYB 2023	2					$7,000,000	$6,500,000					
20-614 / College Park Contract Wastewater Flows	D	C	FYB 2027	2									$4,500,000	$4,000,000	
20-615 / Pressure Sewer Assessment and Rehabilitation Program	A	O	FYB 2020	10		$1,000,000	$1,700,000	$1,700,000	$1,700,000	$1,700,000	$1,700,000	$1,700,000	$1,700,000	$1,700,000	$1,700,000
20-616 / Cathodic Protection Evaluation	D	O	FYB 2026	1								$250,000			
20-617 / GDOT Projects	A	C	FYB 2020	10		$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000
20-618 / Shoal Creek WRF to Casey WRRF Forcemain Conveyance Design	R	C	FYB 2027	1									$2,000,000		
20-619 / Shoal Creek WRF to Casey WRRF Forcemain Conveyance Construction	R	C	FYB 2028	1										$19,500,000	

Note (Budget Type): O = Operating Budget, C = Capital Budget

Note (Project Type): R = Regulatory/Capacity, A = Annual Program, D = Discretionary/Other

	FYB 2020	FYB 2021	FYB 2022	FYB 2023	FYB 2024	FYB 2025	FYB 2026	FYB 2027	FYB 2028	FYB 2029
Annual Total (D&C Projects)	$15,150,000	$16,850,000	$16,750,000	$23,550,000	$23,850,000	$16,800,000	$16,800,000	$23,250,000	$40,050,000	$22,100,000
Annual (Operating)	$2,650,000	$4,100,000	$4,250,000	$4,050,000	$4,850,000	$4,300,000	$4,300,000	$4,250,000	$4,050,000	$4,600,000
Annual (Capital)	$12,500,000	$12,750,000	$12,500,000	$19,500,000	$19,000,000	$12,500,000	$12,500,000	$19,000,000	$36,000,000	$17,500,000

10-year Total (D&C Projects)	$215,150,000
10-year (Operating)	$41,400,000
10-year (Capital)	$173,750,000

2020 SMP Project Number	Project Type	Project Name	Functional Area	Planning Level Estimated Cost	Total Benefit Score	Estimated Duration (years)	Project Lead	Project Description
20-600	D	20-600 / Partnership for Safe Water - Distribution	Distribution & Conveyance	$ 50,000	64	1 year	Assistance General Manager - Operations	This project would involve obtaining the Partnership for Safe Water – Distribution designation from the American Water Works Association. The self-assessment procedure will result in a systemic analysis, identification, and correction of factors which could limit the performance of the distribution system. This designation will further define CCWA's brand as "best-in-class."
20-601	A	20-601 / Galvanized Water Main Replacement Program	Distribution & Conveyance	$ 20,000,000	N/A	10 years	Program Management & Engineering Director	This project will focus on systematic replacement of 2-inch galvanized water mains over the 10-year planning period. The affected areas of the water distribution system targeted for water main replacements are the areas with the majority of water leakage and water quality complaints. Approximately 43 miles of galvanized pipe remain. Cost assumes $20 million over a 10-year period.
20-602	A	20-602 / Commercial Meter Replacement and Fire Metering Program	Distribution & Conveyance	$ 5,000,000	N/A	10 years	Distribution & Conveyance Director	CCWA previously completed the replacement of many commercial meters. This program will focus on replacing the remaining 200 commercial meters and metering the 1000 unmetered fire lines.
20-603	D	20-603 / Distribution System Risk Assessment & Prioritization Strategy	Distribution & Conveyance	$ 500,000	66.6	2 years	Program Management & Engineering Director	CCWA has implemented a risk-based linear asset management methodology for the collection system. This project will develop a similar strategy for water distribution asset management activities. The project will utilize asset management software to manage risk matrices for Consequence of Failure (COF) and Likelihood of Failure (LOF) parameters which can be completed using existing data and institutional knowledge. Future condition assessment processes can be conformed so that data collection, analysis, work orders, corrective actions, and performance tracking can be integrated into asset management and other business enterprise software. Develop a pilot project to assess a specific area of the system in order to refine a system-wide strategy.
20-604	A	20-604 / Water Distribution Model Update	Distribution & Conveyance	$ 700,000	N/A	2 years	Program Management & Engineering Director	Every 5 years, update the water model to include new network additions and other model inputs in order to provide a more accurate understanding of the water distribution system and water quality. Next updates scheduled for 2024 and 2029.
20-605	A	20-605 / Uni-Directional Flushing Program	Distribution & Conveyance	$ 3,150,000	N/A	9 years	Program Management & Engineering Director & Distribution & Conveyance Director	Implement a uni-directional flushing program which involves systematically operating valves to force water at high velocities through pipes to provide better scouring/cleaning. The program will be conducted on pipes $\leq$ 12 inches. Cost estimates 1M LF per year until the system is complete.
20-606	A	20-606 / Sewer Condition Assessment Program	Distribution & Conveyance	$ 19,500,000	N/A	10 years	Program Management & Engineering Director	Sewer condition assessment program for small diameter (<15") and large diameter ($\geq$15") sewer lines. Small diameter basins will include SSES activities such as smoke testing, CCTV, and manhole inspections, and the small diameter pipes will be cleaned as part of the condition assessment. The large diameter condition assessments may include pole camera inspections or other methodologies as identified. This project also include flow monitoring that will be utilized for: prioritizing assessment and cleaning activities, calibrating hydraulic models, and evaluating the success of rehabilitation activities.
20-607	A	20-607 / Small Diameter Sewer Rehabilitation and Replacement Program	Distribution & Conveyance	$ 20,000,000	N/A	10 years	Program Management & Engineering Director	This project will implement repairs, rehabilitations or replacements of the CCWA wastewater collection system based on the findings of the SSES program. The solutions implemented will be the most cost effective for reduction of I/I in the basins.
20-608	A	20-608 / Large Diameter Sewer Rehabilitation and Replacement Program	Distribution & Conveyance	$ 60,000,000	N/A	10 years	Program Management & Engineering Director	Replacement/rehabilitation of large diameter sewer mains as identified from condition assessments and hydraulic modeling.
20-609	A	20-609 / Expand Sewer Service to Key Unsewered (Septic Tank) Areas	Distribution & Conveyance	$ 5,000,000	22.2	1 year	Program Management & Engineering Director	CCWA is considering expanding sewer service to older areas of the county that are currently on septic tanks. Several areas (Fairfield Community, Riverdale, northeast Clayton County, etc.) may be considered in this 10-year planning period.
20-610	D	20-610 / Sewer Model Update (Casey Basin; DeKalb/Northeast/Shoal Basins)	Distribution & Conveyance	$ 800,000	N/A	4 years	Program Management & Engineering Director	Every 5 years, update the sewer model to provide a more accurate understanding of the collection system and to identify needed replacement projects. The Casey Basin model will be updated in 2022 and 2027, and the DeKalb, Northeast, and Shoal Creek Basin models will be updated in 2024 and 2029.
20-611	A	20-611 / Develop WATS Model	Distribution & Conveyance	$ 150,000	48.6	1 year	Program Management & Engineering Director	Development of WATS (Wastewater Aerobic Through Sewer and Plants) Model to simulate H2S through sewer pipes and water reclamation facilities.
20-612	D	20-612 / Design & Implement Selected Odor and Corrosion Control Technologies	Distribution & Conveyance	$ 250,000	39.6	1 years	Program Management & Engineering Director	Selected technologies from the WATS Model will be designed and implemented.
20-613	D	20-613 / Conveyance Modifications to Accept DeKalb County Flows	Distribution & Conveyance	$ 13,500,000	23.8	2 years	Program Management & Engineering Director	This project will implement the necessary conveyance modifications to return flow currently sent to DeKalb County back to a CCWA WRF. Included in this project will be the design and construction of the necessary modifications.
20-614	D	20-614 / College Park Contract Wastewater Flows	Distribution & Conveyance	$ 8,500,000	25.2	2 years	Program Management & Engineering Director	Based on same trench replacement of existing sewer with 2240 LF of 18" and 9420 LF 21" PVC sewer main and manholes in the Flint River Interceptor west of GA85. Sized to accept 4.0 mgd from College Park in addition to CCWA flows in the basin.

2020 SMP Project Number	Project Type	Project Name	Functional Area	Planning Level Estimated Cost	Total Benefit Score	Estimated Duration (years)	Project Lead	Project Description
20-615	D	20-615 / Pressure Sewer Assessment and Rehabilitation Program	Distribution & Conveyance	$ 16,300,000	N/A	10 years	Program Management & Engineering Director	The Pressure Sewer Condition Assessment Methodology project being initiated in FYB2019 will identify a plan for continued assessment and rehabilitation/replacement of pressure sewer mains. The methodology developed will be used to continuously identify: priority projects for rehabilitation and replacement and priority projects and recommended techniques for field assessment. The cost and schedule for field assessments assume that 100% of the total 48 miles will be assessed over the course of 10 years. Assumes an average cost of $9/LF. The cost and schedule for rehabilitation assume that 30% of the total 48 miles will be rehabilitated over the course of 10 years. Assumes an average cost of $200/LF.
20-616	D	20-616 / Cathodic Protection Evaluation	Distribution & Conveyance	$ 250,000	36.2	1 year	Program Management & Engineering Director	Evaluate the need for cathodic protection of water pipes throughout the distribution system.
20-617	A	20-617 / GDOT Projects	Distribution & Conveyance	$ 20,000,000	N/A	10 years	Distribution & Conveyance Director	This project represents funds to respond to GDOT projects throughout the system and the distribution & conveyance responsibilities of these projects.
20-618	R	20-618 / Shoal Creek WRF to Casey WRRF Forcemain Conveyance Design	Distribution & Conveyance	$ 2,000,000	N/A	1 year	Program Management & Engineering Director	Design of wastewater conveyance from the Shoal Creek WRF to the Casey WRRF will be required to facilitate the future decommissioning of the Shoal Creek WRRF planned for 2031.
20-619	R	20-619 / Shoal Creek WRF to Casey WRRF Forcemain Conveyance Construction	Distribution & Conveyance	$ 19,500,000	N/A	1 year	Program Management & Engineering Director	This project include the construction of a new forcemain from the new Shoal Creek WRF transfer pump station to the RL Jackson pump station.

Note (Project Type): R = Regulatory/Capacity, A = Annual Program, D = Discretionary/Other

Water Reclamation

WATER RECLAMATION - PROJECT SCHEDULE

Project Name	Total Benefit Score	Planning Level Estimated Cost	Predecessors	Successors	FYB 2019	FYB 2020	FYB 2021	FYB 2022	FYB 2023	FYB 2024	FYB 2025	FYB 2026	FYB 2027	FYB 2028	FYB 2029
20-701 / Northeast Capacity Upgrades	N/A	$16,400,000													
20-702 / Casey 24 MGD Capacity Recovery Upgrades - Blowers and Casey Raw Pump Station	N/A	$7,600,000													
20-703 / Casey WRRF 32 MGD Upgrade - Solids	N/A	$101,000,000		20-724											
20-704 / Casey WRRF Interim Pelletizing Operational Improvements	65.8	$1,000,000													
20-705 / Shoal Creek Process Upgrades - UV Disinfection System Upgrade	N/A	$1,400,000													
20-706 / Casey 24 MGD Capacity Recovery Upgrades - RL Jackson upgrades	N/A	$1,000,000													
20-707 / Casey WRRF Improvements - W3 Pump Station	34.8	$3,600,000													
20-708 / Wetland Assessment and O&M Plan Update	63.6	$100,000													
20-709 / Casey WRRF - Effluent Gravity Line Assessment	73.0	$250,000													
20-710 / Wetland Distribution (Gravity) Line Assessment	54.0	$100,000													
20-711 / Northeast WRF Improvements - Flow Metering	30.4	$1,710,000													
20-712 / Casey WRRF Improvements - Influent Screens for Casey Raw and RL Jackson Pump Stations	50.2	$9,000,000													
20-713 / Operability and Safety Improvement Plan	N/A	$50,000													
20-714 / Casey WRRF Chemical Optimization Study	24.2	$50,000													
20-715 / Huie Wetland – High Rating Analysis	N/A	$150,000													
20-716 / Partnership for Clean Water	N/A	$50,000													
20-717 / Northeast WRF Improvements - Influent Screening	43.6	$5,070,000													
20-718 / Northeast WRF Improvements - Coatings	43.6	$400,000													
20-719 / Automated Sampling Technology	50.0	$150,000													
20-720 / Shoal Creek Process Upgrades - Aeration System	50.8	$2,300,000													
20-721 / Shoal Creek Process Upgrades - Screening	43.6	$100,000													
20-722 / Huie Pond Complex Evaluation	54.0	$150,000													
20-723 / Casey WRRF Improvements - Energy Recovery Assessment	20.8	$200,000													
20-724 / Casey WRRF 32 MGD Upgrade - Liquids	N/A	$118,000,000	20-724	20-727, 20-728, 20-729, 20-730											
20-725 / Casey WRRF Improvements - Equalization	40.8	$12,000,000													
20-726 / Casey WRRF Improvements - Primary Clarifier Concrete Repair	50.2	$350,000													
20-727 / Decommission Shoal Creek WRF - New Shoal Creek pump station	N/A	$8,900,000	20-703, 20-724												
20-728 / Decommission Shoal Creek WRF - Upgrade RJ Jackson pump station	N/A	$6,100,000	20-703, 20-724												
20-729 / Decommission Shoal Creek WRF - Fiber optic line	N/A	$200,000	20-703, 20-724												
20-730 / Decommission Shoal Creek WRF - Demolition	N/A	$4,900,000	20-703, 20-724												
20-731 / Evaluate, Develop and Implement Panhandle Land Management Plan	N/A	$250,000	20-727, 20-728, 20-729, 20-730												

LEGEND: 2020 Master Plan Projects

WATER RECLAMATION - ANNUAL CASH FLOW

Project Name	Project Type	Budget Type	Start Year	Budgeted Length (Years)	FYB 2019	FYB 2020	FYB 2021	FYB 2022	FYB 2023	FYB 2024	FYB 2025	FYB 2026	FYB 2027	FYB 2028	FYB 2029
20-701 / Northeast Capacity Upgrades	R	C	FYB 2020	2		$3,600,000	$12,800,000								
20-702 / Casey 24 MGD Capacity Recovery Upgrades - Blowers and Casey Raw Pump Station	R	C	FYB 2020	1		$7,600,000									
20-703 / Casey WRRF 32 MGD Upgrade - Solids	R	C	FYB 2020	2		$8,000,000	$93,000,000								
20-704 / Casey WRRF Interim Pelletizing Operational Improvements	D	C	FYB 2020	2		$510,000	$490,000								
20-705 / Shoal Creek Process Upgrades - UV Disinfection System Upgrade	R	C	FYB 2021	1			$1,400,000								
20-706 / Casey 24 MGD Capacity Recovery Upgrades - RL Jackson upgrades	R	C	FYB 2021	1			$1,000,000								
20-707 / Casey WRRF Improvements - W3 Pump Station	D	C	FYB 2022	1				$3,600,000							
20-708 / Wetland Assessment and O&M Plan Update	D	O	FYB 2021	1			$100,000								
20-709 / Casey WRRF - Effluent Gravity Line Assessment	D	O	FYB 2021	1			$250,000								
20-710 / Wetland Distribution (Gravity) Line Assessment	D	O	FYB 2021	1			$100,000								
20-711 / Northeast WRF Improvements - Flow Metering	D	C	FYB 2022	2				$170,000	$1,540,000						
20-712 / Casey WRRF Improvements - Influent Screens for Casey Raw and RL Jackson Pump Stations	D	C	FYB 2022	2				$800,000	$8,200,000						
20-713 / Operability and Safety Improvement Plan	D	O	FYB 2022	1				$50,000							
20-714 / Casey WRRF Chemical Optimization Study	D	O	FYB 2023	1					$50,000						
20-715 / Huie Wetland – High Rating Analysis	R	C	FYB 2023	1					$150,000						
20-716 / Partnership for Clean Water	D	O	FYB 2023	1					$50,000						
20-717 / Northeast WRF Improvements - Influent Screening	D	C	FYB 2024	2						$500,000	$4,570,000				
20-718 / Northeast WRF Improvements - Coatings	D	O	FYB 2024	1						$400,000					
20-719 / Automated Sampling Technology	D	C	FYB 2024	1						$150,000					
20-720 / Shoal Creek Process Upgrades - Aeration System	D	C	FYB 2025	1							$2,300,000				
20-721 / Shoal Creek Process Upgrades - Screening	D	C	FYB 2025	1							$100,000				
20-722 / Huie Pond Complex Evaluation	D	O	FYB 2025	1							$150,000				
20-723 / Casey WRRF Improvements - Energy Recovery Assessment	D	O	FYB 2025	1							$200,000				
20-724 / Casey WRRF 32 MGD Upgrade - Liquids	R	C	FYB 2025	2							$10,000,000	$108,000,000			
20-725 / Casey WRRF Improvements - Equalization	D	C	FYB 2025	2							$1,500,000	$10,500,000			
20-726 / Casey WRRF Improvements - Primary Clarifier Concrete Repair	D	C	FYB 2025	1							$350,000				
20-727 / Decommission Shoal Creek WRF - New Shoal Creek pump station	R	C	FYB 2027	2									$900,000	$8,000,000	
20-728 / Decommission Shoal Creek WRF - Upgrade RJ Jackson pump station	R	C	FYB 2027	2									$600,000	$5,500,000	
20-729 / Decommission Shoal Creek WRF - Fiber optic line	R	C	FYB 2027	1									$200,000		
20-730 / Decommission Shoal Creek WRF - Demolition	R	C	FYB 2028	2										$400,000	$4,500,000
20-731 / Evaluate, Develop and Implement Panhandle Land Management Plan	R	C	FYB 2029	1											$250,000

Note (Budget Type): O = Operating Budget, C = Capital Budget

Note (Project Type): R = Regulatory/Capacity, A = Annual Program, D = Discretionary/Other

	FYB 2019	FYB 2020	FYB 2021	FYB 2022	FYB 2023	FYB 2024	FYB 2025	FYB 2026	FYB 2027	FYB 2028	FYB 2029
Annual Total (Water Reclamation Projects)		$19,710,000	$109,140,000	$4,620,000	$9,990,000	$1,050,000	$19,170,000	$118,500,000	$1,700,000	$13,900,000	$4,750,000
Annual (Operating)		$0	$450,000	$50,000	$100,000	$400,000	$350,000	$0	$0	$0	$0
Annual (Capital)		$19,710,000	$108,690,000	$4,570,000	$9,890,000	$650,000	$18,820,000	$118,500,000	$1,700,000	$13,900,000	$4,750,000

10-year Total (Water Reclamation Projects)	$302,530,000
10-year (Operating)	$1,350,000
10-year (Capital)	$301,180,000

2020 SMP Project Number	Project Type	Project Name	Functional Area	Planning Level Estimated Cost	Total Benefit Score	Estimated Duration (years)	Project Lead	Project Description
20-701	R	20-701 / Northeast Capacity Upgrades	Water Reclamation - Northeast WRF	$ 16,400,000	N/A	2 years	Water Reclamation Director	Design and construction of upgrades required to operate at NPDES B2 limits (currently in permit) or new NPDES interim limits. A wasteload allocation (WLA) request for a permit modification is currently under review by GAEPD. A response expected by mid-February 2020. Depending on potential new interim flow limit and associated effluent concentrations, upgrades will include one or more of the the following: 1. Aeration System Upgrades (required regardless of EPD response) 2. New phosphorus polishing facility - concept determined through TO# CH-RE-17-04 Northeast Phosphorus Polishing Alternatives Evaluation 3. Nitrification capacity upgrades - concept determined through TO# JA-RE-19-01, Northeast Modeling Support Placeholder costs assumes all of the above upgrades are required and includes design and construction.
20-702	R	20-702 / Casey 24 MGD Capacity Recovery Upgrades - Blowers and Casey Raw Pump Station	Water Reclamation - Casey WRRF	$ 7,600,000	N/A	1 year	Water Reclamation Director	Upgrades to restore capacity to design basis capacity of 24 MGD. Current capacities of the bioreactor aeration system and the Casey raw pump station are below 24 MGD as determined in the WB Casey Capacity Analysis and Plant Expansion Evaluation project. Projects to be addressed include blower addition to meet peak air requirements and restore reliability and redundancy criteria of one unit out of service and upgrade to the Casey raw pump station.
20-703	R	20-703 / Casey WRRF 32 MGD Upgrade - Solids	Water Reclamation - Casey WRRF	$ 101,000,000	N/A	2 years	Water Reclamation Director	Replacement of existing Pelletizing and solids handling facilities. The existing facilty is at capacity and at the end of its useful life. New facility will have a 32 mgd capacity. New facility will be based on Alternative 3B defined in the WB Casey Capacity Analysis and Plant Expansion Evaluation. This includes primary sludge anaerobic digestion, sludge blending, dewatering and pelletization.
20-704	D	20-704 / Casey WRRF Interim Pelletizing Operational Improvements	Water Reclamation - Casey WRRF	$ 1,000,000	65.8	2 years	Water Reclamation Director	Upgrades to address saftey issues identified by recent Dust Hazard Analysis conducted by Andritz (dryer manufacturer). (At the time of this evaluation, the report has not been submitted). Upgrades could include instrumentation and limited equipment reconfiguration to address any saftey hazards identified. Required improvements may or may not be handled by CCWA staff and operational budget.
20-705	R	20-705 / Shoal Creek Process Upgrades - UV Disinfection System Upgrade	Water Reclamation - Shoal Creek WRF	$ 1,400,000	N/A	1 year	Water Reclamation Director	The UV disinfection system requires upgrades for improved reliability. Currently, the control system does not function properly and staff have to manually set the UV dose. Additionally, Trojan will not guarantee parts or support of the existing UV facility beyond 2025. This cost represents full equipment replacement.
20-706	R	20-706 / Casey 24 MGD Capacity Recovery Upgrades - RL Jackson upgrades	Water Reclamation - Casey WRRF	$ 1,000,000	N/A	1 year	Water Reclamation Director	Upgrades to restore capacity to design basis capacity of 24 MGD. Current capacity of the RL Jackson influent pump station is below 24 MGD as determined in the WB Casey Capacity Analysis and Plant Expansion Evaluation project. Project to be addressed in this project include one influent pump to the RL Jackson raw pump station.
20-707	D	20-707 / Casey WRRF Improvements - W3 Pump Station	Water Reclamation - Casey WRRF	$ 3,600,000	34.8	1 year	Water Reclamation Director	Increase the capacity of the W3 pump station. This project may be addressed in the near term along with the 24 MGD Capacity Recovery Upgrades (702) or Solids facility (703) upgrades depending on urgency and timing of major upgrades projects.
20-708	D	20-708 / Wetland Assessment and O&M Plan Update	Natural Treatment Systems	$ 100,000	63.6	1 year	Water Reclamation Director	Comprehensive wetlands assessment which will include the current state of the wetlands and identify maintenance activities or capital projects that will improve the functionality and longevity of the wetlands (Huie and Panhandle). Based on the assessment, update Wetland O&M Plans, including routine and non-routine activities to maintain the proper functionality of the wetlands.
20-709	D	20-709 / Casey WRRF - Effluent Gravity Line Assessment	Water Reclamation - Casey WRRF	$ 250,000	73	1 year	Water Reclamation Director	The existing gravity line between the WB Casey effluent box and the Jackson Transfer Pump Station requires assessment to determine if the line is compromised. Over the last decade, Casey staff have noted that the peak flows that this line can pass has decreased, indicating that the line might require repair. This line is a 48-inch RCP which is over 40 years old.
20-710	D	20-710 / Wetland Distribution (Gravity) Line Assessment	Water Reclamation - Casey WRRF	$ 100,000	54	1 year	Water Reclamation Director	Evaluaton of the older of the two 36-inch lines from the distribution box to the Huie Wetlands
20-711	D	20-711 / Northeast WRF Improvements - Flow Metering	Water Reclamation - Northeast WRF	$ 1,710,000	30.4	2 years	Water Reclamation Director	Design and contruction of Influent flow metering facility upstream of preliminary treatment
20-712	D	20-712 / Casey WRRF Improvements - Influent Screens for Casey Raw and RL Jackson Pump Stations	Water Reclamation - Casey WRRF	$ 9,000,000	50.2	2 years	Water Reclamation Director	Add screens at the RL Jackson and Casey WRRF raw water pump stations. This project may be addressed with either 24 MGD Capacity Recovery Upgrades or 32 MGD Upgrades or separately depending on urgency and timing of major upgrades projects. Screening facility costs are include in 32 mgd upgrade cost but is broken out as it may be implmented prior to 32 mgd upgrade. Project includes below grade screening structure with bar screens at each of the two pump stations.
20-713	D	20-713 / Operability and Safety Improvement Plan	Water Reclamation - All Plants	$ 50,000	N/A	1 year	Water Reclamation Director	An evaluation of daily, chronic, and infrequent operation and maintenance activities to identify unsafe conditions at all Water Reclamation Facilities
20-714	D	20-714 / Casey WRRF Chemical Optimization Study	Water Reclamation - Casey WRRF	$ 50,000	24.2	1 year	Water Reclamation Director	This study would assess how to optimize chemical use, specifically coagulant to meet lower phosphorus limits. CCWA has considered adding coagulant at dewatering to reduce phosphorus recycling to the head of the plant. Given that the phosphorus polishing facility will come online in a Spring 2020, this will be deferred until the new operational mode is in place so investigation matched the near-term configuration change.
20-715	R	20-715 / Huie Wetland – High Rating Analysis	Natural Treatment Systems	$ 150,000	N/A	1 year	Water Reclamation Director	Perform analysis to determine if the Huie wetland cell network could be high-rated to increase its treatment capacity. This project would include additional infrastructure analysis to facilitate the additional treatment capacity. The additional capacity would have to be tied into the EPD permitting discussions and the optimization of the NTS coagulant operation to increase flow but not Phosphorus load in Ocmulgee Basin. Analysis should include other raw water impacts downstream at Pates Creek and Hooper Reservoirs.
20-716	D	20-716 / Partnership for Clean Water	Water Reclamation - All Plants	$ 50,000	N/A	1 year	Water Reclamation Director	Submit an application for the AWWA Partnership for Clean Water.
20-717	D	20-717 / Northeast WRF Improvements - Influent Screening	Water Reclamation - Northeast WRF	$ 5,070,000	43.6	2 years	Water Reclamation Director	Desing and construction of improved screening before and/or after influent pumping. Proejct may include retrofit of esiting Parkson Aquaguard screens and/or addition of new drum screen. For conservative cost estimating it is assumed that upgrades would be similar to Casey with a new drum screen facility with a single screen but expandable to two. Some flow would bypass drum screen at high flows and only be treated with existing screen.
20-718	D	20-718 / Northeast WRF Improvements - Coatings	Water Reclamation - Northeast WRF	$ 400,000	43.6	1 year	Water Reclamation Director	Coating of Metal Substrates - Coating of metal substrates in clarifiers and aeration basins.
20-719	D	20-719 / Automated Sampling Technology	Natural Treatment Systems	$ 150,000	50	1 year	Water Reclamation Director	Investigation, selection and implementation of automated sampling technology as sampling equipment becomes more reliable and cost effective. Technology implementation will reduce manual testing and improve testing via real-time data retrieval.
20-720	D	20-720 / Shoal Creek Process Upgrades - Aeration System	Water Reclamation - Shoal Creek WRF	$ 2,300,000	50.8	1 year	Water Reclamation Director	Aeration system upgrades include replacement of blowers and diffuser system. It is assumed that diffusers from Northeast would be relocated to the shoal creek plant following the pending diffuser system replacement at Northeast.
20-721	D	20-721 / Shoal Creek Process Upgrades - Screening	Water Reclamation - Shoal Creek WRF	$ 100,000	43.6	1 year	Water Reclamation Director	Screenings improvements would likely include repair only given the future decommissioning of Shoal Creek. Required repairs will would be determined following full equipment assessment.
20-722	D	20-722 / Huie Pond Complex Evaluation	Natural Treatment Systems	$ 150,000	54	1 year	Water Reclamation Director	Evaluate the long-term use of the Huie Pond Complex, including potential for using the ponds or repurposing a portion of the ponds for: 1) continued use of equalization storage for NTS ponds, 2) continued backwash storage from Hicks WPP, 3) Raw water Storage for future expanded Hicks WPP or 4) abandon ponds. Consider impact of potential reclassification of dams to Category 1 by EPD Safe Dams.
20-723	D	20-723 / Casey WRRF Improvements - Energy Recovery Assessment	Water Reclamation - Casey WRRF	$ 200,000	20.8	1 year	Water Reclamation Director	Investigate energy recovery opportunities. This may include but it's not limited to cogeneration with digester biogas, fog receiving, microturbines, and solar.
20-724	R	20-724 / Casey WRRF 32 MGD Upgrade - Liquids	Water Reclamation - Casey WRRF	$ 118,000,000	N/A	2 years	Water Reclamation Director	Upgrade to increase WB Casey WRRF from 24 to 32 mgd. Upgrades needed to increase plant capacity to 32 mgd as defined from WB Casey Capacity Analysis and Plant Expansion Evaluation. 32 mgd upgrade cost includes influent screens and grit system. 32 mg upgrades cost does not include w3 pump station as that was not considered during conceptual design development. 32 mgd upgrades cost does not include equalization.
20-725	D	20-725 / Casey WRRF Improvements - Equalization	Water Reclamation - Casey WRRF	$ 12,000,000	40.8	2 years	Water Reclamation Director	Add equalization at Casey to help with peak flow management. Note polishing plant (in progress) and recommended influent pump station upgrades (referenced in the 24 MGD Upgrades project) should improve peak flow management. This project could be added to 32 MGD Upgrades project although it was not considered as part of the 32 MGD upgrades cost.
20-726	D	20-726 / Casey WRRF Improvements - Primary Clarifier Concrete Repair	Water Reclamation - Casey WRRF	$ 350,000	50.2	1 year	Water Reclamation Director	Primary Clarifiers Concrete Repair - Concrete repair in effluent trough. Concrete loss due to corrosion. Repair requires bypass pumping. This project may be addressed with either 24 MGD Capacity Recovery Upgrades or 32 MGD Upgrades or separately depending on urgency and timing of major upgrades projects.
20-727	R	20-727 / Decommission Shoal Creek WRF - New Shoal Creek pump station	Water Reclamation - Shoal Creek WRF	$ 8,900,000	N/A	2 years	Water Reclamation Director	Design and construction of a new Shoal Creek transfer pump station to pump flow from the Shoal Creek WRF to the RL Jackson pump station
20-728	R	20-728 / Decommission Shoal Creek WRF - Upgrade RJ Jackson pump station	Water Reclamation - Shoal Creek WRF	$ 6,100,000	N/A	2 years	Water Reclamation Director	Design and construction of upgrades to the RL Jackson pump station to pump flows from the new Shoal Creek transfer pump station to Casey WRRF.
20-729	R	20-729 / Decommission Shoal Creek WRF - Fiber optic line	Water Reclamation - Shoal Creek WRF	$ 200,000	N/A	1 year	Water Reclamation Director	Design and construction of a new fiber optic line directly to the Smith WPP or routed from the new Shoal Creek transfer pump station to the Smith WPP
20-730	R	20-730 / Decommission Shoal Creek WRF - Demolition	Water Reclamation - Shoal Creek WRF	$ 4,900,000	N/A	2 years		Demolition of the Shoal Creek WRF

2020 SMP Project Number	Project Type	Project Name	Functional Area	Planning Level Estimated Cost	Total Benefit Score	Estimated Duration (years)	Project Lead	Project Description
20-731	R	20-731 / Evaluate, Develop and Implement Panhandle Land Management Plan	Natural Treatment Systems	$ 250,000	N/A	1 year	Water Reclamation Director	This study will evaluate the Panhandle Wetlands to determine current and future occupancy, capacity and functional uses of each property and surrounding natural infrastructure. A long-term land management plan will be developed that considers watershed protection, historical features, timber and wildlife management, and recreational activities. Information will be gathered on the current (and long-term) needs of each operation. Information gathered will be used to evaluate need for preservation, protection, renovations, additions, repurposing, and/or construction. This plan will result in a facilities and land management report and actionable items to implement this plan. This project will be completed when the Shoal Creek WRF is decommissioned.
Supplemental Projects								
N/A	N/A	Northeast WRF Grit Pumps	Water Reclamation - Northeast WRF	N/A	N/A	N/A	Water Reclamation Director	Grit Pump Replacement - Air lift pump at grit removal needs to be to be retrofitted with a Gorman Rupp self-priming pump. This project may become an operational activity depending on the need for design services.
N/A	N/A	Northeast WRF RAS Solids Meter	Water Reclamation - Northeast WRF	N/A	N/A	N/A	Water Reclamation Director	RAS Solids Meter - Install a solids meter in the RAS pump station to allow for more accurate characterization of sludge recycle at NEWRF.
N/A	N/A	Casey WRRF Improvements - Pressure Gauges	Water Reclamation - Casey WRRF	N/A	N/A	N/A	Water Reclamation Director	Assess and Upgrade Pressure Gauges - Upgrade pressure gauges at the Casey WRRF. Staff report that existing magnehelic gauges are not working well. Parts and service for these gauges is becoming a challenge. This project may be addressed with either 24 MGD Capacity Recovery Upgrades or 32 MGD Upgrades or separately depending on urgency and timing of major upgrades projects.
N/A	N/A	Casey WRRF Clarifier Launder Covers	Water Reclamation - Casey WRRF	N/A	N/A	N/A	Water Reclamation Director	Install Launder Covers on Clarifiers. This project replaces what was formerly titled "Clarifier Brush System." Staff have elected to install covers for algae control instead of installing a brush system. The intent is to perform this in phases as an operational project over a few budget periods.
N/A	N/A	Casey WRRF Secondary Clarifier Drain Improvements	Water Reclamation - Casey WRRF	N/A	N/A	N/A	Water Reclamation Director	Jacobs has provided design details to improve draining of secondary clarifier 1, 2 and 3. Previously, CCWA intended on implementing drain improvements in 2019 through an existing service contract. CCWA has since implemented a cleaning program with Allsouth to clean out the secondary clarifiers therefore the draining improvements are not needed at this time but might be in the future.
N/A	N/A	Casey WRRF Smoke Testing	Water Reclamation - Casey WRRF	N/A	N/A	N/A	Water Reclamation Director	Smoke testing of all storm drains at the Casey WRRF after construction upgrades (Phosphorus Polishing) are complete. Perform stormwater drain replacement as needed.
N/A	N/A	Casey WRRF Improvements - Admin Building	Water Reclamation - Casey WRRF	N/A	N/A	N/A	Water Reclamation Director	Expand the Casey WRRF administration building to accommodate potential increased staff due to increased flows. Existing control room has insufficient space for operations. Other spaces requiring upgrades include the laboratory and conference room. This project may be addressed with either 24 MGD Capacity Recovery Upgrades or 32 MGD Upgrades or separately depending on urgency and timing of major upgrades projects.
N/A	N/A	Casey WRRF Improvements - Record Drawing Consolidation	Water Reclamation - Casey WRRF	N/A	N/A	N/A	Water Reclamation Director	Create a complete updated set of drawings which combines record drawings for all Casey construction projects. May need to work with multiple consultants to collect appropriate design drawings. This task would be most efficiently completed in conjunction with a plant upgrade as the master file will be used as a base map for the design drawings. This project may be addressed with either 24 MGD Capacity Recovery Upgrades or 32 MGD Upgrades or separately depending on urgency and timing of major upgrades projects.
N/A	N/A	Drone Optimization Analysis	Water Reclamation - All WRF	N/A	N/A	N/A	Water Reclamation Director	Implement the use of drones for maintenance inspection purposes. Tie data collected to the GIS and other analytical tools.
N/A	N/A	VFD Replacement	Water Reclamation - All WRF	N/A	N/A	N/A	Water Reclamation Director	Assessment of the VFDs at all WRFs and replace as needed.
N/A	N/A	Huie Nature Preserve Implementation	Natural Treatment Systems	N/A	N/A	N/A	Water Reclamation Director	Implementation of certain phases of the Huie Nature Preserve Concept plan (2017). Coordinate elements of this plan with the relocation of the NTS Building and potential future expansion of the Hicks WPP.
N/A	N/A	Huie Wetlands Miscellaneous Improvements	Natural Treatment Systems	N/A	N/A	N/A	Water Reclamation Director	Project consists of various wetlands improvement projects such as, replacing diaphragm valves with butterfly valves at valve box structures throughout the wetlands, adding skirt baffles to the remaining area of the wetlands to prevent invasive plant growth.

Note (Project Type): R = Regulatory/Capacity, A = Annual Program, D = Discretionary/Other

General Services

GENERAL SERVICES - PROJECT SCHEDULE

Project Name	Total Benefit Score	Planning Level Estimated Cost	Predecessors	Successors	FYB 2019	FYB 2020	FYB 2021	FYB 2022	FYB 2023	FYB 2024	FYB 2025	FYB 2026	FYB 2027	FYB 2028	FYB 2029
20-910 / Lift Station Rehabilitation	N/A	$16,800,000	902 (2015)												
20-912 / SCADA Master Plan Update	N/A	$375,000		20-913											
20-913 / SCADA Master Plan Project Implementation	N/A	$800,000	20-912												
20-914 / Upgrade GE IFIX / GE Proficy Software	N/A	$500,000													

LEGEND: 0 Master Plan Projects

GENERAL SERVICES - ANNUAL CASH FLOW

Project Name	Project Type	Budget Type	Start Year	Budgeted Length (Years)	FYB 2019	FYB 2020	FYB 2021	FYB 2022	FYB 2023	FYB 2024	FYB 2025	FYB 2026	FYB 2027	FYB 2028	FYB 2029
20-910 / Lift Station Rehabilitation	A	C	FYB 2020	10		$ 1,500,000	$ 1,700,000	$ 1,700,000	$ 1,700,000	$ 1,700,000	$ 1,700,000	$ 1,700,000	$ 1,700,000	$ 1,700,000	$ 1,700,000
20-912 / SCADA Master Plan Update	A	O	FYB 2020	2		$ 125,000					$ 250,000				
20-913 / SCADA Master Plan Project Implementation	A	C	FYB 2021	8			$ 100,000	$ 100,000	$ 100,000	$ 100,000		$ 100,000	$ 100,000	$ 100,000	$ 100,000
20-914 / Upgrade GE IFIX / GE Proficy Software	A	C	FYB 2020	10		$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000

Note (Budget Type): O = Operating Budget, C = Capital Budget

Note (Project Type): R = Regulatory/Capacity, A = Annual Program, D = Discretionary/Other

Annual Total (General Services Projects)	$1,675,000	$1,850,000	$1,850,000	$1,850,000	$1,850,000	$2,000,000	$1,850,000	$1,850,000	$1,850,000	$1,850,000
Annual (Operating)	$125,000	$0	$0	$0	$0	$250,000	$0	$0	$0	$0
Annual (Capital)	$1,550,000	$1,850,000	$1,850,000	$1,850,000	$1,850,000	$1,750,000	$1,850,000	$1,850,000	$1,850,000	$1,850,000

10-year Total (General Services Projects) $18,475,000

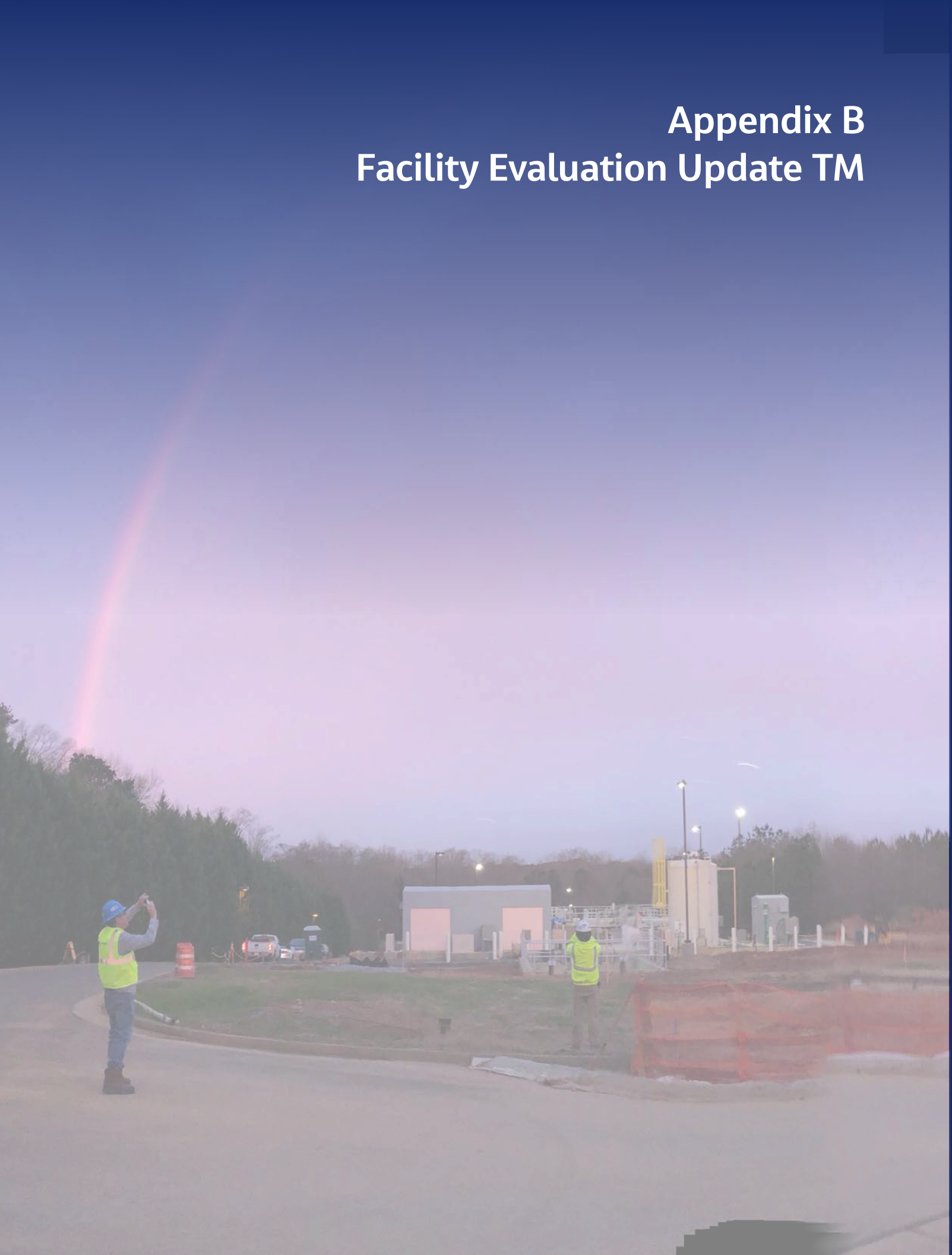
10-year (Operating) $375,000

10-year (Capital) $18,100,000

2020 SMP Project Number	Project Type	Project Name	Functional Area	Planning Level Estimated Cost	Total Benefit Score	Estimated Duration (years)	Project Lead	Project Description
20-910	A	20-910 / Lift Station Rehabilitation	General Services	$ 16,800,000	N/A	10 years	General Services Director	Based on the results of the lift station assessment (project 902 from 2015 SMP), various lift station rehabilitation and optimization projects will be identified. This project will include the cost for any identified rehabilitation. Based on staff recommendations, the following lift stations should be considered for rehabilitation due to infiltration issues and SSO potential (Walnut Creek, Reeves Creek, Atlanta, Lovejoy Rd, Rum Creek, Tara Blvd, Whaley's Lake, LaCosta, Pinto Trail, London Ct, Government Circle, Rivercrest).
20-912	A	20-912 / SCADA Master Plan Update	General Services	$ 375,000	N/A	2 years	General Services Director	SCADA Master plan update. This update will be performed twice in the 10-year master plan period in FYB2021 and FYB2026.
20-913	A	20-913 / SCADA Master Plan Project Implementation	General Services	$ 800,000	N/A	8 years	General Services Director	Implementation of projects from 912 / SCADA Master Plan Update.
20-914	A	20-914 / Upgrade GE IFIX / GE Proficy Software	General Services	$ 500,000	N/A	10 years	General Services Director	Purchase, install and implement updated GE IFIX / GE Proficy software. Integrate with WIMS.
Supplemental Projects								
N/A	N/A	Additional Staff and vehicle	General Services	N/A	N/A	N/A	General Services Director	Additional staff needed to maintain new assets and provide preventive maintenance. An additional lift station technician and vehicle to maintain new lift stations

Note (Project Type): R = Regulatory/Capacity, A = Annual Program, D = Discretionary/Other

Appendix B
Facility Evaluation Update TM



Contents

Exhibits

Appendix B. Background

B.1 Clayton County Water Authority (CCWA) Water Cycle

The CCWA water cycle has played a major role in the construction and continued operation of smaller facilities as compared to other utilities who operate a single facility for water reclamation and production. The location of water resources and existing infrastructure forms the basis for infrastructure configuration options. Exhibit B-1 was developed to provide an understanding of the movement of water throughout the system and has been since updated to reflect changes in infrastructure. Exhibit B-1 also demonstrates the importance of reclaimed water in Clayton County (the County), where raw water resources are limited because of the County's location on a ridge line in the upper portion of two river basins.

As Exhibit B-1 shows, CCWA's complex water cycle includes:

- Two major river basins (Ocmulgee and Flint River Basins)
- Infrastructure in two counties (Henry and Clayton)
- Four water supply sources (Flint River, Smith/Shoal Creek Reservoirs, Shamrock/Blalock Reservoirs, and Hooper Reservoir)
- Five raw water transmission mains (two from the Smith Reservoir, feeding two separate Water Production Plants (WPPs), and one from each of the other three raw water sources)
- Three WPPs (J.W. Smith (Smith), Terry R. Hicks (Hicks), and W.J. Hooper (Hooper))
- Four ground storage tanks and two on-line elevated storage tanks with re-pump stations (Crystal Lake and Conley Road)
- Forty-one wastewater pump stations (not shown on Exhibit B-1)
- Three Water Reclamation Facilities (WRFs) (Shoal Creek WRF, Northeast WRF, and W. B. Casey Water Resource Recovery Facility (WRRF)), with two discharging to natural treatment wetlands (W.B. Casey and Shoal Creek) and two discharging to surface waters (W.B. Casey and Northeast)
- Two natural treatment wetlands systems (Huie Constructed Treatment Wetlands (CTW) and Panhandle CTW))
- Four permitted WRF discharge locations (Flint River, Huie CTW, Panhandle CTW, and Panther Creek)
- Three natural treatment wetlands discharge locations, which are also raw water sources (Shoal Creek Reservoir, Shamrock Reservoir, and Blalock Reservoir)

CCWA has a unique combination of treatment wetlands and reservoirs which are used for water storage and supply through indirect potable reuse. This linkage to the WRFs highlights the need for holistic water and wastewater system planning as described in the following sections.

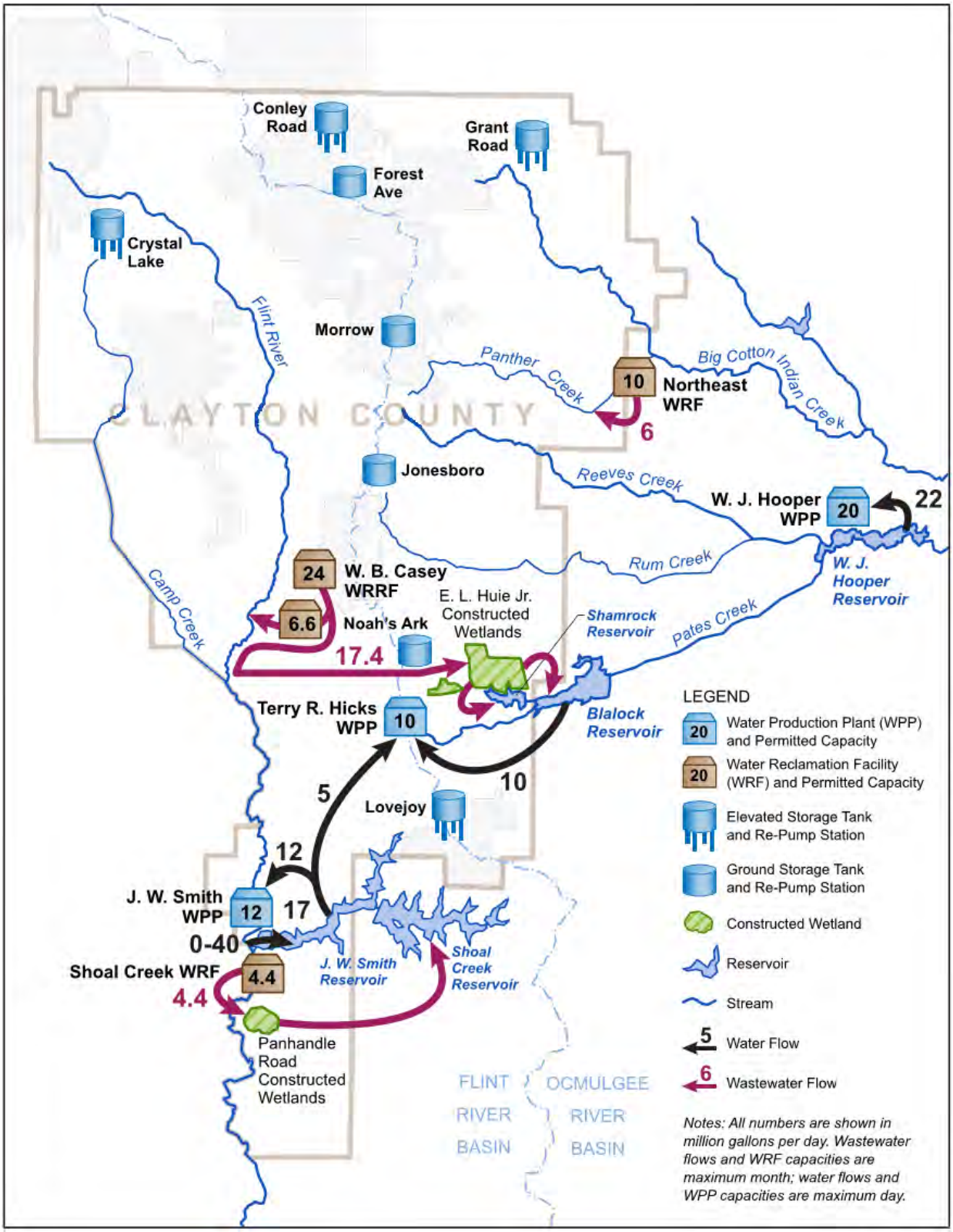


Exhibit B-1. Clayton County Water Cycle

B.2 Drivers for the Development of a 2020 Facility Evaluation Update

The *Water Production Plant and Water Reclamation Facility Evaluation Project* (Facility Evaluation), which was completed in 2017, evaluated the optimal configuration of both water production and water reclamation facilities within the system. The 2017 Facility Evaluation had several key drivers, including investigating the optimal number of facilities and evaluating the long-term cost-effectiveness of providing wholesale water and wastewater services to communities outside of the County. The Facility Evaluation was developed shortly following the *2015 Strategic Master Plan Report* (2015 SMP). The 2015 SMP included multiple capital improvements for water reclamation, water production, distribution, and conveyance, and before investing in this infrastructure, CCWA recognized that– the optimal configuration of CCWA facilities should be determined.

Exhibit B-2 shows the number of water production plants and water reclamation facilities for several of the major utilities in the metropolitan Atlanta area, including those for CCWA. As shown, CCWA operates three WPPs with a combined capacity of 42 million gallons per day (MGD) and three WRFs with a combined capacity of 34.4 MGD. The general trend in surrounding communities is to have fewer WPPs and WRFs, with larger capacities. This differentiator motivated CCWA to continue to evaluate its facilities and determine the optimal number of facilities to maintain in the future.

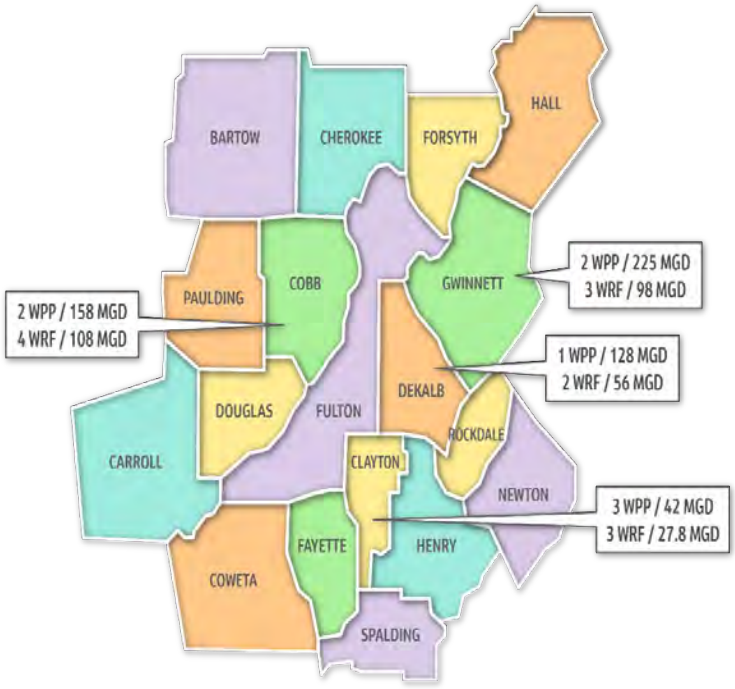


Exhibit B-2. Metro Atlanta County Water Production and Water Reclamation Facility

B.2.1 2017 Facility Evaluation

During the 2017 Facility Evaluation, various scenarios for water and wastewater facilities were evaluated based on future water demands and wastewater flows projected from 2014. Each scenario considered WPP and WRF capacities, distribution, conveyance, and discharge infrastructure associated with these capacities. The scenarios were screened for feasibility, and engineering and cost-benefit analyses were completed for the most feasible scenarios. It was determined that the optimal facility configuration would be to decommission Smith WPP and Shoal Creek WRF, in a scenario referred to as "Four Facilities(b)". This scenario included a new 27 MGD WPP located adjacent to existing Hicks WPP and an expanded 22 MGD Hooper plant, for a total combined WPP capacity of 49 MGD. The scenario also included an upgrade to 32 MGD at the W.B. Casey WRRF and an upgrade to 10 MGD at the Northeast WRF, for a total combined WRF capacity of 42 MGD (Exhibit B-3).

Exhibit B-3. Four Facilities(b) Summary

Facility	Permitted Capacity[1] (MGD)	Impact to Flint River Basin (MGD)	Impact to Ocmulgee River Basin (MGD)
Hicks WPP	27	-17	-10
Hooper WPP	22	0	-22
Smith WPP	0	0	0
Subtotal	**49**	**-17**	**-32**
Shoal Creek WRF	0	0	0
Northeast WRF	10	0	+10
Casey WRRF	32	+14.6	+17.4
Subtotal	**42**	**+14.6**	**+27.4**
Interbasin Transfer		-2.4	-4.6

[1]Permitted Capacities for WPPs shown are for Maximum Day Demand. Permitted Capacities for WRFs shown are for Annual Average Flows.

B.2.2 Recent Facility Evaluation-related Projects

At the conclusion of the 2017 Facility Evaluation, it was determined that the following studies were needed to confirm the feasibility of the recommended approach:

1) ***Raw Water Supply***: A critical question which remained at the end of the 2017 Facility Evaluation was whether adequate raw water supplies could be maintained if Shoal Creek were decommissioned in the future. In 2018, the *Upper Flint Hydrology Study* was completed. As part of this, a hydrological model of the Flint River basin was developed to estimate future levels in the Smith and Shoal Creek Reservoirs. The modeling effort indicates if the Shoal Creek WRF and Panhandle wetlands are decommissioned, CCWA will be able to sustain adequate levels in both reservoirs while withdrawing up to 17 MGD from the Smith Reservoir.

2) ***W.B. Casey WRRF Capacity***: Future flow projections developed for the 2020 SMP determined that:

   - Casey basin flows are projected to exceed Casey WRRF's current capacity (24 MGD) by the year 2032, and
   - Casey + Shoal Creek basin flows are projected to exceed 24 MGD by the year 2023.

   The *W.B. Casey WRRF Capacity Analysis and Plant Expansion Evaluation project (2019)* determined that the Casey WRRF could not accept Shoal Creek WRF basin flows without an immediate increase in existing capacity, because some of the existing treatment trains at W. B. Casey WRRF are operating at less than the rated capacity. If CCWA elects to upgrade Casey WRRF to a 32-MGD facility in the immediate term, in order to accept Shoal Creek flows, then the risks of operating lower than capacity would be eliminated with this upgrade. However, if CCWA elects to defer an expansion to a time when it would be required regardless of accepting Shoal Creek basin flow (projected to be 2030), then near-term upgrades would be required to recover capacity to match the permitted capacity of 24 MGD.

3) ***Shoal Creek Conveyance Feasibility***: To further evaluate the cost-effectiveness of decommissioning Shoal Creek WRF beyond the planning-level cost estimates developed in the 2017 Facility Evaluation, a more detailed analysis of conveying flows from Shoal Creek WRF to W.B. Casey WRRF was completed. The costs developed in the *Shoal Creek WRF Decommissioning Study (2019)* were used in the 2020 Facility Evaluation update.

4) ***Water Distribution System Model, WaterProduction and Storage Analysis, and Repump Evaluation Study***: In order to determine impacts to the distribution system if the Smith WPP were to be decommissioned, CCWA updated its water distribution system model and distribution system capital improvement project list. This series of studies confirmed the feasibility of decommissioning the Smith WPP and determined the capital improvements required to accommodate this change in the distribution system.

The 2020 Facility Evaluation Update was completed to reevaluate the decisions reached in 2017 by using the updated information summarized above, as well as updated demand and flow projections that were developed as part of the 2020 Strategic Master Plan Report (SMP) project prioritization process. Results from the Shoal Creek Water Reclamation Facility Decommissioning Feasibility Study (2018) demonstrated that because adequate levels can be maintained in the Shoal Creek Reservoir if the Shoal Creek WRF and the Panhandle Wetlands were decommissioned, the configuration of water production and water reclamation facilities could be evaluated separate from one another. The following sections detail the steps taken to reevaluate the current facility configuration to develop updated recommendations which will allow CCWA to capture projects in the 2020 SMP which align with the future of the facilities.

B.3 Water Production

B.3.1 Scenario Development

The updated demand and flow projections summarized in Section 1.3 of the SMP were used as a part of this evaluation. A planning horizon of 2050 was selected to provide a long-term evaluation of facility configurations for which projected future water demands were developed. As shown in Exhibit 1-G in the SMP, the maximum daily demand (MDD) for the year 2050 is projected to be 49.1 MGD, excluding wholesale demand. CCWA elected to disregard the wholesale demand from College Park during the engineering analysis of WPPs due to stalled growth and uncertainty of future need. However, the distribution system analysis included the existing and potential future College Park demand to assess the impact of location specific demands to the planned improvements.

CCWA's combined permitted withdrawal limit from all of its sources is 49 MGD. Given that the projected demand and existing raw water supply are equivalent within the accuracy of the estimates, both the 2017 Facility Evaluation and this effort focused on facility configurations to supply 49 MDD with no additional water withdrawal scenarios.

B.3.1.1 Establish Potential Water Production Facility Configurations

The first step of scenario development was to establish the potential number of water production facilities in the future. At several workshops throughout the master planning process, the project team agreed that having more than one WPP was necessary, to provide redundancy and reliability. Therefore, it was determined that there can only be either two or three WPPs.

The next step of scenario development was to use the potential number of facilities to determine all possible combinations of CCWA's WPP facilities. At the Hooper WPP Project Identification workshop, it was determined that as the largest plant, Hooper WPP plays a vital role in the water production strategy and therefore will not be considered for decommissioning. As noted in the *Water Production and Storage Analysis TM,* the Hooper WPP is primarily responsible for producing the water to serve the northern portion of the County. It was further mentioned that CCWA must purchase water from the City of Atlanta and DeKalb County when Hooper WPP must be taken offline (e.g., in 2017 CCWA also purchased approximately $1 million of drinking water from the City of Atlanta due to taste and odor issues within the Hooper Reservoir). At the Hicks WPP Project Identification Workshop, it was determined that the Hicks WPP would most likely not be decommissioned in the future due to its proximity to the re-pump stations, its centralized location in the county, and the adjacent land available for plant expansion. Since demand in the southern region of the County is much lower than that in the north and northwest regions, only decommissioning of the Smith WPP was further considered.

B.3.1.2 Establish Capacity Options

The third step of scenario development involved determining the potential capacities of each of the three WPPs. During the 2017 Facility Evaluation, a series of workshops were held with CCWA management, project consultants, and plant staff to discuss the feasibility of expanding and decommissioning each plant. Potential future expansion considered factors such as the plant's history, current plant processes, site layout, surrounding land use and ownership, and location. Potential future capacities were also developed with the overarching assumption that the cumulative maximum day WPP capacity in 2050 would be 49 MGD to meet the existing permitted withdrawal capacity.

The Facility Evaluation update in 2020 assessed the 2017 expansion alternatives and added new capacity options (i.e., Hicks WPP at 12 MGD and Smith WPP at 15 MGD) as it may not be feasible to expand the Hicks plant to 15 MGD. Potential future capacities included in the 2020 update are summarized in Exhibit B-4.

Exhibit B-4. Potential Future Capacities of Water Production Facilities

Facility	Potential Future Capacities (Maximum Day MGD)
J.W. Smith WPP (12 MGD)	0, 12, 15
Terry R. Hicks WPP (10 MGD)	12, 15, 27
W. J. Hooper WPP (20 MGD)	20, 22

There are two key risks with the combined WPP capacity and maximum day demand being equivalent. First, this assumes that each plant is operating at full capacity. To address this risk, a goal was established that each plant would have sufficient redundancy that it would be able to meet its rated maximum production capacity with equipment offline for maintenance or repair. The level of redundancy needed will be specific to each plant and unit operation, but, in general, the goal will be that the firm capacity (i.e. capacity with the single largest unit offline) will be equal or greater than the plant rated capacity. The SMP will include projects to address the necessary redundancy improvements to achieve this goal.

The second risk to meeting the maximum day demand is the plant production efficiency (the ratio of water produced to raw water intake). At present the WPPs efficiency is approximately 86% (Exhibit B-5). The SMP will include projects to address the necessary efficiency improvements to increase the efficiency at each plant.

Exhibit B-5. Current Water Production Plant Efficiencies

Facility	Water Production Efficiency[1]
J.W. Smith WPP	89%
Terry R. Hicks WPP	85%
W. J. Hooper WPP	84%

[1]Based on operating data from 2017-2019.

B.3.1.3 Select Scenarios for Engineering Analysis

The last step of scenario development required CCWA to select scenarios for further analysis. Once capacity options were established for each facility, the next step was to screen the list of scenarios based on assumptions regarding the water production system. These assumptions included:

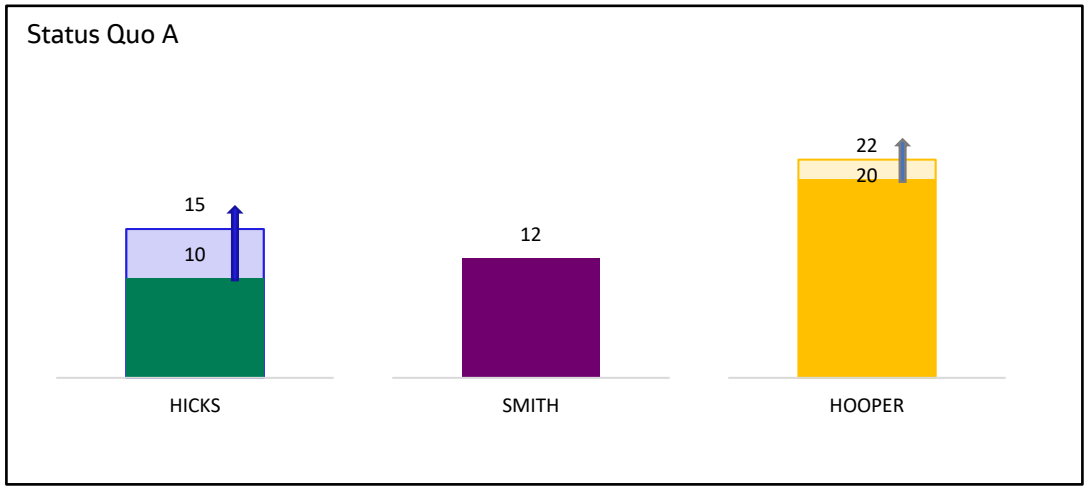
- The Hooper WPP will not be expanded beyond 22 MGD, which is the maximum withdrawal allowed from the Hooper Reservoir.
- A new 49-MGD Hicks WPP will not be considered for evaluation, as CCWA did not want to consider scenarios with only one WPP.

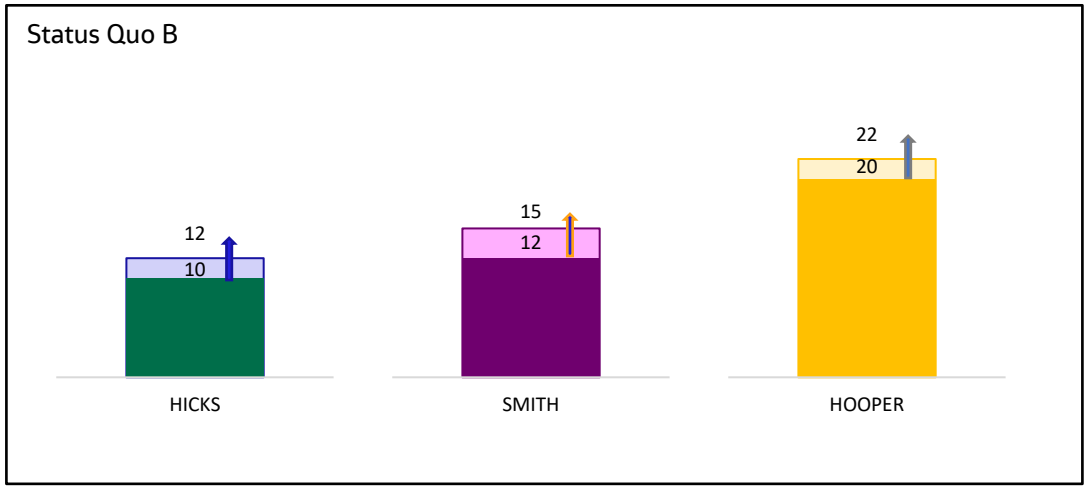
- The water production capacity must be at least 49 MGD to match 2050 demand and to maximize use of existing permitted raw water withdrawal. Scenarios requiring a new raw water withdrawal permit were eliminated.
- Alternatives should generally reduce the need to purchase water from other entities as much as possible.
- Any scenario that resulted in two major plant expansions would not be considered.

Based on this screening criteria, three scenarios remained at the end of the screening exercise (Exhibits B-6 and B-7).

Exhibit B-6. 2050 Future Plant Capacities by Scenario

Scenario	Permitted Maximum Day Capacity (MGD)			
	Hicks WPP	Smith WPP	Hooper WPP	Total Combined
Existing Conditions	10	12	20	42
Status Quo A	15	12	22	49
Status Quo B	12	15	22	49
Decommission Smith WPP	27	0	22	49





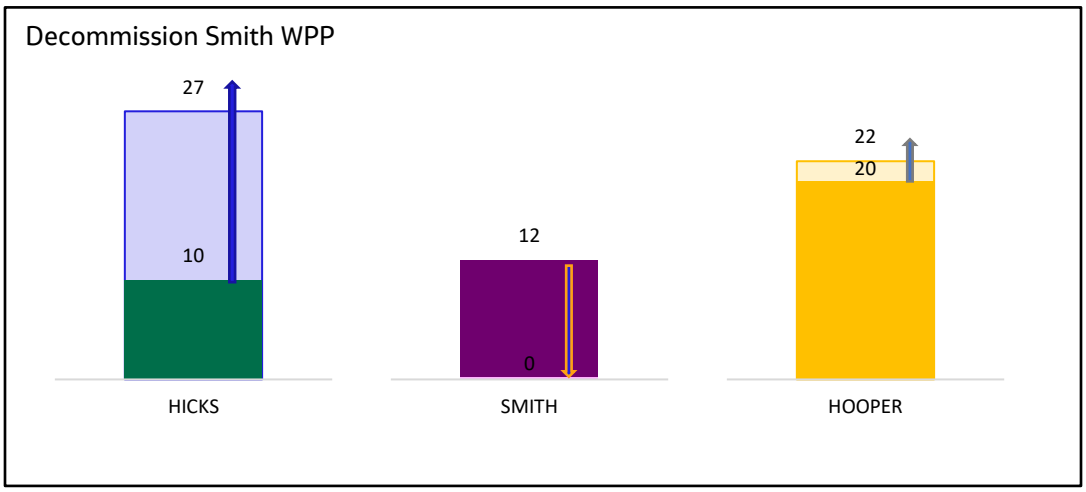


Exhibit B-7. Graphical Summary of 2050 Future Plant Capacities by Scenario

B.3.2 Engineering Analysis

An engineering analysis was performed on the final scenarios to determine the feasibility of the proposed modifications, as well as to provide planning-level cost estimates. Results were reviewed by the project team and incorporated into decision-making process for the final recommended scenario.

Appendix B includes the individual components of each of the scenarios, in a timeline format. For each scenario, the timeline shows projects that would occur between 2020 and 2050. This includes projects related to process equipment, structural components, and necessary plant upgrades for each WPP, as well as associated changes to the distribution and conveyance systems. The methodology for developing these timelines is outlined herein.

B.3.2.1 Methodology

The engineering analysis was conducted to determine capital investments, as well as O&M costs for each of the facilities over the 30-year planning period. Asset information from the JD Edwards system was sorted by facility, from which the age and cost of plant assets were derived. The engineering analysis involved the following steps:

- Obtain record drawings and feedback from management and plant staff through workshops and individual meetings to determine the age and condition of existing infrastructure.
- Develop lifecycle assumptions for major WPP components.
- Develop a timeline for expanding or decommissioning WPPs based on projected demands and, for expansions, the optimal timing to realize the full value of existing assets.
- Develop conceptual designs for plant expansions.

The lifecycle assumptions were collaboratively determined at project workshops and based on historical information and industry trends. These assumptions, summarized in Exhibit B-8, were used to create a timeline for replacement for each piece of equipment considered in the analysis.

Exhibit B-8. Lifecycle Assumptions for Engineering Analysis

	Replacement Cost[a]	Replacement Frequency (years)
Process Equipment Useful Life	100% of original asset cost	20
Pumps: Transfer, Backwash, High Service, Raw Water	100% of original asset cost	30
Other pumps	100% of original asset cost	20
Electrical Equipment	100% of original asset cost	20
Chemical Feed Systems	100% of original asset cost	20
Controls	100% of original asset cost	10
Buildings and Structural Components – Surface Repair	$20/ft2 [b]	20
Buildings and Structural Components - Rehabilitation	$40/ ft2 [b]	40

[a] Asset replacement assumes in-kind replacement of existing equipment, structure, or system at the original cost escalated to the year of evaluation (2019).

[b] Structural rehab and repair costs determined based on surface area of wetted concrete.

Note:

ft2= square foot

B.3.2.2 Water Production Results

The following section details the necessary upgrades and improvements to WPPs for each scenario. Along with the proposed modification summarized for each WPP, all the existing infrastructure would require upgrades and replacements on the lifecycle timeline outlined in the engineering methodology section.

Status Quo A

In the Status Quo A scenario, all three WPPs would operate through 2050, with two major modifications: upgrading Hooper to 22 MGD in 2023 and high-rating Hicks WPP to 15 MGD 2034. Exhibit B-9 shows the potential timing of these modifications, based on demand projections and the condition of existing plant infrastructure.

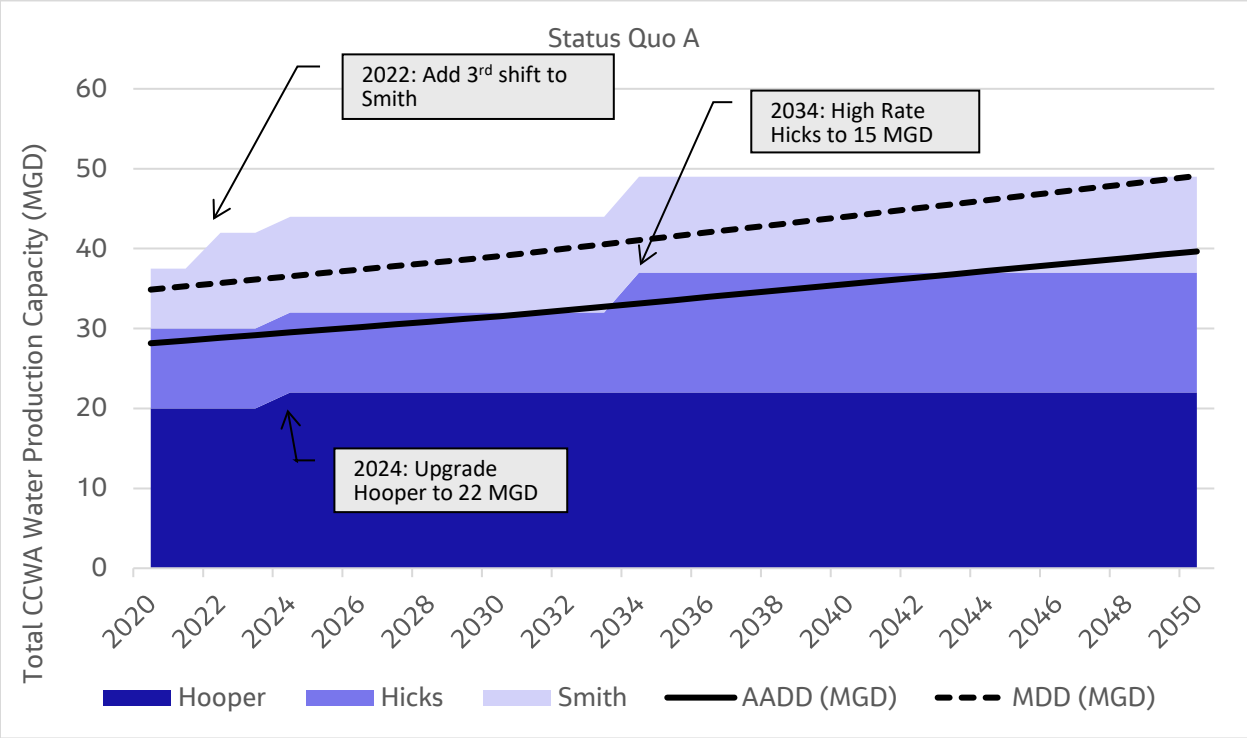


Exhibit B-9. Status Quo A Project Timeline

Several efficiency and capacity upgrades will be required at the WPPs in order to meet the projected water demands and to maximize the utilization of the system-wide permitted withdrawal of 49 MGD by 2050. These upgrades are described in the following sections.

Terry R. Hicks WPP

As part of the water production strategy shown in Exhibit B-9, 5 MGD of treatment capacity would be added to the Hicks WPP. An analysis of firm versus maximum treatment capacity was completed for each process at the Hicks WPP to determine potential bottlenecks during the process of re-rating the plant, where it was revealed that there may be some challenges to feasibly high-rating Hicks WPP to 15 MGD. Based on an initial review of loading rates, it was determined that capacity bottlenecks at the plant are the Claricone and Filtracone systems. A detailed analysis would need to be completed to confirm if the plant could be high rated to a capacity of 15 MGD. The filter loading rate at 15 MGD will require further study, but the higher clarifier overflow rate will require an EPD waiver and presents the greater challenge.

To increase the Hicks WPP capacity to 15 MGD, a high-rate study would be performed to determine the feasibility and to define the improvements necessary to treat an additional 5 MGD. This includes improvements to the existing high-service pump station, the Blalock Reservoir Raw Water Pump Station, the Smith Reservoir Raw Water Pump Station, the ultraviolet (UV) disinfection system, and a retrofit of the Claricone system to include tube settlers. The Georgia Environmental Protection Division (GAEPD) High

Rating Guidelines indicate granular media filters which are planned to be high-rated to a loading rate beyond 4.0 gpm/ft^2 will be required to complete a 180-day pilot test. GAEPD Minimum Standards for Public Water Systems further specify that GAEPD will require "supporting data" (i.e. a pilot study) should an entity wish to operate a solids contact clarifier at an upflow rate greater than 1.0 gpm/ft^2. Thus, a pilot study will be needed in order to upgrade either system, if feasible.

The Status Quo A scenario also includes replacing the existing lime dry-feed system with a liquid lime system, adding a redundant blower to the filtration system, and implementing solids handling improvements to address equipment which is nearing the end of its useful life.

J. W. Smith WPP

In the Status Quo A scenario, a third shift would be added in 2022 to increase production to rated plant capacity of 12 MGD. Other modifications required for the J. W. Smith WPP to operate at the rated capacity include adding intake screens at the Flint River intakes, improving the solids handling system (replacing aged flocculators and thickener rake mechanism), and adding flood-proofing at the plant. CCWA is currently in the process of upgrading the high service pump station to restore pumping capacity back to 12 MGD.

W. J. Hooper WPP

To meet projected water demands, and to maximize the permitted withdrawal of 22 MGD from Hooper Reservoir, 2 MGD of treatment capacity would be added to the Hooper WPP. As part of this 2 MGD upgrade, two additional filters would be added, and all filters may utilize granular activated carbon (GAC) media; changing to GAC is currently being explored as part of the Hooper WPP GAC Filter Pilot Testing project. The additional filters were designed as part of a previous expansion but were not constructed. The filter addition, which is included in the 2020 SMP Project List as 20-304 / Hooper GAC Filter Retrofit and Plant High Rating, would allow for 11 duty filters and 1 standby filter for a total plant capacity of 22 MGD. As part of these upgrades, the 10 existing filters will tentatively be retrofitted with GAC media to treat future taste and odor concerns and to stay ahead of future regulations. To prevent media loss which may occur during backwash due to shallow filter beds, media retaining troughs are included in this project. The filter underdrains would be replaced to accommodate an air scour header for improved cleaning of the media and due the age of the existing underdrains.

The Status Quo A scenario also includes a project at Hooper WPP to add redundancy and reliability improvements

Status Quo B

In the Status Quo B scenario, all three plants will be upgraded to meet the projected maximum day demand of 49 MGD (Exhibit B-10).

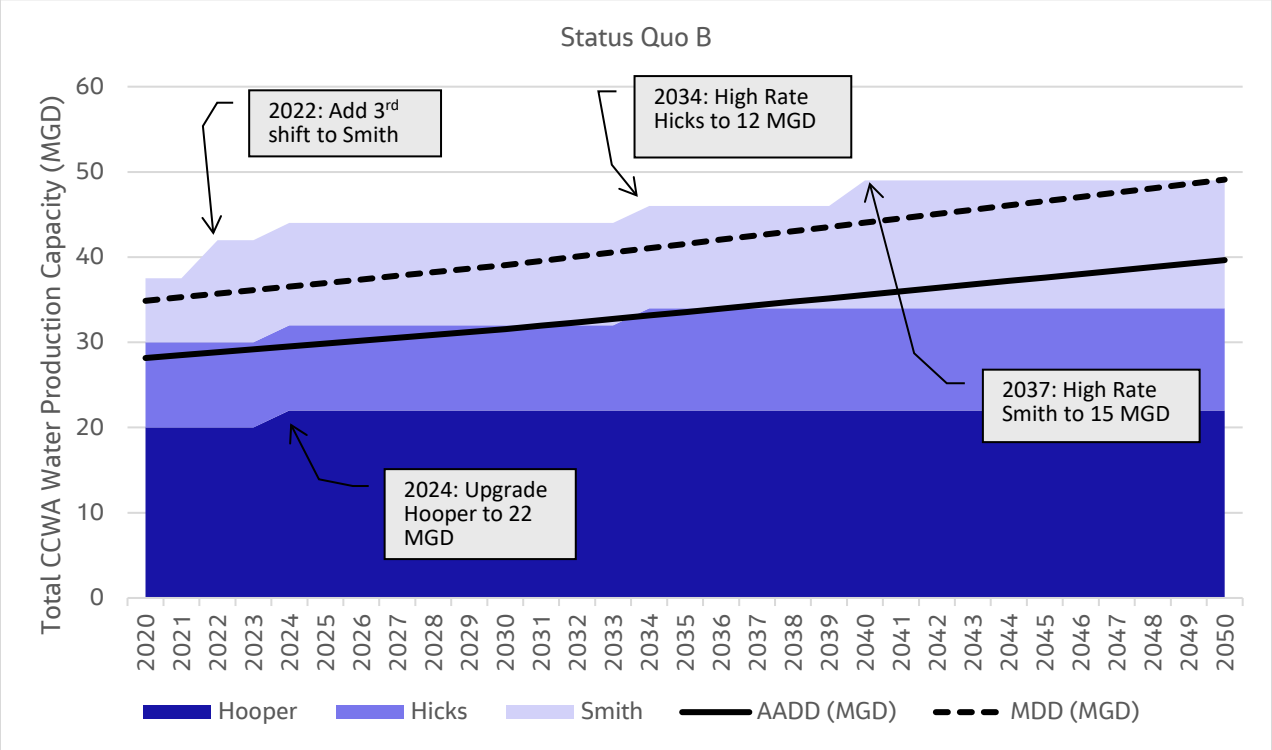


Exhibit B-10. Status Quo B Project Timeline

Efficiency and capacity upgrades which will be required at the WPPs are described in the following sections.

Terry R. Hicks WPP

To meet the projected water demands, and to maximize the permitted withdrawal of 49 MGD by 2050, 2 MGD of treatment capacity would be added to the Hicks WPP. At a rise rate of 1.0 gpm/ ft^2, the Claricones can accomplish a maximum capacity of 12.0 MGD and a firm capacity of 8.0 MGD.

The Status Quo B scenario also includes projects to replace the existing lime dry-feed system with a liquid lime system, add a redundant blower to the filtration system, and construct solids handling improvements due to end-of-useful-life assumptions.

To increase the Hicks WPP capacity to 12 MGD, a high-rate study would be performed to determine the feasibility and to identify the improvements necessary to treat an additional 2 MGD. These may include improvements to one or more areas including the existing high-service pump station, the Blalock Reservoir Raw Water Pump Station, the Smith Reservoir Raw Water Pump Station, and the Claricone system to include tube settlers.

J. W. Smith WPP

In the Status Quo B scenario, a third shift would be added in 2022 to increase production to rated plant capacity of 12 MGD. To meet the projected water demands and to maximize the permitted withdrawal of 49 MGD by 2050, 3 MGD of treatment capacity would be added to the Smith WPP. At the plant's current

rated maximum capacity of 12 MGD, the filter loading rate is 2.85 gpm/ft^2; at the proposed capacity of 15 MGD, the filter loading rate is 3.57 gpm/ft^2.

To increase the Smith WPP capacity to 15 MGD, a high-rate study of the entire plant would be performed. The study will identify necessary upgrades to treat 15 MGD which may include retrofitting the existing sedimentation basins with plate settlers and installing a second thickener to accommodate increased solids production. Other modifications required for the Smith WPP to operate at rated capacity include adding intake screens at the Flint River intakes and adding flood-proofing at the plant.

W. J. Hooper WPP

In the Status Quo B scenario, the Hooper WPP timeline would be the same as that in the Status Quo A scenario.

Decommission Smith WPP

In the Decommission Smith WPP scenario, the J. W. Smith WPP would be decommissioned, and finished water would be supplied by a New Hicks WPP and an upgraded Hooper WPP (Exhibit B-11).

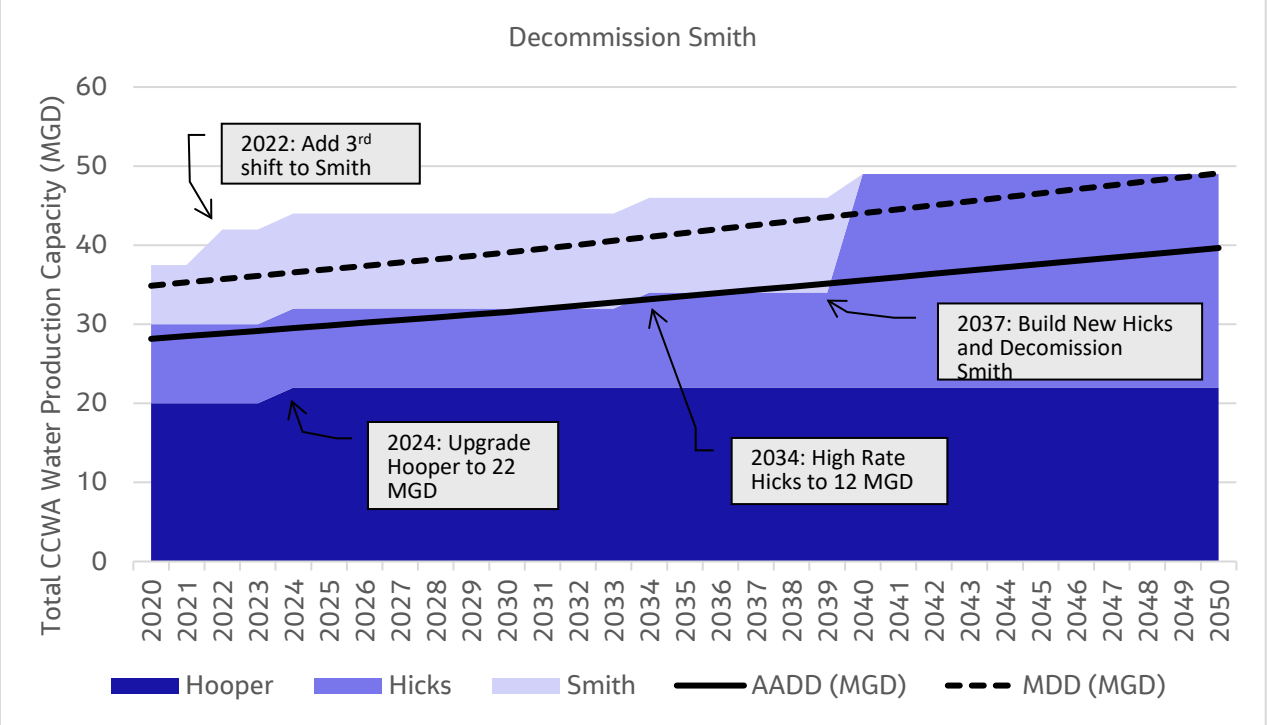


Exhibit B-11. Decommission Smith WPP Project Timeline

Efficiency and capacity upgrades which will be required at the WPPs are described in the following sections.

Terry R. Hicks WPP

The expansion of the existing Hicks WPP was not considered as a part of this analysis due to the limited amount of space available for new treatment processes. To minimize the initial construction cost incurred, it is recommended to take a phased approach to the construction of the New Hicks WPP. This will allow

CCWA to maximize the useful life of the existing Hicks WPP, and the sequential construction of treatment trains at the New Hicks WPP will allow for increased reliability.

In this scenario, 2 MGD of treatment capacity would be added to the Hicks WPP in 2034 to ensure CCWA could meet average daily demand with one plant down for maintenance and delay the need for the new plant construction. The new plant (New Hicks WPP) would be built on the land adjacent to the existing plant. This is an ideal location for an expanded water plant, because it is central within the County, near distribution system re-pump stations, and will maximize the use of the existing raw water conveyance infrastructure.

The proposed new WPP (Exhibit B-12) would be a filter plant with conventional flocculation/ sedimentation, clarification, GAC filtration, UV disinfection, and ozone treatment. The plant would also have thickening, mechanical dewatering, and bulk chemical storage. The existing Hicks WPP would be decommissioned following the construction of the new conventional filtration plant.

Contrary to the previous evaluation, a membrane plant was not considered feasible due to the relatively high rejection rates associated with membrane technology. Considering that 2050 MDD is just above total plant capacity (equal to maximum permitted raw water withdrawal), it is important to consider technologies that maximize the ratio of drinking water production to raw water consumption.

J. W. Smith WPP

Decommissioning the Smith WPP was identified as feasible due to the relatively low demands in the southern portion of the County and the large number of assets requiring renewal at the plant. In this scenario, the Smith WPP would be decommissioned in the year 2040 shortly after the New Hicks WPP came online. Under this scenario, there will be a project to demolish existing infrastructure.

W. J. Hooper WPP

In the Decommission Smith WPP scenario, the Hooper WPP timeline would be the same as that in the Status Quo A scenario.

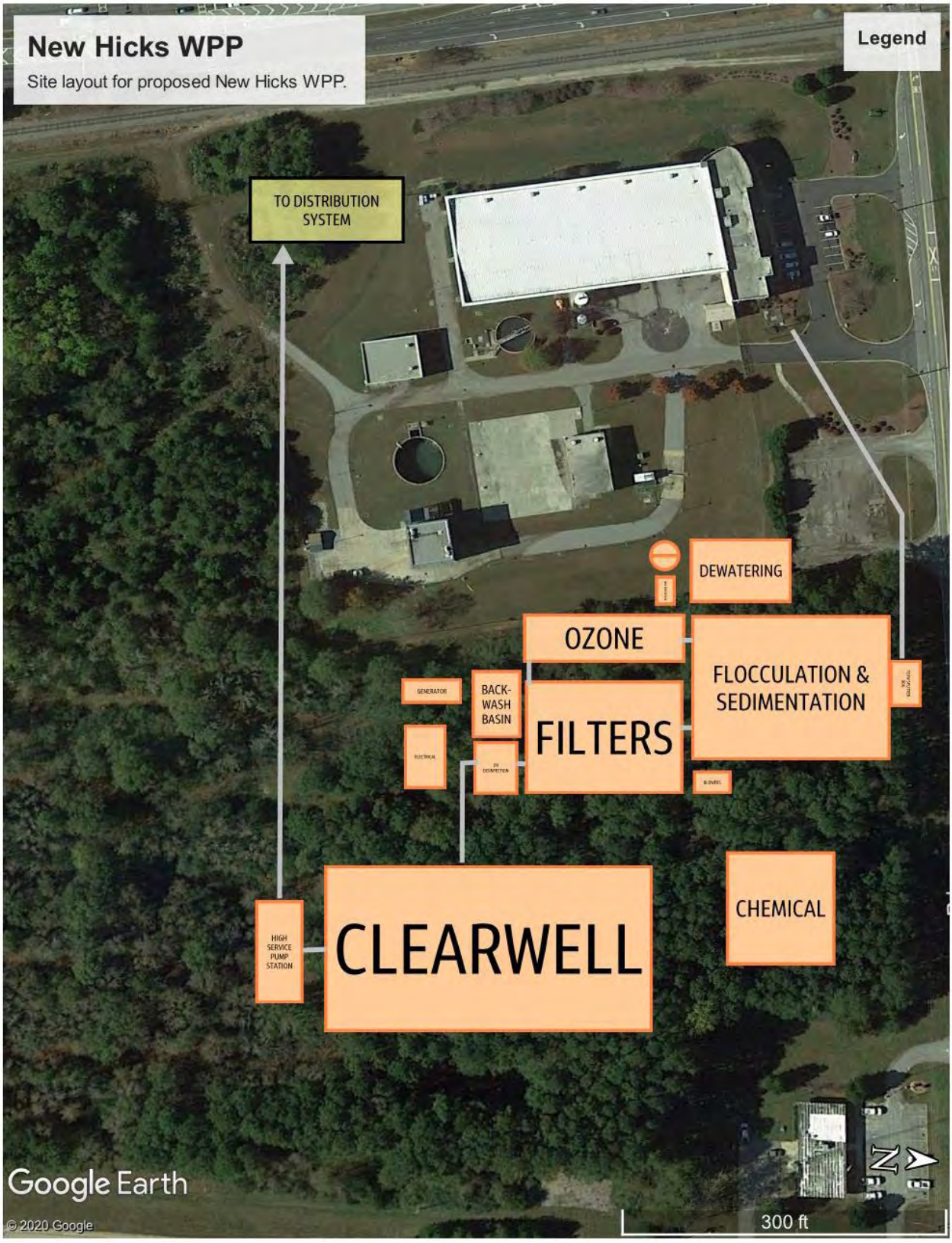


Exhibit B-12. Proposed New Hicks WPP Site Layout

B.3.2.3 Distribution Results

The distribution system analysis used the demands presented in Section 1.3 of the *Strategic Master Plan Report* to predict the distribution system changes required under each scenario. These demands include new commercial growth, population-based demands, and the assumption that the College Park MDD in 2050 will not exceed 2 MGD. It is recommended that CCWA compare actual water production demands with the 2020 SMP projected demands on an annual basis to confirm that the recommended timeline for completion of capital projects remains accurate.

It is assumed that under all scenarios, all elevated storage tanks within the system are taken offline and that the construction of the Northwest and North Booster Pump Stations is completed, per the recommendations of the reports following the *Water Distribution System Model* (JA-RE-16-08) and *Water Production and Storage Analysis* (JA-RE-18-07).

Additionally, there were two further upgrades identified during this analysis that will be needed under all scenarios if demand in the northern part of the County grows as expected:

1. By the year 2037, the Jonesboro ground storage tank (GST) must be converted to a booster pump station by removing the existing GST and increasing the pumping capacity.

2. It will also be necessary to upgrade the transmission main from the Hicks WPP to the Morrow GST to accommodate higher demands in the northern region of the County. The timing and necessity of these two projects are tied to the demand projections used for this SMP.

Status Quo A

Under the Status Quo A scenario, two projects, in addition to those summarized above, will be necessary, but not until after 2030. It will be necessary to replace the pumps at Noah's Ark Repump Station to obtain a firm pumping capacity of 27 MGD in the year 2033 before the Hicks WPP can be high-rated. CCWA will also need to install pressure-regulating valves (PRVs) on the 30-inch transmission main that extends from Noah's Ark to the Morrow GST. These PRVs would allow water from the Hooper WPP to flow north toward Morrow GST. Initially, the flow would be 8 MGD for 2020 to 2030 and then are projected to increase to 4 MGD after 2030.

Status Quo B

Under the Status Quo B scenario, the same two distribution projects required for Status Quo A (replacing pumps at Noah's Ark Repump Station and installing PRVs) will be necessary. Additionally, the existing transmission main (approximately 8 miles) from Smith WPP to Noah's Ark must be upsized in 2037 from a 24-inch diameter to a 30-inch diameter pipeline (or a smaller parallel line installed) to accommodate higher production at the Smith WPP after capacity is increased.

Decommission Smith WPP

Under the Decommission Smith WPP scenario, the same two projects (replacing pumps at Noah's Ark Repump Station and installing PRVs) required for Status Quo A and Status Quo B will be necessary.

In addition, two significant distribution system projects are required under the Decommission Smith scenario. By the year 2037, it will be necessary to upgrade the transmission main from the Hooper WPP to the Morrow GST to a 24-inch pipe diameter. Before Smith WPP is decommissioned in 2041, when the New Hicks WPP comes online it will be necessary to install 36-inch distribution piping (approximately

8,600 linear feet of pipeline to the Hooper low-pressure service area). This assumes the Noah's Ark Repump Station is replaced with new high-service pumping at the New Hicks WPP. If that occurs, the south leg of Hooper WPP transmission system will no longer be operational, and distribution upgrades will be required to supply water to the Hooper Low Pressure service area.

B.3.2.4 Water Production Scenario Summary

There were several projects identified during the Engineering Analysis that are required from 2020-2050 to maintain the treatment capacity of water production facilities, however certain upgrades were identified as necessary only in certain scenarios. Exhibit B-13 below summarizes the key differences in projects required under the different scenarios. While it will be critical to complete the high rate feasibility studies in the near-term to select a final scenario, the capital upgrades associated with each scenario are roughly equivalent between the three scenarios for the next two 5-year planning cycles. Thus, as CCWA selects a scenario for implementation now it should be noted that minimal investment will be lost if they pivot to a different scenario in the future.

Exhibit B-13. Summary of Water Production Improvements by Scenario

Improvements	Status Quo A	Status Quo B	Decommission Smith WPP
Improvements (2020-2030)			
Efficiency Improvements	X	X	X
Redundancy Improvements	X	X	X
Upgrade Hooper WPP to 22 MGD	X	X	X
Hicks WPP Solids Handling Improvements	X	X	
Smith WPP Improvements – Replace flocculators, solids handling improvements	X	X	
Hicks WPP Liquid Lime Upgrade	X	X	X
Flint River Pump Station Improvements	X	X	X
Chemical Feed System Storage Replacement	X	X	X
Smith Reservoir Oxygenation System	X	X	X
Improvements (2030-2040)			
Replace Pumps and PRVs	X	X	X
High Rate Hicks WPP to 15 MGD	X		
Expand Hicks WPP to 12 MGD		X	X
Expand Smith WPP to 15 MGD		X	
New Hicks WPP			X
Upgrade Smith RW PS (10 to 17 MGD)			X
Upgrade Transmission Main from Hicks WPP to Morrow GST, Convert Jonesboro to Booster Pump Station	X	X	X
Install 8615 LF from New Hicks WPP to the Hooper LPZ			X
Upgrade Transmission Main, Hooper WPP to Morrow GST			X
Smith to Noah's Ark: 24 to 30-inch line replacement		X	

Exhibit B-13. Summary of Water Production Improvements by Scenario

Improvements	Status Quo A	Status Quo B	Decommission Smith WPP
Improvements (2040-2050)			
Demolish Smith WPP			X
Abandon Noah's Ark and Smith WPP			X

As previously noted, the WPPs currently average 86% efficiency across all three plants. Since projected MDD in 2050 is 49.1 MGD and current raw water permitted withdrawal is 49 MGD, it would not be prudent to assume that it will be possible to operate all three plants at 100% efficiency to meet MDD in 2050. It is recommended to perform an evaluation and implementation of all possible efficiency improvements at the WPPs to help maximize allocated raw water withdrawal. This may include the implementation of returning the backwash and gravity thickener overflow to the head of the plant. These improvements will improve overall plant efficiency, thus allowing urgent capital upgrades to be delayed. With these improvements and continued comparison of actual to projected demand, future need for an increase of withdrawal permitted capacity or connections to neighboring communities can be assessed.

B.3.3 Cost-Benefit Analysis

The final step in identifying the optimal configuration of WPPs was to evaluate the financial and nonfinancial impacts of each scenario. This involved developing planning-level cost estimates to implement the scenarios over the next 30 years, as well as developing scoring criteria and scoring the scenarios to compare the benefits of each. The cost-benefit analysis formed the basis for the selection of the final recommended scenario.

B.3.3.1 Cost Estimation Methodology

The detailed engineering analysis, together with lifecycle and O&M assumptions, were used to develop detailed cost estimates over the next 30 years for each of the three scenarios. For capital improvements included in each scenario, planning-level cost estimates were developed using CCWA's asset data from JD Edwards, vendor quotes, and Jacobs' Parametric Cost Estimating System (CPES).

O&M cost estimates for the WPPs include costs for chemicals, power, external maintenance, and staffing. To determine a basis for external maintenance costs, an average of historical CCWA O&M costs from 2016-2018 was used as a baseline. Beyond this baseline cost, external maintenance costs were escalated at 3 percent annually. To determine a basis for chemicals, power, and staffing costs, the most recent year of data (2018) available at the time was used to determine a baseline cost. Beyond this baseline cost, power and chemical costs were scaled based on average annual plant flows. Future staffing considerations were handled on a case-by-case basis for each plant, as discussed by the project team at the Scenario Development Workshop. Power cost calculations did not include distribution system pumping costs.

The capital investments and O&M costs for each plant were combined for each scenario, and the cumulative cost was converted into net present value (NPV) for a comparison of each scenario in 2019 dollars. The NPV calculations included the following assumptions:

- Base cost estimates are in 2019 dollars
- 30-year study period (2020-2050)

- Real discount rate of 2 percent
- No revenues or cash savings
- Salvage values were applied to assets with life remaining beyond 2050

B.3.3.2 Cost Estimation Results

Based on the cost methodology, the NPV of the 30-year cost for the three water production scenarios ranged from $206.9 million to $332.3 million (Exhibits B-14 and B-15). The capital cost ($166 million) of building a New Hicks WPP by 2040 in the Decommission Smith WPP scenario far outweighs the costs associated with the capital projects required for the WPPs under the different scenarios and thus it has the highest overall cost during this specific time period. The Decommission Smith WPP scenario does include ozone and GAC advanced treatment processes at the New Hicks WPP, but even when those processes are removed, the Decommission Smith WPP scenario is still the most expensive scenario.

Exhibit B-14. 2020-2050 NPV Cost Summary Table

	Status Quo A	Status Quo B	Decommission
Capital – Water Production Facilities[a]	$58,990,000	$61,440,000	$178,220,000
Capital – Distribution System[b]	$11,480,000	$23,590,000	$21,630,000
Operating	$136,440,000	$137,650,000	$132,420,000
Total	**$ 206,910,000**	**$ 222,680,000**	**$ 332,270,000**

[a] Includes costs from SMP Water Production Project list, asset replacement, and estimated costs of large capital upgrades necessary for each scenario.

[b] Includes estimated cost of distribution system capital upgrade projects necessary for each scenario.

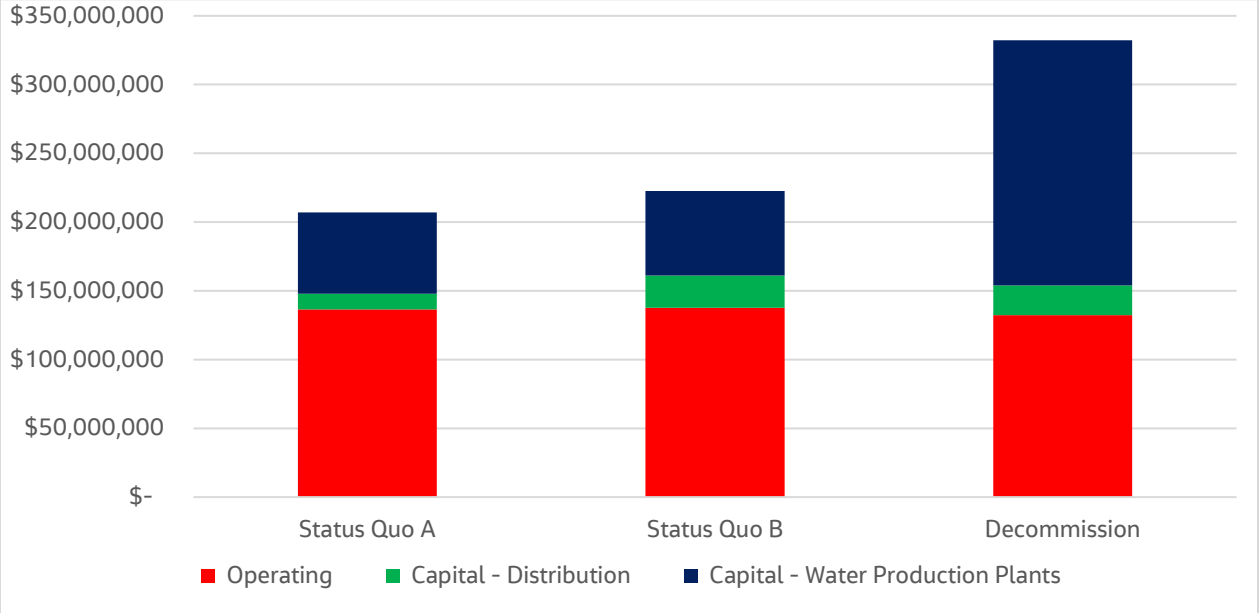


Exhibit B-15. 2020-2050 NPV Cost Summary Graph

Certain distribution projects under Status Quo B and Decommission Smith carry significant costs. Under Status Quo B, it will be necessary to upgrade the transmission main from the Smith WPP to Noah's Ark for an estimated total cost of $31 million in 2038. Under the Decommission Smith WPP scenario, which involves abandoning Noah's Ark, it will be necessary to upgrade the transmission main from the Hooper low-service area to the Morrow GST for an estimated cost of $16.6 million. Further, it will be necessary to install a 36-inch ductile iron pipe transmission main from the New Hicks WPP to the Hooper low pressure service area for an estimated cost of $9.5 million.

While the NPV of operational costs associated with each scenario were approximately equal, significant savings are realized under the Decommission Smith scenario after the Smith WPP is decommissioned (Exhibit B-16). In 2050, the average annual operating costs are $6.7 million, $6.8 million, and $6.0 million. It is noted that the cost of power at the Smith WPP is almost double that at either the Hooper or Hicks WPPs. Both the Smith and Hooper WPPs utilize the same Georgia Power rate plan that is based on the time of day that the power is consumed, whereas the Hicks WPP utilizes a rate plan that becomes cheaper as more power is consumed.

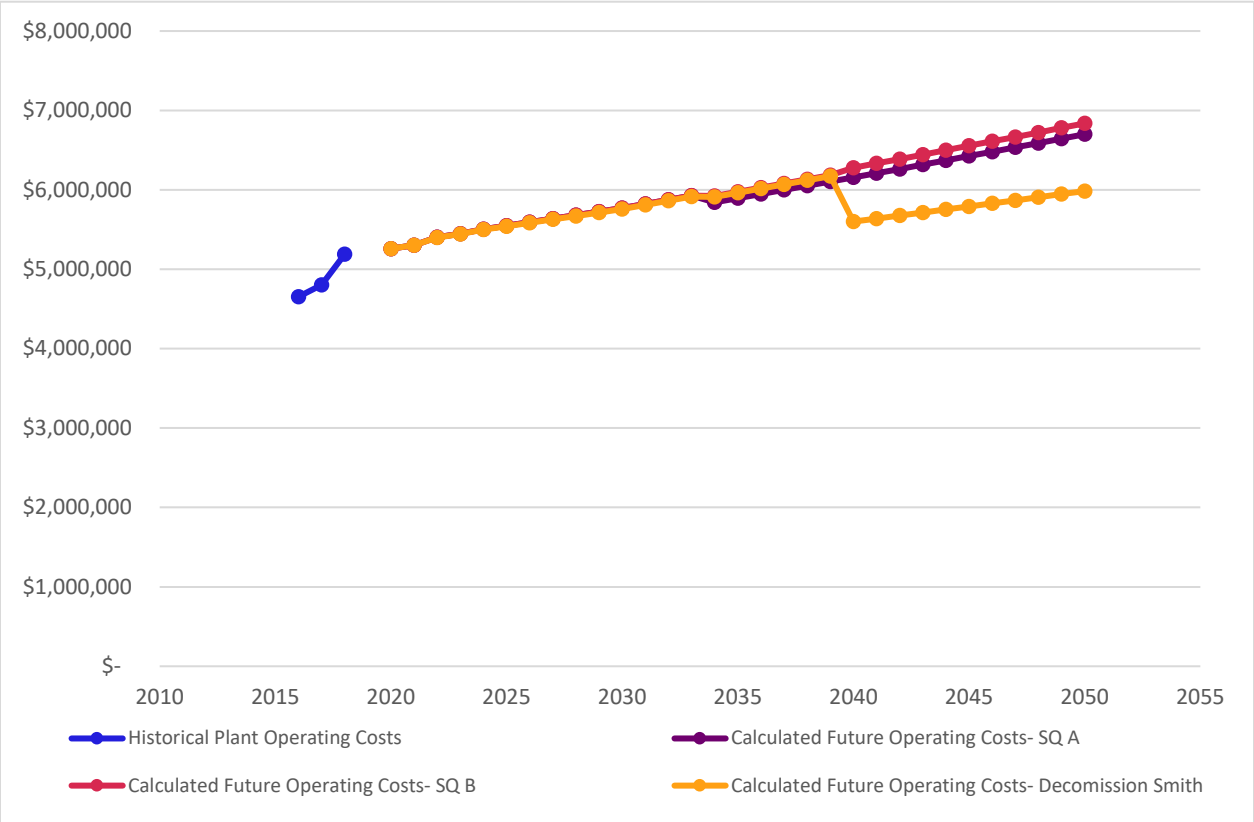


Exhibit B-16. 2020-2050 Annual WPP Operating Costs (Historical and Projected)

B.3.3.3 Performance Measures and Weighting

The project team elected to use the performance measures developed for the 2017 Facility Evaluation to evaluate the water production scenarios. These performance measures include components of the scoring criteria developed for the 2015 SMP Update. The performance measures are intended to represent nonfinancial considerations and represent all stakeholders with interest in the future of CCWA.

Performance measure weights were determined through a pair-wise scoring exercise, where the importance of each measure is compared against each other. During this exercise, CCWA staff were asked to compare each performance measure to one another and indicate which is more important to them. The winner of the performance measure comparison drove the weights of each performance measure.. The weights do not indicate a lack of importance only that these criteria will not drive a decision but may serve as a tiebreaker among technically equivalent scenarios.

Exhibit B-17. Pair-wise Process Weighting Results

Performance Measures	Performance Measure Description	Weight (%)
Inter-basin Transfer (IBT) Management	Optimizes water allocation to where water resources are most highly valued.	11
Redundancy/Reliability (R/R)	Ensures ongoing, timely, cost-effective, reliable, and sustainable performance improvements, making provision for continuous operations even when maintenance requires taking major system components offline.	24
Operational Optimization/Resiliency (OO)	Optimize operations to control costs and ensure CCWA can respond effectively to changing regulatory, environment, and economic conditions.	20
Infrastructure Stability (IS)	Understands the condition of and costs associated with critical infrastructure assets. Maintains and enhances the condition of all assets over the long-term at the lowest possible life-cycle cost and acceptable risk consistent with customer, community, and regulator-supported service levels, and consistent with anticipated growth and system reliability goals.	24
Stakeholder Support (SS)	Engenders understanding and support from oversight bodies, community and watershed interests, and regulatory bodies for service levels, rate structures, operating budgets, capital improvement programs, and risk management decisions. Manages operations to protect the natural environment; efficiently uses water and energy resources; promotes economic vitality; and encourages overall community improvement.	3
Negative Construction Impact (NCI)	Minimizes environmental and community disturbance during construction activities.	5
Environmental Sustainability (ES)	Promote sustainable engineered systems that support human well-being and that are also compatible with sustaining natural (environmental) systems	13

B.3.3.4 Benefit Scoring and Cost-Benefit Results

Scenarios were then scored using a scale described in Exhibit B-18.

Exhibit B-18. Scenario Scoring Worksheet

Facility Evaluation Update					
	Scale				
Scoring Factors	**0**	**1**	**3**	**7**	**10**
Inter-basin Transfer (IBT) Management: Optimize water allocation to where water resources are most highly valued	Potential Negative Impact	No Impact	MAY optimize water allocation	LIKELY to optimize water allocation	WILL optimize water allocation
Redundancy/Reliability (R/R): Ensures ongoing, timely, cost-effective, reliable, and sustainable performance improvements, making provision for continuous operations even when maintenance requires taking major system components offline.	Potential Negative Impact	No Impact	MAY improve reliability OR MAY improve sustainability OR MAY increase redundancy	LIKELY to improve reliability AND LIKELY to improve sustainability OR LIKELY to increase redundancy	WILL improve reliability AND WILL improve sustainability AND WILL increase redundancy
Operational Optimization/Resiliency (OO): Optimize operations to control costs and ensure CCWA can respond effectively to changing regulatory, environment, and economic conditions	Potential Negative Impact	No Impact	MAY improve efficiency OR MAY improve responsiveness/recovery OR MAY reduce risk	LIKELY to improve efficiency AND LIKELY to improve responsiveness/recovery OR LIKELY to reduce risk	WILL improve efficiency AND WILL improve responsiveness/recovery AND WILL reduce risk
Infrastructure Stability (IS): Understands the condition of and costs associated with critical infrastructure assets. Maintains and enhances the condition of all assets over the long-term at the lowest possible life-cycle cost and acceptable risk consistent with customer, community, and regulator-supported service levels, and consistent with anticipated growth and system reliability goals.	Potential Negative Impact	No Impact	Addresses a FEW best practices OR reduces risk	Addresses a FEW best practices AND reduces risk	Addresses SEVERAL best practices AND reduces risk
Stakeholder Support (SS): Engenders understanding and support from oversight bodies, community and watershed interests, and regulatory bodies for service levels, rate structures, operating budgets, capital improvement programs, and risk management decisions. Manages operations to protect the natural environment; efficiently uses water and energy resources; promotes economic vitality; and encourages overall community improvement.	Potential Negative Impact	No Impact	MAY improve relationships/positive media OR MAY improve watershed protection OR MAY support economic development	LIKELY to improve relationships/positive media AND LIKELY to improve watershed protection OR LIKELY to support economic development	WILL improve relationships/positive media AND WILL improve watershed protection AND WILL support economic development
Negative Construction Impact (NCI): Minimizes environmental and community disturbance during construction activities.	Potential Negative Impact	No Impact	MAY reduce community disturbance	LIKELY to reduce community disturbance	WILL reduce community disturbance
Environmental Sustainability (ES): Promote sustainable engineered systems that support human well-being and that are also compatible with sustaining natural (environmental) systems.	Potential Negative Impact	No Impact	MAY lead to increased sustainability	LIKELY to lead to increased sustainability	WILL lead to increased sustainability

CCWA staff assigned a performance measure score from 0 to 10 (0 being the worst score and 10 being the best) for the three final WPP scenarios for each of seven scoring criteria summarized in Exhibit B-20. Scores were assigned in a workshop conducted on December 18, 2019 with the CCWA Management Team and Jacobs.

Exhibit B-19. Performance Measure Scoring – Water Production

Scenario	Unweighted Score	Reason	Weighted Score
Criterion 1 - Interbasin Transfer Management (Weighting = 11)			
Status Quo A	1	There are no differences in IBT between the different scenarios and they will therefore all receive the same score.	0.1
Status Quo B	1		0.1
Decommission Smith	1		0.1
Criterion 2 - Redundancy and Reliability (Weighting = 24)			
Status Quo A	7	It was decided that having three plants is more reliable and redundant than having two plants.	1.7
Status Quo B	7	It was decided that having three plants is more reliable and redundant than having two plants.	1.7
Decommission Smith	3	It was collectively decided that having one less plant is less reliable and redundant, even though the New Hicks WPP will be designed with improved reliability.	0.7
Criterion 3 - Operational Optimization and Resiliency (Weighting = 20)			
Status Quo A	3	This scenario was considered "in-between" the other scenarios.	0.6
Status Quo B	1	This scenario received a lower score, as it involves producing more water at the Smith WPP, which has a much higher power cost than either the Hicks or Hooper plants.	0.2
Decommission Smith	7	The New Hicks WPP will have ozone and GAC systems, which are not only innovative but will also respond more effectively to emerging contaminants of concern.	1.4
Criterion 4 - Infrastructure Stability (Weighting = 24)			
Status Quo A	3	No creation of "new" assets.	0.7
Status Quo B	3	No creation of "new" assets.	0.7
Decommission Smith	7	The New Hicks WPP will be a brand-new asset, and therefore receives a higher score.	1.7

Exhibit B-19. Performance Measure Scoring – Water Production

Scenario	Unweighted Score	Reason	Weighted Score
Criterion 5 - Stakeholder Support (Weighting = 3)			
Status Quo A	3	Several factors were discussed regarding stakeholders. Some CCWA expressed that expanding Hicks could have a negative construction impact. Other CCWA staff expressed an equity concern about water quality throughout the system. After a lengthy discussion, it was determined that each scenario has positive and negative stakeholder impact and the staff could not distinguish between the scenarios. It was determined that all three scenarios would score a 3.	0.1
Status Quo B	3		0.1
Decommission Smith	3		0.1
Criterion 6 - Negative Construction Impact (Weighting = 5) *After discussion with the staff about this scoring factor, the scoring factor was changed to "Construction Impact." The greater the construction impact, the lower the score.*			
Status Quo A	7	There are no major "new" construction projects that will affect the communities serviced by CCWA, and this scenario therefore receives the highest score.	0.4
Status Quo B	0	This scenario requires the construction of a new transmission main, which will require construction on several private properties. The construction impact was deemed to be a negative.	0
Decommission Smith	3	This scenario received a middle score as there would be new construction; however, it would take place "within a fence" on property that CCWA already owns.	0.2
Criterion 7 - Environmental Sustainability (Weighting = 13)			
Status Quo A	3	After a lengthy discussion about sustainability, it was determined that all three scenarios had generally the same level of sustainability. Keeping all three plants was deemed sustainable by not disturbing the environmental with the New Hicks WPP. The New Hicks WPP was also deemed sustainable, as it would produce high-quality water with a smaller footprint as water production innovation increases. In the end, the CCWA staff determined that each scenario possessed differing sustainable qualities, and each one was assigned a 3.	0.4
Status Quo B	3		0.4
Decommission Smith	3		0.4

Exhibit B-20 shows the weighted benefit score, which includes the weights of the performance measures calculated via the pair-wise process. Exhibit B-21 shows the weighted benefits score, the cost-benefit ratio, and the NPV cost of the scenario. Status Quo A received the highest cost-benefit ratio when considering the NPV of each scenario.

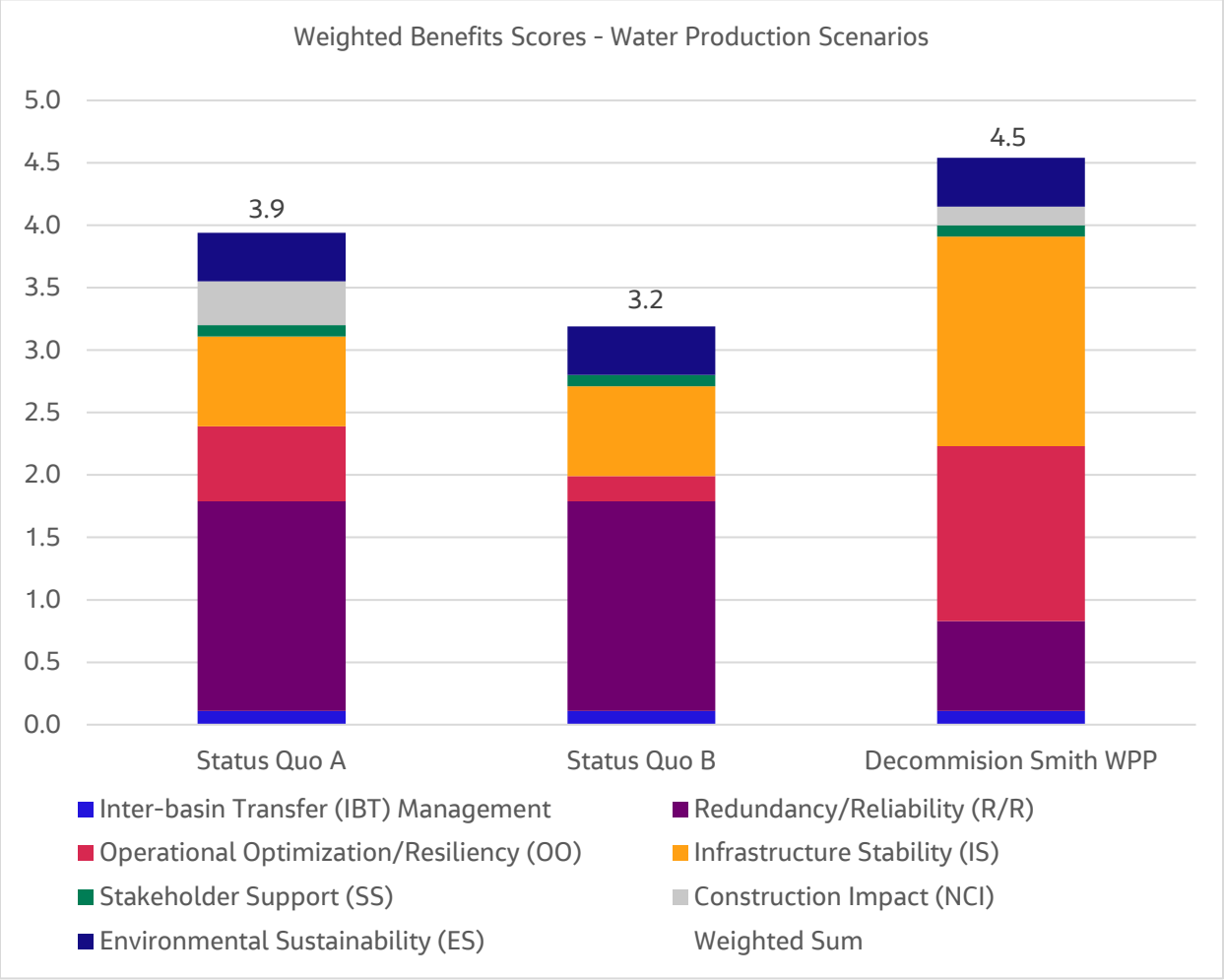


Exhibit B-20. Weighted Benefits Score - Water Production Scenarios

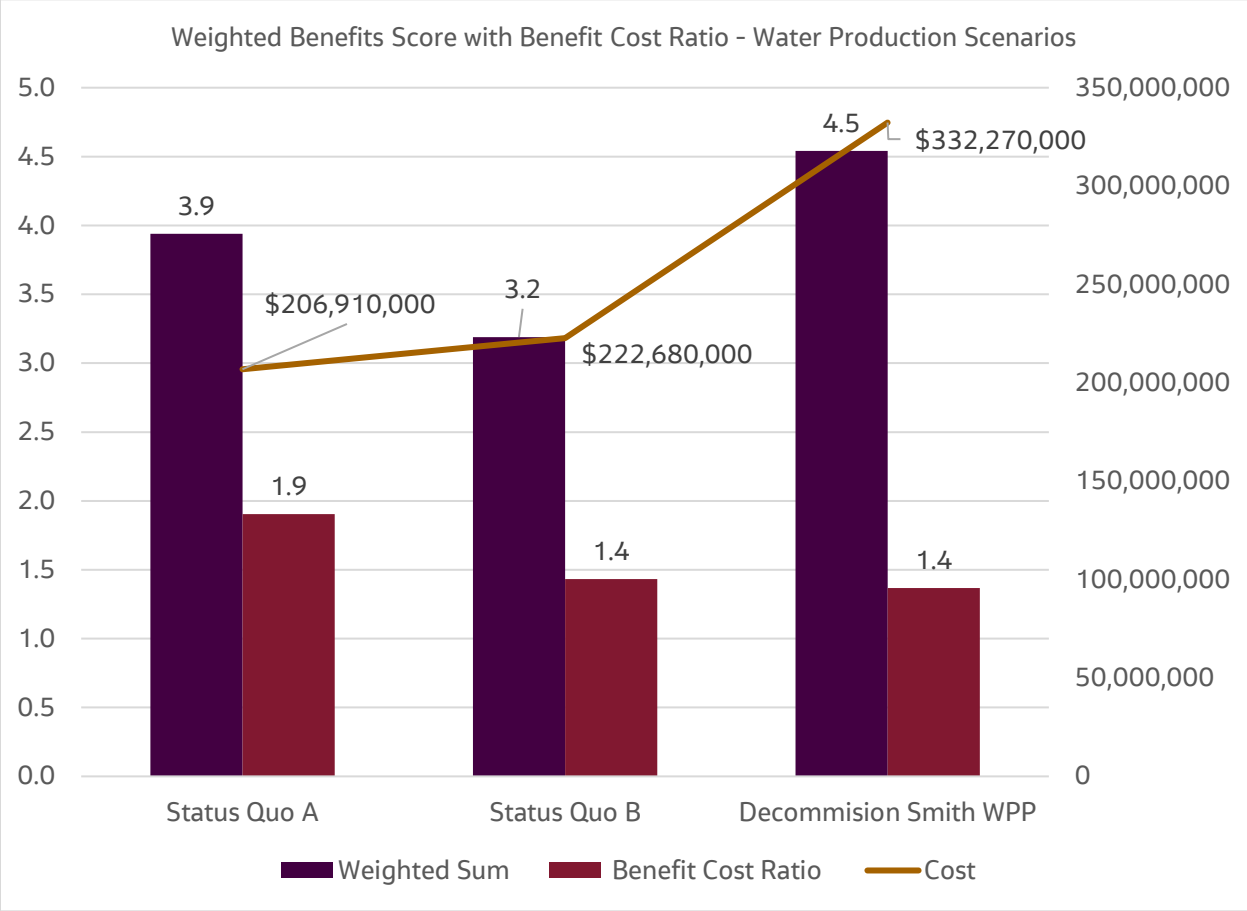


Exhibit B-21. Weighted Benefits Score, Cost-benefit Ratio, and NPV – Water Production Scenarios

B.3.4 Recommended Scenarios and Path Forward

Based on the results of the 2020 Facility Evaluation Update, the CCWA project team elected to move forward with evaluating the feasibility of the Status Quo A scenario. The Status Quo A scenario has the lowest cost-benefit ratio, driven by the significantly lower cost. While this is the recommended scenario, additional analysis would be required to confirm that high-rating the Hicks WPP to 15 MGD would be feasible (Exhibit B-22). This is the most fiscally conservative approach and is also prudent as there is a significant amount of time before the improvement projects for the three scenarios diverge (see section 2.2.1 above).

While Status Quo B is $100M less than the Decommission Smith WPP scenario, it is not recommended as it has lower operational optimization/resiliency, lower construction impact scores, and the lowest cost-benefit ratio. The Decommission Smith WPP scenario provides the greatest benefit, particularly the operational optimization/resiliency and infrastructure stability. This is because the New Hicks WPP will have advanced treatment and will be designed to reliably provide excellent water over the next 50 years. Should changes in raw water quality or regulations dictate the need for additional advanced treatment, the Decommission Smith scenario will provide the highest level of treatment of the scenarios evaluated. If the Status Quo A scenario is deemed infeasible, CCWA will re-evaluate the Status Quo B an Decommission Smith WPP scenarios.

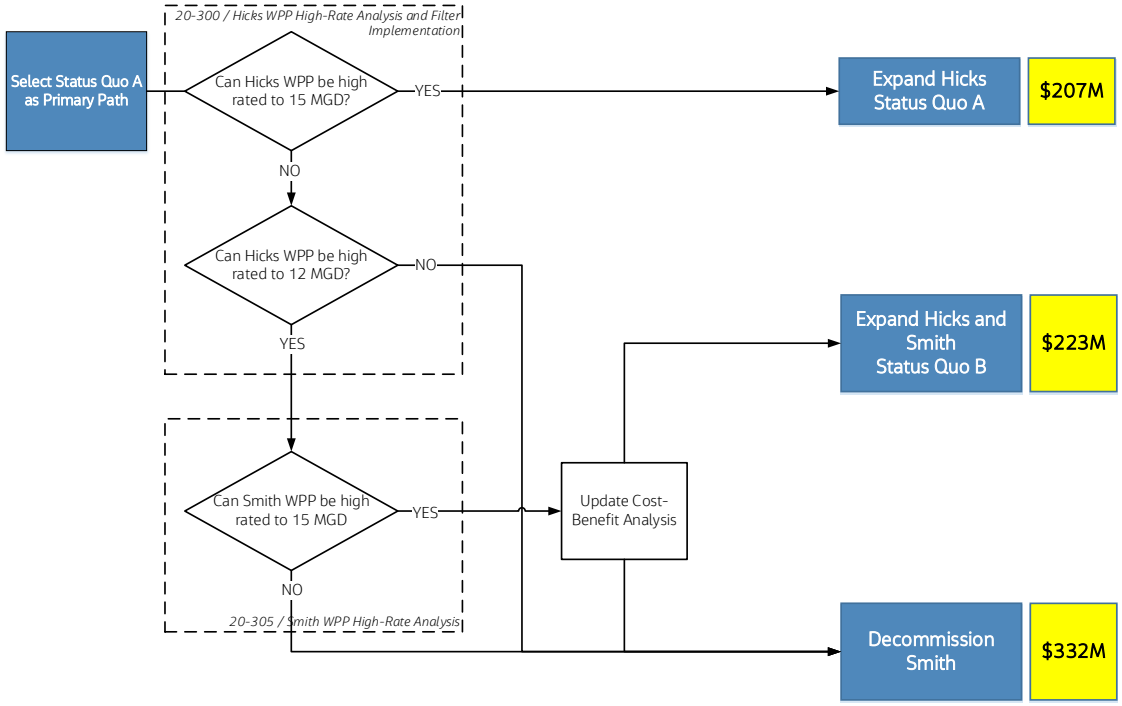


Exhibit B-22. Water Production Facility Configuration Decision Tree

The recommended next steps are to begin projects which will demonstrate the feasibility of high-rating the Hicks WPP and to complete the necessary improvements to allow the plants to be taken partially offline for maintenance. These two projects are represented in the SMP by 20-300 / Hicks WPP High-Rate Analysis and Filter Implementation and 20-309 / Single Points-of-Failure Elimination Study and Implementation. To allow CCWA the time to perform the plant high-rating studies necessary to select a scenario, the following three near-term actions are recommended under all scenarios:

1) Adding a third shift at the Smith WPP to increase from the current 7-8 MGD to closer to the plant's rated capacity of 12 MGD
2) Upgrading the Hooper WPP through the construction of two additional filters
3) Performing an evaluation of all potential efficiency improvements at the WPPs and implementing the recommended improvements.

In parallel with the near-term actions, it is recommended to perform a study to confirm the Hicks WPP can be high-rated to 12 or 15 MGD. If Hicks can produce 15 MGD, it will not be necessary to perform a high-rate analysis of the Smith WPP (Project 20-305). If Hicks can feasibly produce 12 MGD, a similar analysis should be performed for the Smith WPP to determine whether it can be expanded to 15 MGD. At the completion of these studies, it is recommended to reevaluate the cost-benefit analysis described above under Status Quo A.

Should high rate analyses show that neither the Smith WPP nor the Hicks WPP can be feasibly upgraded to the desired capacities, CCWA may conduct additional studies or may move forward with the Decommission Smith WPP scenario.

B.4 Water Reclamation

B.4.1 Scenario Development

Updated flow projections summarized in the 2020 SMP were used to establish a timeline for water reclamation capacity needs through 2050. Projections indicated a total capacity need of 39.8 MGD in 2050 with each plant having individual flow projections based on collection area.

B.4.1.1 Establish Potential Water Reclamation Facility Configurations

The first step of scenario development was to establish the potential number of water reclamation facilities in the future. At several workshops through the master planning process, the project team agreed that the Casey WRF would not be decommissioned.

B.4.1.2 Establish Capacity Options

Neither the revised projections nor the evaluation results on decommissioning the Shoal Creek WRF warranted the development of additional potential plant capacities to those developed in the 2017 Facility Evaluation. Therefore, the evaluation process started with the scenarios established in the 2017 Facility Evaluation as shown in Exhibit B-23 below.

Exhibit B-23. Potential Future Capacities of Water Production Facilities

Facility	Potential Future Capacities (Maximum Month MGD)
W.B. Casey WRRF	32, 40
Northeast WRF	6, 10
Shoal Creek WRF	0, 4.4

B.4.1.3 Select Scenarios for Engineering Analysis

The last step of scenario development required CCWA to select scenarios for further analysis. Once capacity options were established for each facility, the next step was to screen the list of scenarios based on assumptions regarding the water reclamation system. The first screening involved:

- The potential scenarios that were oversized (i.e., total capacity was greater than 44 MGD) were removed from further consideration.
- The potential scenarios that were undersized (i.e., total capacity was less than 42 MGD) were removed from further consideration.
- Due to redundancy concerns, any scenario consisting of only a single water reclamation facility would not be considered.
- Northeast WRF at 6 MGD was removed from further consideration since most unit processes at the plant are already sized for 10 MGD.

The scenarios in Exhibit B-24 remained after this first screening.

Exhibit B-24. Potential Future Capacities of Water Reclamation Facilities

Scenario	Casey WRRF (Maximum Day MGD)	Northeast WRF (Maximum Day MGD)	Shoal Creek WRF (Maximum Day MGD)	Total (Maximum Day MGD)
Existing conditions	24	6	4.4	34.4
2050 Projected	29.1	7.2	3.5	39.8
3	32	0	10	42.0
4	32	10	0	42.0
8a	40	0	4.4	44.4
8b	40	0	4.4	44.4
8c	40	0	4.4	44.4
5	32	10	4.4	46.4

Lastly, it was determined that decommissioning the Northeast WRF would not be considered due to challenges in conveying flow from the Northeast WRF sewer basin to the Casey WRRF sewer basin. After applying these final criteria, only two scenarios (4 and 5) remained.

Scenarios 4 and 5 are hereafter referred to as Status Quo (Scenario 5) and Decommission Shoal Creek (Scenario 4). In both the Status Quo and Decommission Shoal Creek Scenarios, Northeast WRF would be kept at the same capacity through the planning period and would require the same operations and maintenance costs. Based on Northeast WRF being identical in the two evaluated scenarios, it was determined that the future of the Northeast WRF would not impact analysis of these scenarios and was therefore excluded from the engineering analysis described in the next section.

B.4.2 Engineering Analysis

The final two scenarios were analyzed to determine projects needed to maintain the WRF facilities and reach the capacities identified under Status Quo and Decommission Shoal Creek scenarios from 2020 to 2050. The following types of projects, which are provided in Appendix B, were identified as necessary to maintain treatment capacity through the planning period at both Casey WRRF and Shoal Creek WRF:

- Process component replacement
- Structural maintenance and rehabilitation
- Electrical and control equipment replacement
- Necessary upgrades and expansions needed for each facility

Engineering analysis was then performed to determine capital projects and O&M costs associated with each scenario. The methodology used for this analysis is outlined below.

B.4.2.1 Methodology

The first step of engineering analysis for the WRFs involved developing lifecycle assumptions for major components. Asset replacements considered for each scenario included major equipment, controls and

structures. Major equipment included pumps, blowers, process equipment, chemical tanks and electrical gear (such as motor control centers and switchgear). Controls included instrumentation, programmable logic controllers, variable-frequency drives, and software. Pump rebuilds were not considered separately because these costs are already built into the yearly operations budget as "internal maintenance". Equipment replacement costs were based on values in CCWA's JD Edwards asset database, escalated to 2019 dollars. Exhibit B-25 summarizes the assumptions for equipment replacement frequencies.

Exhibit B-25. Water Reclamation Equipment Replacement Frequency Assumptions

Equipment Replacement Frequency	Value (years)
Major Equipment	
Treatment Equipment	20
Pumps	20
Electrical Gear	20
Controls	10

Asset replacement costs for structures include concrete resurfacing and coating repair, and structure rehabilitation. Concrete structure repair and replacement varies depending on the use and environment. Therefore, different repair frequencies were established for structure in corrosive and non-corrosive areas. Structural rehabilitation frequency and costs used for this analysis are summarized in Exhibit B-26.

Exhibit B-26. Structural Rehabilitation Frequency and Cost Assumptions

Structural Rehabilitation Frequency and Cost	Value
Structural Repair Frequency	
Concrete surface repair (corrosive area)	10 years
Concrete surface repair (non-corrosive area)	20 years
Structure repair (water-holding structure)	40 years
Structure repair (other)	50 years
Structural Repair Cost	
Concrete surface/coating repair	$10/ft2
Structure Rehabilitation	20% of original cost

B.4.2.2 Water Reclamation Results

The final scenarios were analyzed to determine projects needed to maintain the WRF facilities, and to reach the final capacities identified under each scenario from 2020 to 2050. Projects identified for both scenarios included capital upgrades for the W.B. Casey WRRF, as well as replacement and repair costs for existing assets at both W.B. Casey and Shoal Creek WRFs.

In both the Status Quo and Decommission Shoal scenarios, the total capacity needed at Casey WRRF in 2050 requires a major upgrade. The Casey WRRF is designed to be upgraded in 8 MGD increments, with new parallel treatment trains; and therefore, the next major upgrade will be to a 32 MGD facility. The required timing of this major capital project for both the Status Quo and Decommission Shoal Creek Scenarios is shown in Exhibit B-27. As shown in Exhibit B-27, the required timing of a 32-MGD upgrade at Casey WRRF is 2023 in the Decommission Shoal scenario and 2030 in the Status Quo scenario.

Existing assets repair and replacement costs were categorized as process equipment, structural maintenance and rehabilitation, and electrical and control equipment replacement. Conceptual design was completed for capital improvement projects. CPES was then used to estimate the capital cost of these improvements. Recurring repair and replacement costs were evaluated for all existing infrastructure that would be used through 2050.

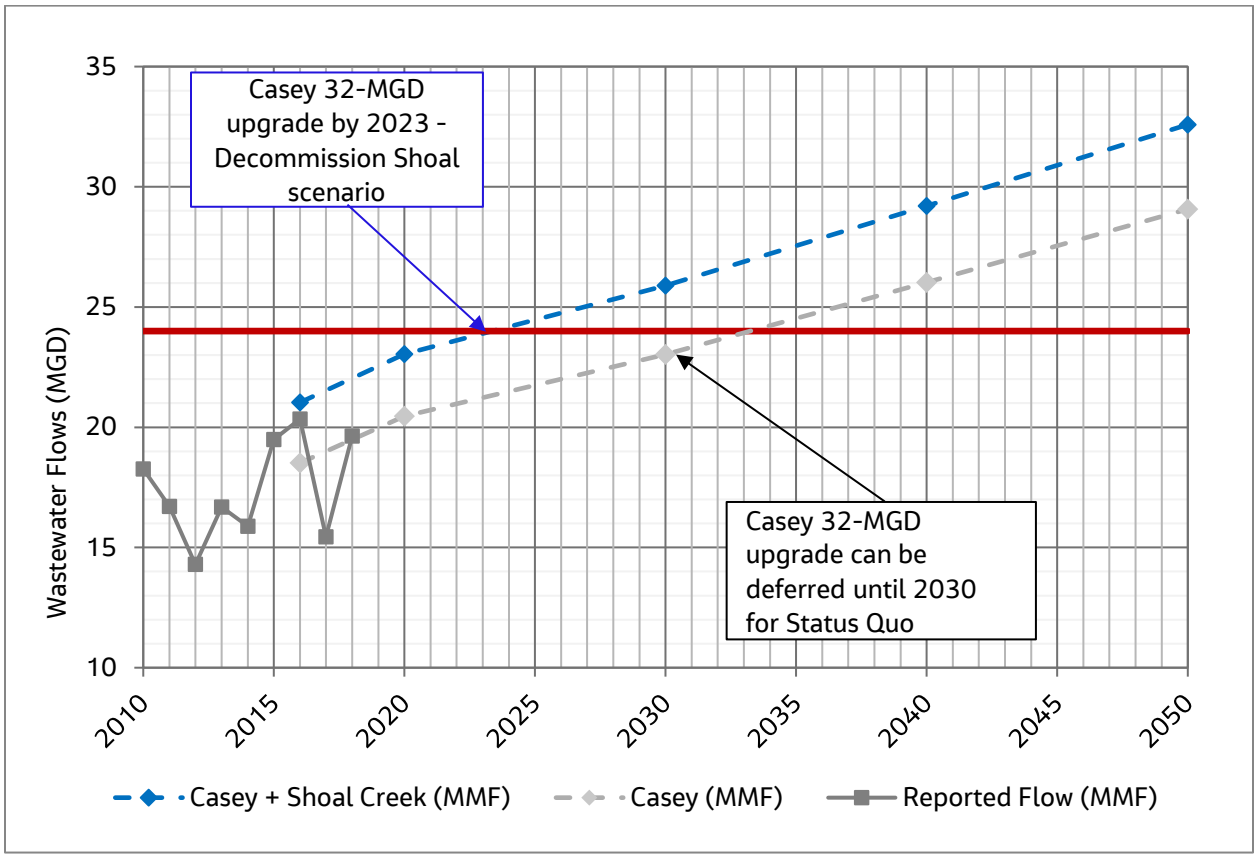


Exhibit B-27. Flow Projections for Casey and the combined Casey and Shoal Creek Flows.

W.B. Casey WRRF

Near-term capital projects required at the W.B. Casey WRRF include capacity recovery upgrades and solids facilities upgrades. The capacity recovery upgrades include modifications to the RL Jackson Pump Station, the Casey Raw Pump Station, and the biological basin aeration system to mitigate capacity shortcomings and maintain Casey at its current permitted capacity of 24 MGD. The Casey solids upgrades include the replacement of existing facilities which are at capacity and at the end of their useful lives. The new facility will include primary sludge-only anaerobic digestion, dewatering, and rotary drum drying (pelletizing). These facilities are sized to serve the WRRF at a future 32-MGD capacity. These near-term projects are required on the same timeline for both Status Quo and Decommission Shoal Creek scenarios.

The other major project required at the W.B. Casey WRRF is the liquid stream plant upgrade to increase capacity from 24 to 32 MGD. New and upgraded facilities for this project are based on expansion of the current processes. A plant expansion alternative evaluation, in progress at this time, included a cost comparison of three technologies: current process (conventional activated sludge process with biological nutrient removal), chemically enhanced primary treatment, and integrated fixed film activated sludge. At this time, CCWA is leaning towards expanding the current process. Therefore, the current processes are used as the basis of the cost analysis presented herein. A plant capacity analysis completed in 2019 confirmed this upgrade would be required before flow was transferred from Shoal Creek.

If Shoal Creek WRF is kept online, it requires no capacity upgrades through 2050. The only near-term capital project identified for Shoal Creek WRF was a UV system replacement. The capital projects required to decommission Shoal Creek WRF include a new force main, a new pump station, upgrades to the existing RL Jackson Raw Pump Station and demolition of Shoal Creek WRF. These project capital costs are collectively referred to as Shoal Creek Decommissioning.

Water Reclamation Summary

Capital improvement projects considered in the cost analysis for the Status Quo scenario are:

- Casey Capacity Recovery Upgrades
- Casey Solids Facilities Upgrades
- Casey Liquid Plant Expansion (24 to 32 MGD in 2030)
- Shoal Creek UV Facility Replacement

Capital improvement projects considered in the cost analysis for the Decommission Shoal Creek scenario were as follows:

- Casey Capacity Recovery Upgrades
- Casey Solids Facilities Upgrades
- Casey Liquid Plant Expansion (24 to 32 MGD in 2024)
- Shoal Creek Decommissioning

While the project team ultimately confirmed the decision to decommission the Shoal Creek WRF, it was decided that by deferring the Casey plant upgrade to 32 MGD to 2030 CCWA may defer the capital costs unique to the Decommission Shoal Creek scenario. Further, this delay will allow more time for completing the design and construction of upgrades require to transfer the flow from Shoal Creek WRF to Casey WRRF.

Detailed project descriptions and planning level cost estimates for these projects are provided in Appendix A. The total treatment capacity and timeline of required capacity expansion upgrades for the Status Quo and Decommission Shoal Creek scenarios are summarized in Exhibits B-28 and B-29, respectively.

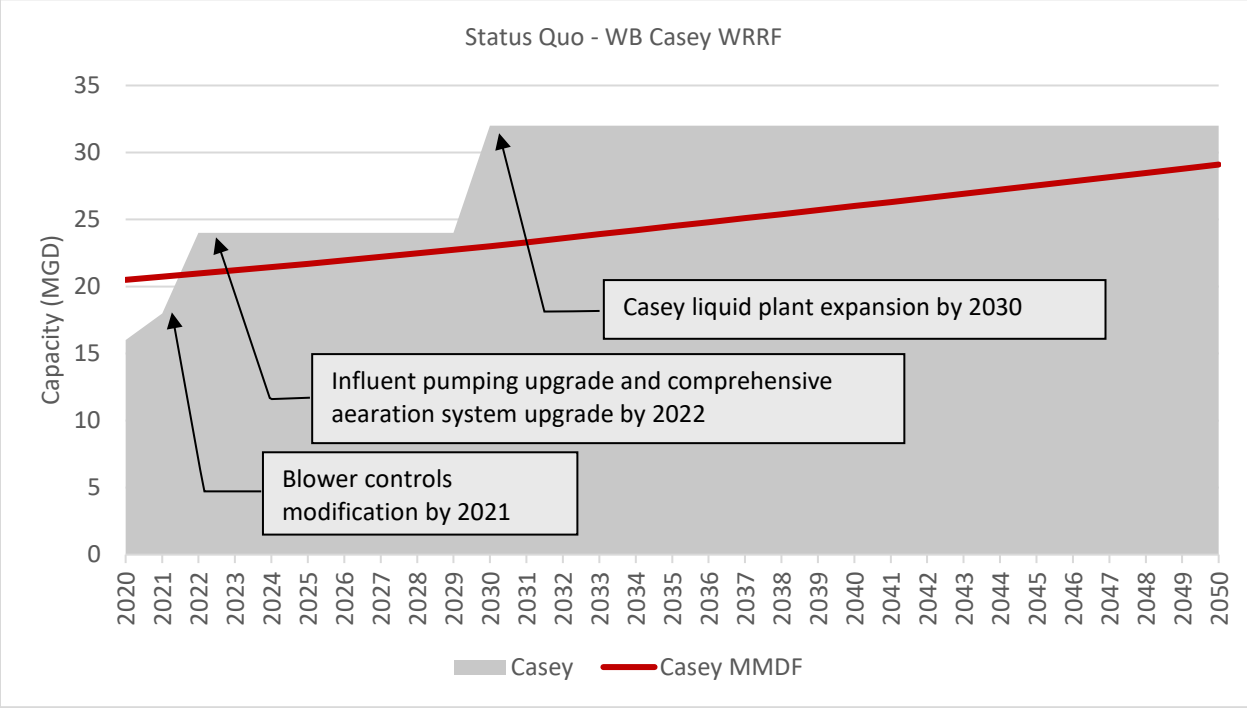


Exhibit B-28. Status Quo – WB Casey WRRF

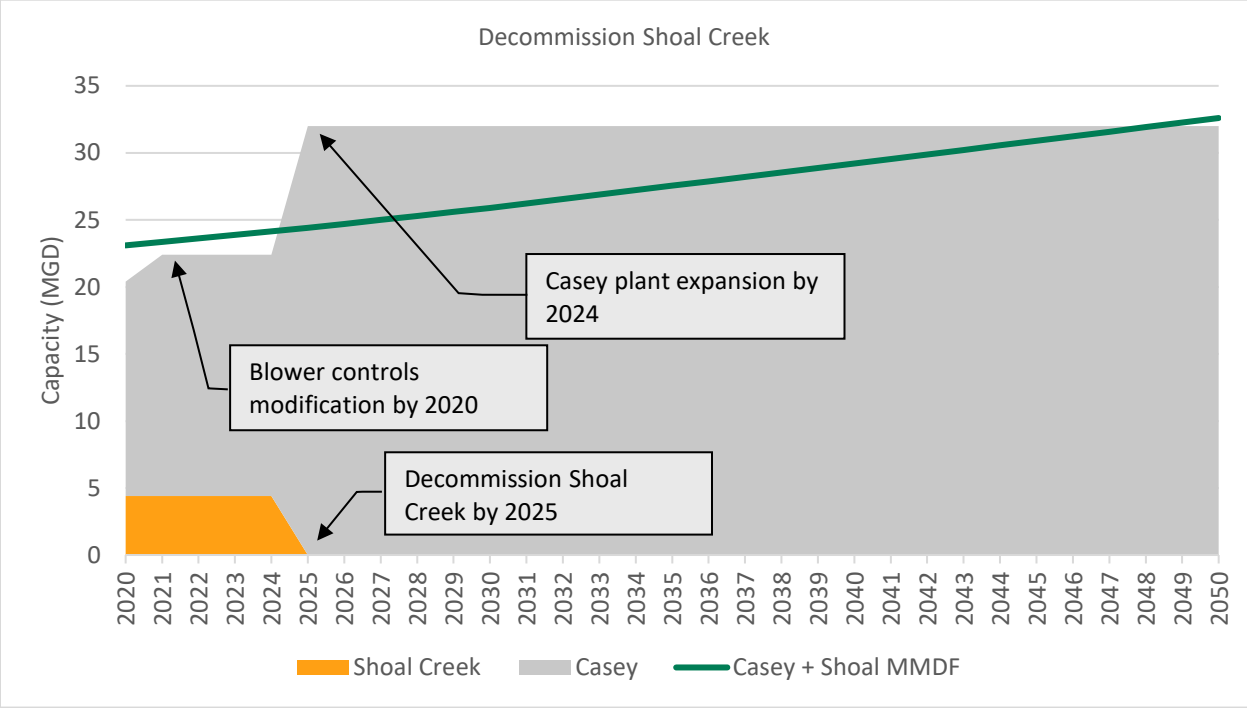


Exhibit B-29. Decommission Shoal – Casey WRRF and Shoal Creek WRF

B.4.3 Cost-Benefit Analysis

B.4.3.1 Cost Estimation Methodology

Similar to Water Production, the detailed engineering analysis, together with lifecycle assumptions and O&M assumptions, were used to develop detailed cost estimates over the next 30 years for each scenario.

O&M cost estimates for the WRFs additionally included biosolids disposal costs. Power cost calculations included pumping costs associated with the most conservative route for transferring of Shoal Creek WRF flows to the W.B. Casey WRRF, as described in Shoal Creek WRF Decommissioning Study (Hazen and Sawyer, 2020)

Assumptions for WRF O&M costs are provided in Exhibit B-30.

Exhibit B-30. Water Reclamation Operational and Maintenance Cost Assumptions

O&M Cost	Assumption
Chemicals	2018 as baseline Scaled to annual average plant flow
Power	2018 as baseline 70 percent of power is scaled to annual average flow
Internal Maintenance	Ave 2015-2018 as baseline Escalated 5 percent annually
Staffing	2018 as baseline (16 employees at Casey, 5 employees at Shoal) Assume addition employees increase from 16 to 19 when Casey is expanded)
Solids Disposal/Revenue	2018 as baseline ($10/dry ton revenue at Casey, $70/dry ton disposal fee at Shoal) Assume solids disposal cost is escalated at an extra 2% per year Scale to annual average plant flow.

The capital investments and O&M costs for each plant were combined for the two scenarios, and the cumulative cost was converted into an NPV to allow for a comparison of each scenario in 2019 dollars. The NPV calculations used to determine these 2019 dollars followed the same assumptions detailed for the WPP scenario evaluation.

B.4.3.2 Cost Estimation Results

Based on the cost methodology, the NPVs of the 30-year cost for the Status Quo and Decommission Shoal Creek scenarios were $332.89 million and $334.84 million, respectively (Exhibit B-31 and Exhibit B-32). It is noted that the cost of structural rehabilitation & repair as well as equipment replacement is included in Asset Replacement.

Exhibit B-31. Total Net Present Value Summary

Cost Component	Net Present Value Estimated Cost	
	Status Quo	Decommission Shoal
Capital Costs		
Casey WRRF	$154,600,000	$167,950,000
Shoal Creek WRF	$1,080,000	$29,260,000
Capital Total[1]	$155,680,000	$197,210,000
Operational Costs		
Casey WRRF	$98,370,000	$104,450,000
Shoal Creek WRF	$33,010,000	$7,480,000
Operational Total	$131,380,000	$111,940,000
Asset Replacement Costs		
Casey WRRF	$29,270,000	$25,260,000
Shoal Creek WRF	$16,560,000	$360,000
Asset Replacement Total	$45,830,000	$25,720,000
Scenario Total	$332,890,000	$333,940,000

[1]Capital cost breakdowns by project are provided in Appendix A.

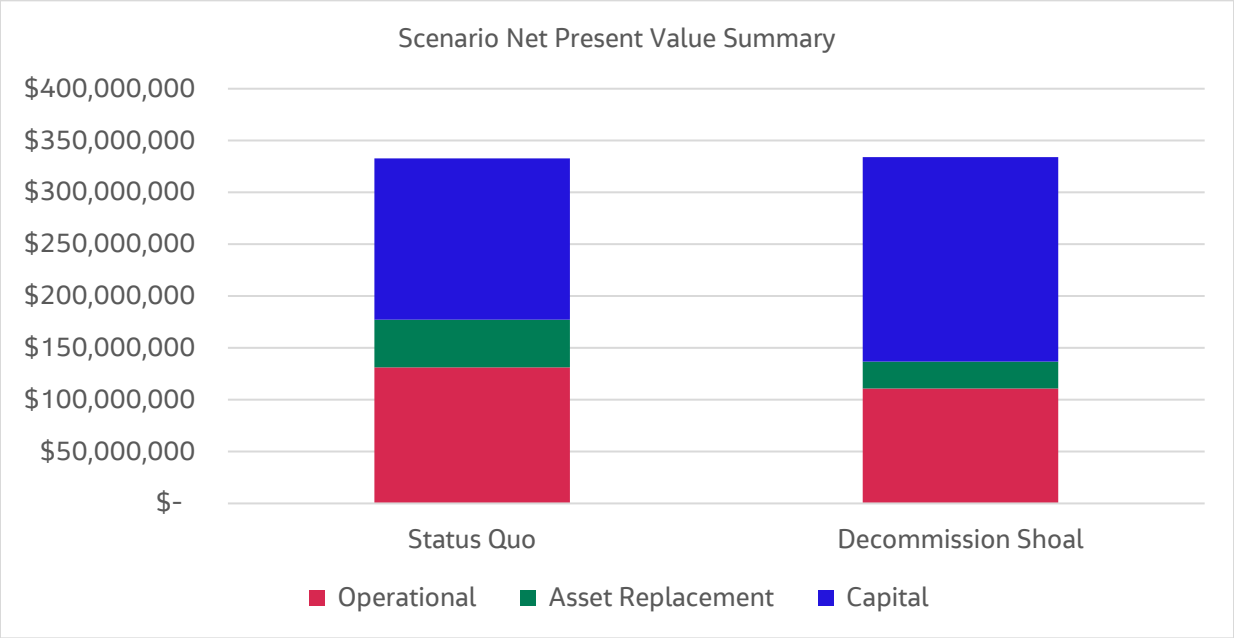


Exhibit B-32. NPV of Water Reclamation Scenarios

B.4.3.3 Benefit Scoring and Cost-benefit Results

Similar to Water Production, scores were assigned in a workshop held on December 18, 2019 with the CCWA Management team and Jacobs staff. Scores are summarized in Exhibit B-33 below.

Exhibit B-33. Performance Measure Scoring – Water Reclamation

Scenario	Unweighted Score	Reason	Weighted Score
Criterion 1 - Interbasin Transfer Management (Weighting = 11)			
Status Quo	1	This scenario has a neutral impact – it does not increase transfer out of the Flint Basin but does not yield any additional flow into the Flint River.	0.11
Decommission Shoal	7	This scenario may allow additional discharge flow to the Flint River, which will recharge the Flint River and enable more water withdrawal, since withdrawal permit is flow-based.	0.77
Criterion 2 - Redundancy and Reliability (Weighting = 24)			
Status Quo	3	Process equipment at Shoal Creek is older than that at Casey. The continued use of Shoal Creek is less reliable than newly upgraded facilities at Casey.	0.72
Decommission Shoal	7	Newer equipment and assets provide higher levels of treatment.	1.68
Criterion 3 - Operational Optimization and Resiliency (Weighting = 20)			
Status Quo	1	Older equipment at Shoal Creek resulted in a lower score due to lower operational optimization.	0.2
Decommission Shoal	3	New equipment and upgraded facilities at Casey would enable operational optimization. The new polishing system provides additional treatment barrier (increased resiliency) and has the potential to meet lower regulatory limits that may be imposed in the future.	0.6
Criterion 4 - Infrastructure Stability (Weighting = 24)			
Status Quo	1	Older equipment at Shoal Creek resulted in a lower score due to lower stability and potentially higher costs to maintain critical infrastructure.	0.24
Decommission Shoal	3	The consolidation of investment into existing and new equipment at an upgraded Casey plant results in more stable infrastructure.	0.72
Criterion 5 - Stakeholder Support (Weighting = 3)			
Status Quo	3	The pipeline from Shoal to Casey would have a negative effect on some stakeholders due to construction impact. Other stakeholders would favor transferring discharge to the Flint River to restore the Flint.	0.09

Exhibit B-33. Performance Measure Scoring – Water Reclamation

Scenario	Unweighted Score	Reason	Weighted Score
Decommission Shoal	3	The group agreed that stakeholders have competing interests and that the two scenarios could not be differentiated, related to the Stakeholder Support criterion.	0.09
Criterion 6 - Negative Construction Impact (Weighting = 5) *After discussion with the staff about this scoring factor, the scoring factor was changed to "Construction Impact." The greater the construction impact, the lower the score.*			
Status Quo	1	The status quo alternative score has a neutral impact compared to the Decommission scenario. Any in-plant upgrades required at either plant are considered to have an equivalent low impact on the community.	0.05
Decommission Shoal	0	This scenario received a lower score due to a significant negative impact of constructing a force main between Shoal Creek and the RL Jackson Pump Station.	0
Criterion 7 - Environmental Sustainability (Weighting = 13)			
Status Quo	1	Both plants have a good compliance record. Keeping Shoal Creek online was determined to have a neutral impact on environmental sustainability.	0.13
Decommission Shoal	3	Differentiators between Shoal Creek and Casey related to environmental sustainability include more sustainable biosolids management at Casey (due to fertilizer production from biosolids) and the potential for more energy recovery at the Casey plant, with the future anaerobic digestion process and biogas production. If more biosolids are processed at Casey, there is more overall resource recovery	0.39

Exhibit B-34 provides the weighted cost-benefit score for the two scenarios. Decommission Shoal received the highest cost-benefit ratio when considering these scenario's NPVs. (Exhibit B-35)

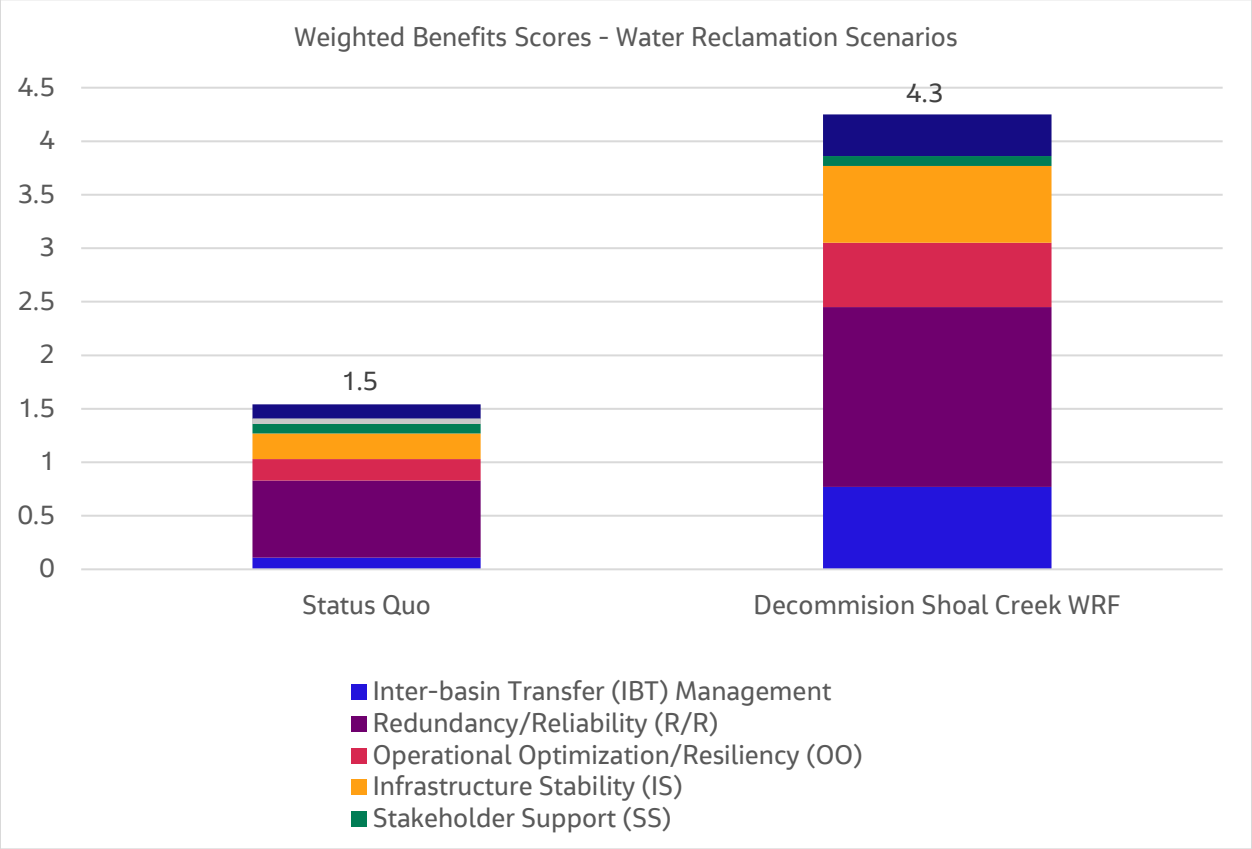


Exhibit B-34. Weighted Benefit Scores - Water Reclamation Scenarios

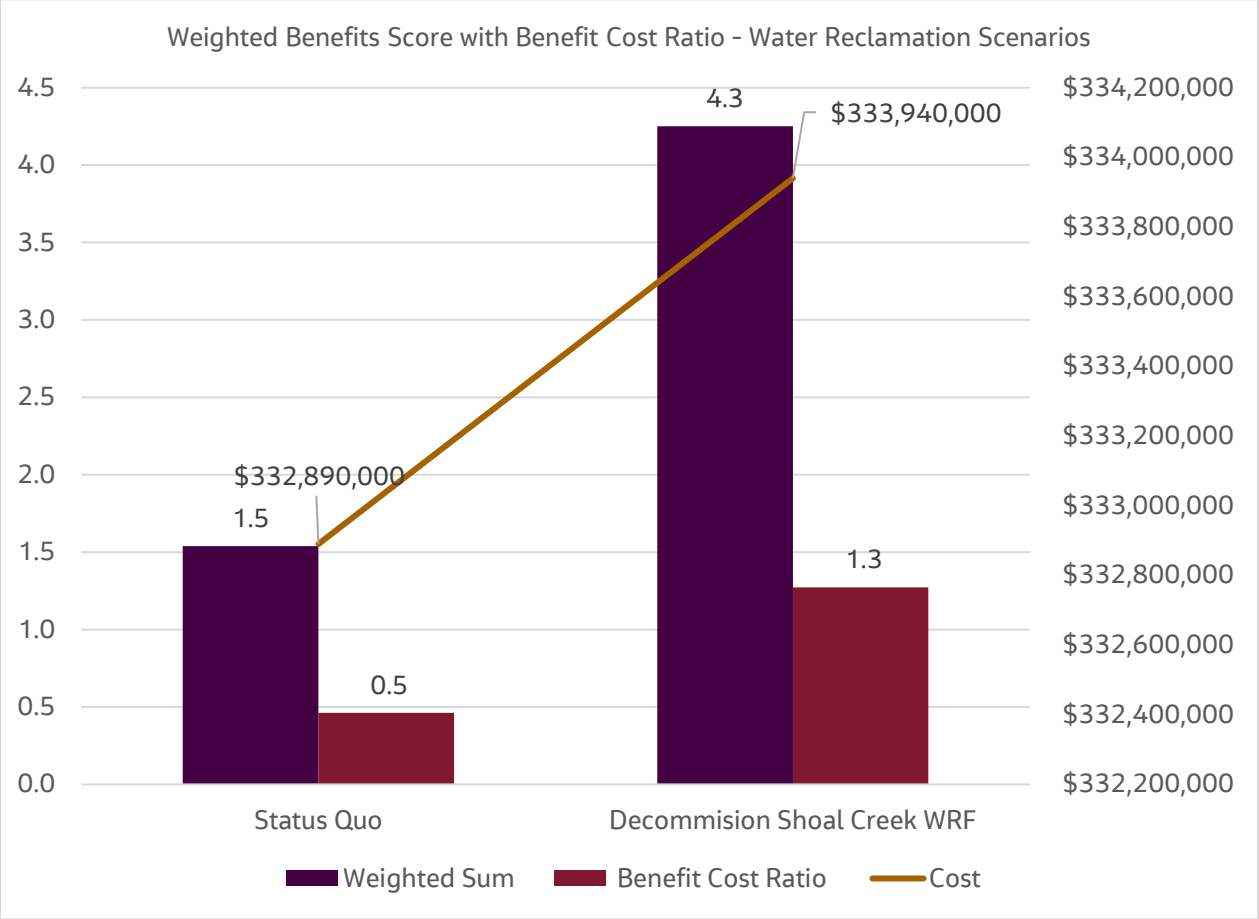


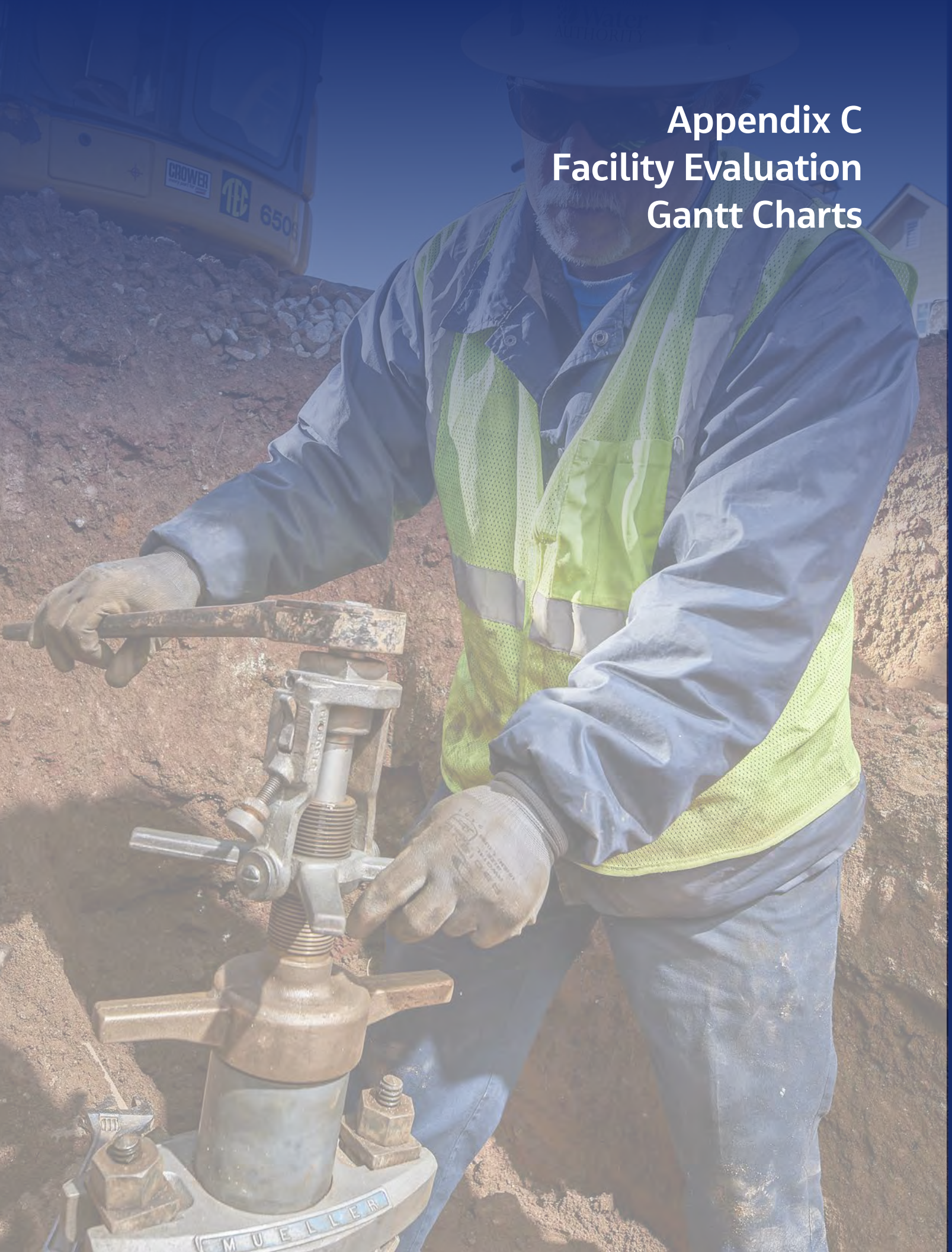
Exhibit B-35. Weighted Benefits Scores, Cost-benefit Ratio, and NPV – Water Reclamation Scenarios

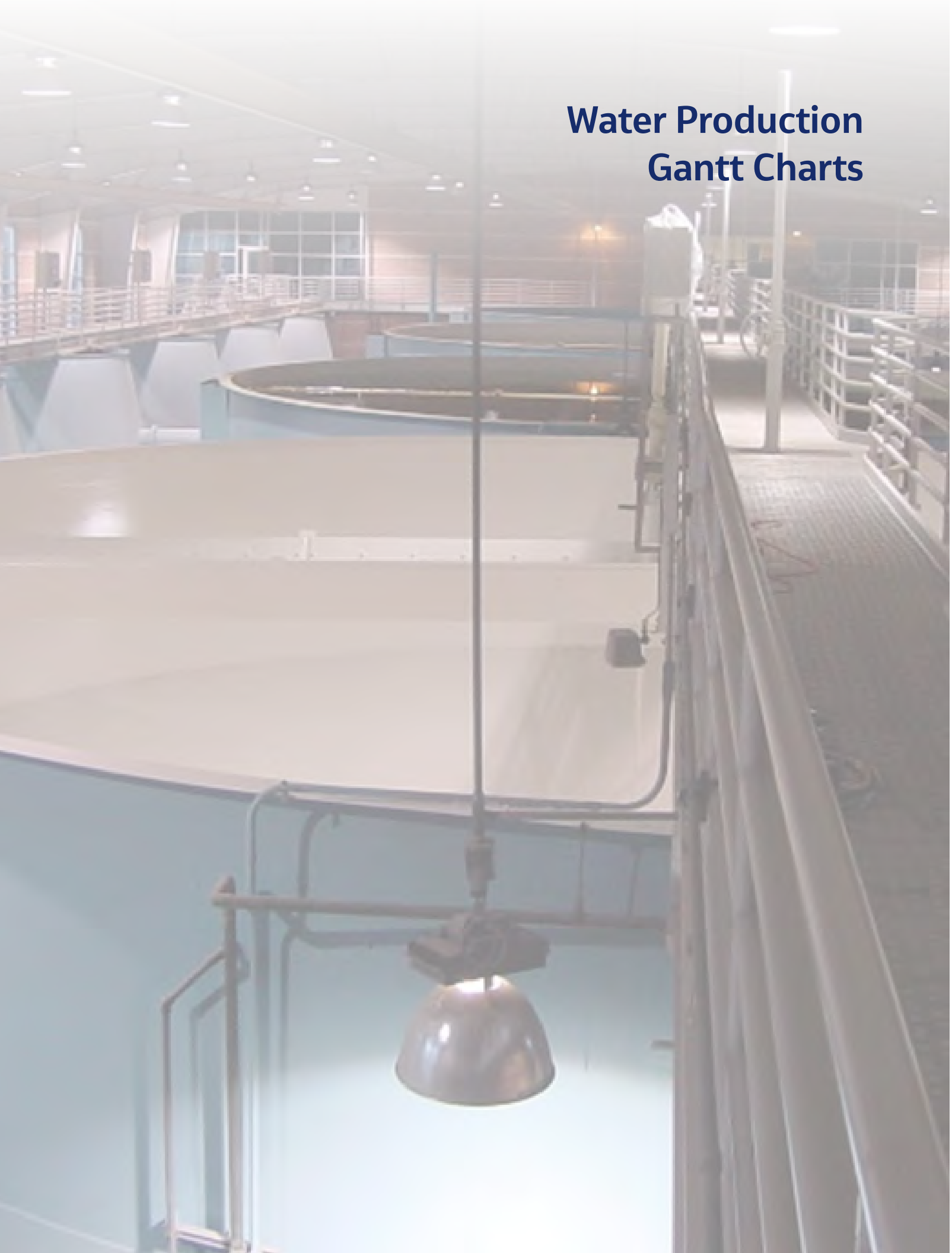
B.4.4 Recommended Scenarios and Path Forward

Based on the results of the 2020 Facility Evaluation Update, the decision made in 2017 to decommission Shoal Creek was confirmed and selected. This scenario received the highest unweighted benefits score, weighted benefit score, and benefit-cost ratio. The two scenarios were found to have very similar lifecycle costs; however, decommissioning Shoal Creek WRF was determined to be more beneficial because it balances interbasin transfers (Criterion 1), relies on newer facilities (Criteria 2, 3, and 4), and offers opportunity for consolidated and more environmentally sustainable solids handling (Criterion 7).

As previously stated, the total capacity needed at Casey WRRF in 2050 requires an upgrade to a 32 MGD facility to meet projected 2050 flows under both scenarios. Therefore, in order to defer the capital costs unique to the Decommission Shoal scenario, the CCWA project team decided that the decommissioning of Shoal Creek WRF would be deferred until 2030, when a Casey WRRF upgrade would be required regardless of taking on flows from the Shoal Creek basin. This approach will allow more time for planning the design and construction of a pump station and transmission main required to decommission the Shoal Creek WRF. In the meantime, CCWA will continue to monitor sewer basin flows, revise future projections, and refine project schedules as needed.

Appendix C
Facility Evaluation Gantt Charts





Water Production Gantt Charts

WPP Status Quo A

E	Equip., Pump, and Elect. Rehab./Replace
C	Control Replacement/Repair
SS	Structural Surface Repair
SR	Structural Rehabilitation
Repair/Replace/Rehabilitate	
New Construction/Upgrade/Expansion/HighRate	
Demolition/Decomission	

2050 Capacity (MMDF)			Raw Water Withdrawal (MGD)			
Smith	Hicks	Hooper	Smith Reservoir to Hicks	Blalock Reservoir to Hicks	Smith Reservoir to Smith	Hooper Reservoir to Hooper
12	15	22	5	10	12	22

	Facility	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
Smith WTP Raw Water	Flint River Intake		E																												
	Flint River Pump Stations				E																				E		E				
	Smith Reservoir Intake																														
	Smith Reservoir Pump Station																										E				

Plant	Facility	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
Smith WPP	Floc/ Sed	SR		C	E									C								SR		C							
	Filtration			C										C							SR,E			C			E				
	Disinfection		E				SS																E				SR				
	Chemical Systems			C			SR							E													SS				
	Finished Water Storage					SR, E																									
	High Service Pump Station	E					SR																				SS				
	Settled Solids						E			E																	SS			E	
	Electrical													E																	
	Admin/ SCADA/ Lab						SR																				SS				

	Facility	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
Hicks WPP Raw Water	Smith Resevoir Hicks Intake																														
	Smith Reservoir, Hicks PS													E																	
	Blalock Reservoir																														
	Blalock Reservoir Pump Station													E	E																

Plant	Facility	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
Hicks WPP	Floc/ Sed	E	E												H.R. Hicks to 15 MGD						SR		E								
	Filtration	E					SR,E		E		C										SR,C							SR,E				C
	Disinfection		E,C											C							SR		E,C								
	Chemical Systems	E	E																		SR	E									
	Finished Water Storage							SR,E													SR										
	High Service Pump Station			E											E						SR			E							
	Settled Solids	SR,E							E,C										C			SS							E,C		
	Electrical				E																				E						
	Admin/ SCADA/ Lab			SR	E																SR				E						

	Facility	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
Hooper WPP Raw Water	Hooper Reservoir Intake																														
	Raw Water Pump Station				E															E				E							

Plant	Facility	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
Hooper WPP	Floc/ Sed	E								E				E																SR,E	
	Filtration				H.R. Hooper to 22 MGD																												
	Disinfection		E,C				SS													E			E,C				SR				
	Chemical Systems				SS					E															SR					E	
	Finished Water Storage											SR																			
	High Service Pump Station				E					C										E,C										E,C	
	Settled Solids						E	E															E				SR,E	SS			
	Electrical									E																				E	
	Admin/ SCADA/ Lab		E																				E								

	Facility	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
Distribution System			NW BPS			Decommission Elevated Storage Tanks					Forest Ave. BPS				Replace pumps at Noah's Ark, add PRVs				Upgrade TM from Hicks to Morrow & Convert Jonesboro to BPS													

WPP Status Quo B

E	Equip., Pump, and Elect. Rehab./Replace
C	Control Replacement/Repair
SS	Structural Surface Repair
SR	Structural Rehabilitation
Repair/Replace/Rehabilitate	
New Construction/Upgrade/Expansion/HighRate	
Demolition/Decomission	

2050 Capacity (MMDF)			Raw Water Withdrawal (MGD)			
Smith	Hicks	Hooper	Smith Reservoir to Hicks	Blalock Reservoir to Hicks	Smith Reservoir to Smith	Hooper Reservoir to Hooper
15	12	22	2	10	15	22

	Facility	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
Smith WTP Raw Water	Flint River Intake		E																												
	Flint River Pump Stations				E																				E		E				
	Smith Reservoir Intake																														
	Smith Reservoir Pump Station																				E						E				

Plant	Facility	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
Smith WPP	Floc/ Sed	SR		C	E									C							H.R. Smith to 15 MGD			C							
	Filtration			C										C										C			E				
	Disinfection		E				SS																E				SR				
	Chemical Systems			C			SR							E													SS				
	Finished Water Storage					SR, E																									
	High Service Pump Station	E					SR																				SS				
	Settled Solids						E			E																	SS			E	
	Electrical													E																	
	Admin/ SCADA/ Lab						SR																				SS				

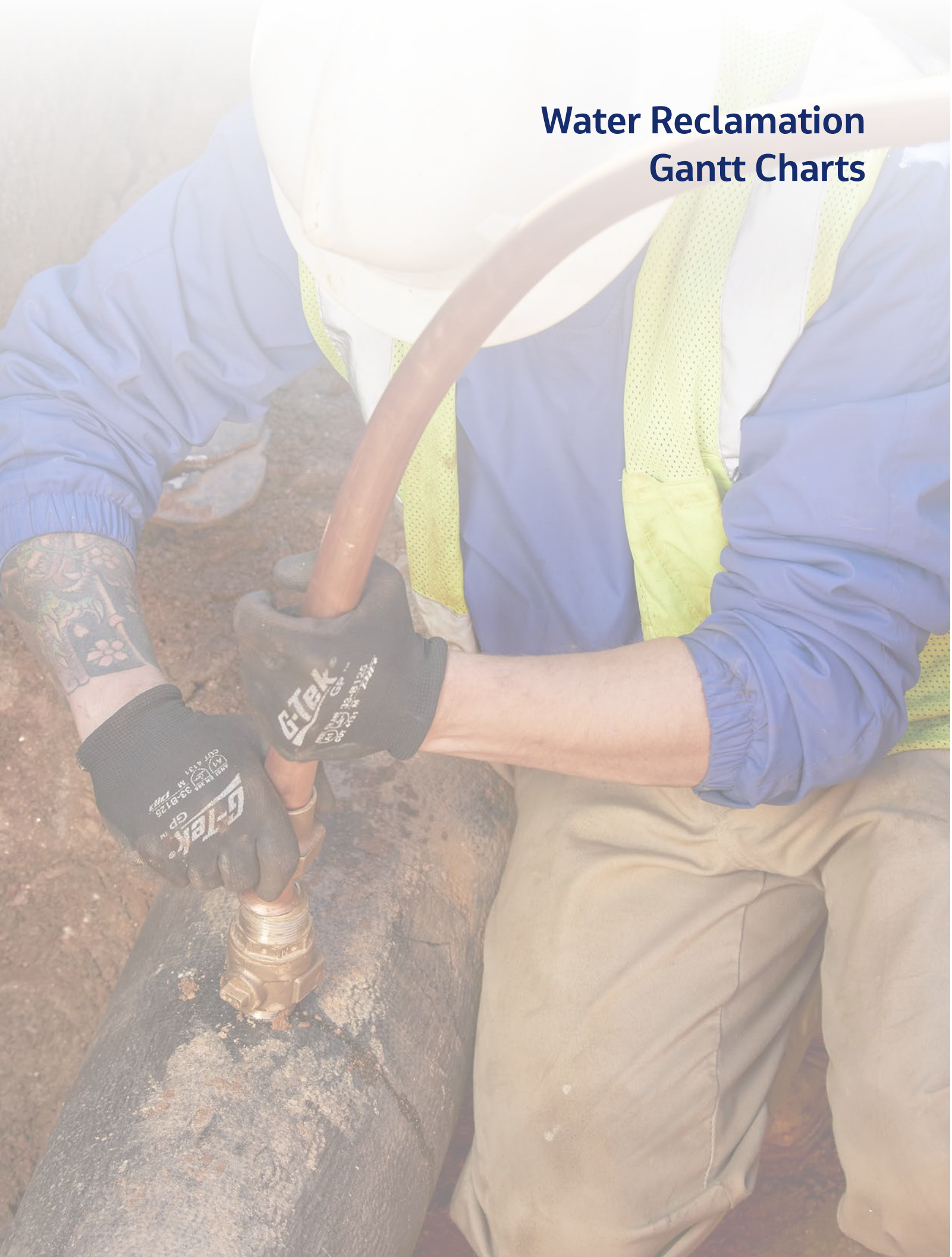
	Facility	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
Hicks WPP Raw Water	Smith Resevoir Hicks Intake																														
	Smith Reservoir, Hicks PS													E																	
	Blalock Reservoir																														
	Blalock Reservoir Pump Station													E		E															

Plant	Facility	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
Hicks WPP	Floc/ Sed	E	E													H.R. to 12					SR		E								
	Filtration	E					SR,E		E		C										SR,C						SR,E				C
	Disinfection		E,C											C							SR		E,C								
	Chemical Systems	E	E																		SR	E									
	Finished Water Storage							SR,E													SR										
	High Service Pump Station			E												E					SR			E							
	Settled Solids	SR,E							E,C										C			SS							E,C		
	Electrical				E																				E						
	Admin/ SCADA/ Lab			SR	E																SR				E						
	Facility	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
Hooper WPP Raw Water	Hooper Reservoir Intake																														
	Raw Water Pump Station				E															E				E							

Plant	Facility	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
Hooper WPP	Floc/ Sed	E								E				E																SR,E	
	Filtration				H.R. Hooper to 22 MGD																												
	Disinfection		E,C				SS													E			E,C				SR				
	Chemical Systems				SS					E															SR					E	
	Finished Water Storage											SR																			
	High Service Pump Station				E					C										E,C											
	Settled Solids						E	E															E				SR,E	SS			
	Electrical									E																				E	
	Admin/ SCADA/ Lab		E																				E								

	Facility	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
Distribution System			NW BPS			Decommission Elevated Storage Tanks					Forest Ave. BPS				Replace pumps at Noah's Ark, add PRVs				Upgrade TM from Smith to Noah's Ark, Upgrade TM from Hicks to Morrow, Convert Jonesboro to BPS																	

Water Reclamation Gantt Charts



E	Equip., Pump, and Elect. Rehab./Replace
C	Control Replacement/Repair
SS	Structural Surface Repair
SR	Structural Rehabilitation
Repair/Replace/Rehabilitate	
New Construction/Upgrade/Expansion/HighRate	
Demolition/Decomission	

2050 Capacity (MMDF)		
Smith	Hicks	Hooper
0	27	22

Raw Water Withdrawal (MGD)			
Smith Reservoir to Hicks	Blalock Reservoir to Hicks	Smith Reservoir to Smith	Hooper Reservoir to Hooper
17	10	0	22

Decommission Smith

	Facility	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
Smith WTP Raw Water	Flint River Intake		E																												
	Flint River Pump Stations				E																				E		E				
	Smith Reservoir Intake																														
	Smith Reservoir Pump Station																						D				E				

Plant	Facility	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
Smith WPP	Floc/ Sed	SR		C	E									C																	
	Filtration			C										C																	
	Disinfection		E				SS																								
	Chemical Systems			C			SR							E																	
	Finished Water Storage					SR, E																									
	High Service Pump Station	E					SR																								
	Settled Solids						E			E																					
	Electrical													E																	
	Admin/ SCADA/ Lab						SR																								

	Facility	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
Hicks WPP Raw Water	Smith Resevoir Hicks Intake																														
	Smith Reservoir, Hicks PS													E			E		E												
	Blalock Reservoir																														
	Blalock Reservoir Pump Station													E		E															

Plant	Facility	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
Hicks WPP	Floc/ Sed	E	E													H.R. to 12															
	Filtration	E					SR,E		E		C																					
	Disinfection		E,C											C																	
	Chemical Systems	E	E																												
	Finished Water Storage							SR,E																							
	High Service Pump Station			E																											
	Settled Solids	SR,E							E,C																						
	Electrical				E																										
	Admin/ SCADA/ Lab			SR	E																										

	Facility	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
Hooper WPP Raw Water	Hooper Reservoir Intake																														
	Raw Water Pump Station				E															E				E							

Plant	Facility	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
Hooper WPP	Floc/ Sed	E								E				E																SR,E	
	Filtration				H.R. Hooper to 22 MGD																												
	Disinfection		E,C				SS													E			E,C				SR				
	Chemical Systems				SS					E															SR					E	
	Finished Water Storage											SR																			
	High Service Pump Station				E					C										E,C										E,C	
	Electrical						E	E		E													E				SR,E	SS			
	Admin/ SCADA/ Lab		E																											E	

	Facility	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
Distribution System			NW BPS			Decommission Elevated Storage Tanks					Forest Ave. BPS				Replace pumps at Noah's Ark, add PRVs				Upgrade TM from Hooper to Morrow & TM from Hicks to Morrow, Convert Jonesboro to BPS			Abandon Noah's Ark & Smith WPP									

E	Equip., Pump, and Elect. Rehab./Replace
C	Control Replacement/Repair
SS	Structural Surface Repair
SR	Structural Rehabilitation
Repair/Replace/Rehabilitate	
New Construction/Upgrade/Expansion/HighRate	
Demolition/Decomission	

2050 Capacity (MMDF)		
Casey	NE	Shoal
32	8	4.4

WRF Status Quo

Plant	Facility	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Shoal Creek WRF	Influent Pump Station			E,SS,C										SS,C										E,SS,SR, C								
	Screening			E,SS,C										SS,C										E,SS,SR, C								
	Grit Removal System			E,SS,C										C										E,SS,SR, C								
	Influent Splitter Box			E,SS,C										C										E,SS,SR, C								
	Aeration			E,SS,C										C										E,SS,SR, C								
	Clarification			E,SS,C										C										E,SS,SR, C								
	Re-aeration			E,SS,C										C										E,SS,SR, C								
	Thickener/Digesters			E,SS,C										C										E,SS,SR, C								
	Blowers			E,C										C										E,C								
	Sludge Pump Station			E,SS,C										C										E,SS,SR, C								
	RAS Pump Station			E,SS,C										C										E,SS,SR, C								
	WAS Pump Station			E,SS,C										C										E,SS,SR, C								
	Disinfection			E,SS,C*										C										E,SS,SR, C								
	Effluent Pump Station			E,SS,C										C										E,SS,SR, C								
	Solids Handling			E,SS,C										C										E,SS,SR, C								
	Chemical Systems						E,C										C										E,C					
	Electrical Buildings						E,C										C										E,C					
	Shoal Creek Raw Water Pump Station																															
	Forcemain to RL Jackson Pump Station																															
	Admin/ SCADA/ Lab			SR,C										C										C								

*Assume new equipment installed into existing channel

Plant	Facility	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
WB Casey WRF	Casey Raw Influent Pump Station		E,C			E,SS,C						New										C										E,C,SS
	RL Jackson Influent Pump Station		E,C			E,SS,C						New										SS,C										E,C,SS
	Preliminary Treatment Unit #1 (New)							SS,C				New										SS,C										E,C,SS
	Preliminary Treatment Unit #2 (Old)					E,SS,C																										
	Primary Treatment					E,SS,C						New										SS,C										E,C,SS
	Biological Basins	C	E			E,SS,C						New										C										E,C,SS
	WAS/Secondary Scum PS					E,SS,C						New										C										E,C,SS
	RAS/WAS Pumping					E,SS,C						New										C										E,C,SS
	PE/RAS Splitter Box					E,SS,C						New										C										E,C,SS
	Secondary Clarification (#1-#3)					E,SS,C						New										SS,C										E,C,SS
	Secondary Clarification (#4)							SS,C				New										SS,C										E,C,SS
	ML Splitter Box					E,SS,C						New										C										E,C,SS
	W3 Pump Station					E,SS,C						New										C										E,C,SS
	Recycle Pump Station											New										C										E,C,SS
	Polishing Splitter Box											New										C										E,C,SS
	Polishing Flow Control Vault											New										C										E,C,SS
	Polishing Densadeg Facility											New										SS,C										E,C,SS
	Polishing UV											New										C										E,C,SS
	Polishing Effluent Flume											New										C										E,C,SS
	Polishing Cascade Aerator											New										SS,C										E,C,SS
	Polishing Chemical Facilities (2)											New										C										E,C,SS
	WAS Thickening											New										C										E,C,SS
	Sludge Blending Tank			New										C										E,SS,C								
	Digestion			New										C										E,C								
	Dewatering			New										C										E,C								
	Pelletizing			New										C										E,C								
	Main Plant Chemical Facility					E,SS,C						New										C										C,E
	Plant Odor Control					E,SS,C						New										C										C,E
	Electrical Bldgs (Qty 2)					E,SS,C						New										C										C,E
	Flint River Discharge																															C,E
	Discharge Line to Jackson Transfer Pump Station																															C,E
	Jackson Transfer Pump Station					E,SS,C						New										C										C,E
	Admin/ SCADA/ Lab					E,SS,C						New										C										C,E

E	Equip., Pump, and Elect. Rehab./Replace
C	Control Replacement/Repair
SS	Structural Surface Repair
SR	Structural Rehabilitation
Repair/Replace/Rehabilitate	
New Construction/Upgrade/Expansion/HighRate	
Demolition/Decomission	

2050 Capacity (MMDF)		
Casey	NE	Shoal
32	8	0

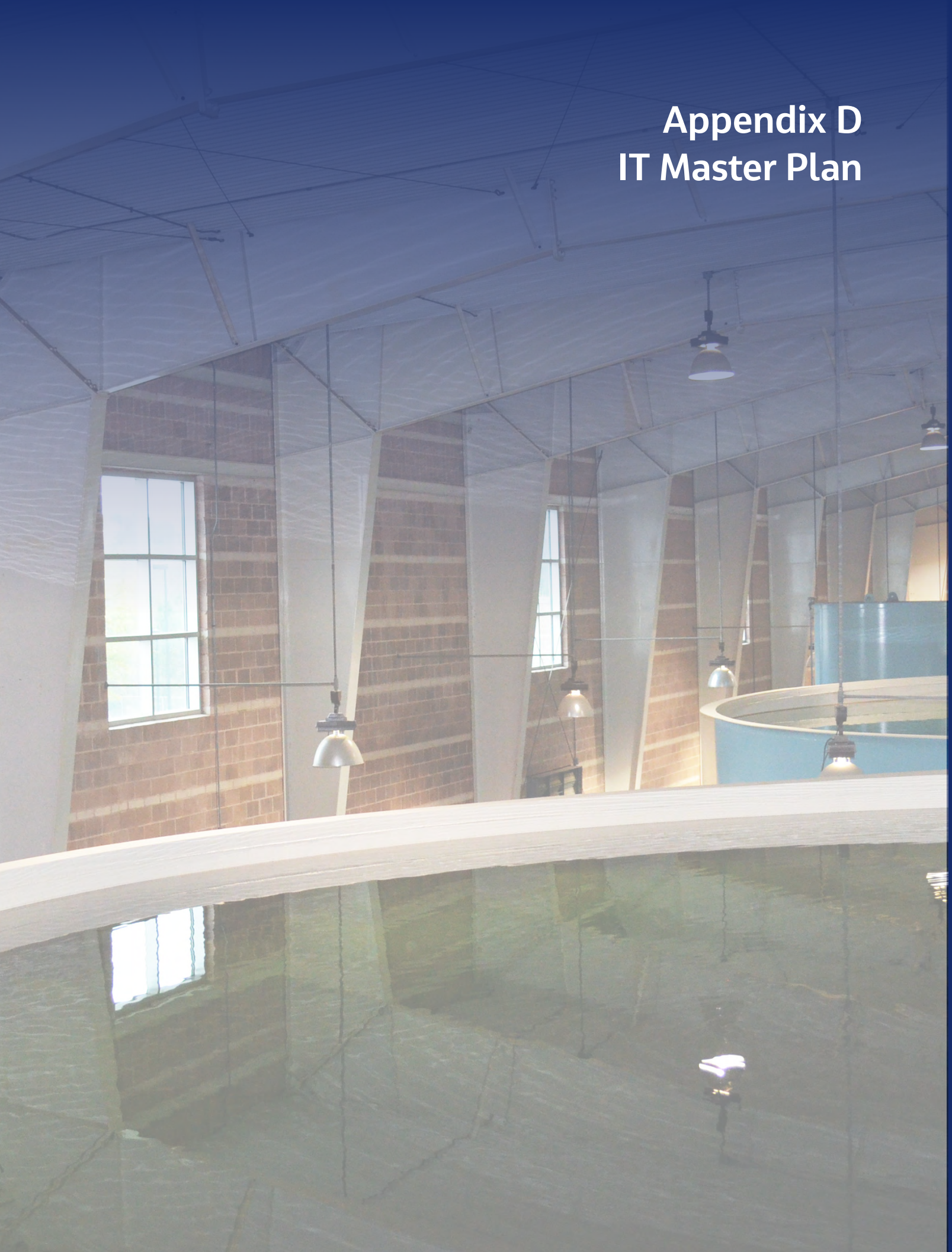
Decommission Shoal Creek WRF

Plant	Facility	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
Shoal Creek WRF	Influent Pump Station			*																											
	Screening			*																											
	Grit Removal System			*																											
	Influent Splitter Box			*																											
	Aeration			*																											
	Clarification			*																											
	Re-aeration			*																											
	Thickener/Digesters			*																											
	Blowers			*																											
	Sludge Pump Station			*																											
	RAS Pump Station			*																											
	WAS Pump Station			*																											
	Disinfection			*																											
	Effluent Pump Station			*																											
	Solids Handling			*																											
	Chemical Systems																														
	Electrical Buildings																														
	Shoal Creek Raw Water Pump Station					New																									
	Forcemain to RL Jackson Pump Station					New																									
	Admin/ SCADA/ Lab			*																											

*Facilities would require equipment (E), controls (C), and strutural surface repair (SS) upgrades based on installation year. However it is assumed that these would be deferred if Shoal Creek were decommissionined in 2025.

Plant	Facility	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
WB Casey WRF	Casey Raw Influent Pump Station		E,C			New										C										E,SS,C					
	RL Jackson Influent Pump Station		E,C			New										SS,C										E,SS,C					
	Preliminary Treatment Unit #1 (New)					New										SS,C										E,SS,C					
	Preliminary Treatment Unit #2 (Old)					New										SS,C										E,SS,C					
	Primary Treatment					New										SS,C										E,SS,C					
	Biological Basins	C				New										C										E,SS,C					
	WAS/Secondary Scum PS					New										C										E,SS,C					
	RAS/WAS Pumping					New										C										E,SS,C					
	PE/RAS Splitter Box					New										C										E,SS,C					
	Secondary Clarification (#1-#3)					New										SS,C										E,SS,C					
	Secondary Clarification (#4)					New										SS,C										E,SS,C					
	ML Splitter Box			E,SS		New										C										E,SS,C					
	W3 Pump Station			E,SS		New										C										E,SS,C					
	Recycle Pump Station					New										C										E,SS,C					
	Polishing Splitter Box					New										C										E,SS,C					
	Polishing Flow Control Vault					New										C										E,SS,C					
	Polishing Densadeg Facility					New										SS,C										E,SS,C					
	Polishing UV					New										C										E,SS,C					
	Polishing Effluent Flume					New										C										E,SS,C					
	Polishing Cascade Aerator					New										SS,C										E,SS,C					
	Polishing Chemical Facilities (2)					New										SS,C										E,SS,C					
	WAS Thickening					New										C										E,SS,C					
	Sludge Blending Tank			New										C										E,SS,C		E,SS,C					
	Digestion			New										C										E,C							
	Dewatering			New										C										E,C		E,SS,C					
	Pelletizing			New										C										E,C		E,SS,C					
	Main Plant Chemical Facility					New										SS,C										E,SS,C					
	Plant Odor Control					New										C										E,SS,C					
	Electrical Bldgs (Qty 2)					New										C										E,SS,C					
	Flint River Discharge					New																									
	Discharge Line to Jackson Transfer Pump Station																														
	Jackson Transfer Pump Station					New										SS,C										E,SS,C					
	Admin/ SCADA/ Lab					New										C										E,SS,C					

Appendix D
IT Master Plan



Clayton County Water Authority
IT Master Plan – 2020 Update
Executive Summary

March 24, 2020

Table of Contents

Executive Summary

IT Strategic Plan Revision

A significant goal of the revised IT Master Plan is to update the strategic processes used to focus on the most impactful initiatives to CCWA, while also taking into consideration what is achievable and implementable by the CCWA IT organization. Additionally, results of cybersecurity penetration tests and critical controls assessments have been incorporated into the plan.

The largest changes from the original master plan are in sections 2, 6 and 7, which have been updated and replaced with new processes to govern. Projects to address security deficiencies were also added. Many of the original elements of the plan remain relevant and as such are left unchanged.

While the intent of an IT strategy plan is not to identify all defined or potential work for an IT department over a specified period of time, the IT Strategic plan provides visibility into major projects and key departmental initiatives that IT has planned for the next 3-5 years. This plan is also a governance mechanism to begin the process of complying with NIST frameworks for security and risk management.

The following is the methodology applied in the update of the IT Strategic Plan

- Previous IT Strategic Plan used as a starting point
- Technology Steering Committee reduced in size
- Incorporated findings from cybersecurity assessments and penetration tests
- Reviewed each of the projects
- Some IT projects on the current plan were carried forward or reclassified in the IT Strategic Plan and provide additional clarity around the initiatives
- Introduction of new programs and projects that were not listed on the previous IT master plan
- Catalogue of policies necessary to go forward in organizational maturity

Plan Structure

- **Executive Summary / Abstract**
  - Summary of the plan's objectives
  - Synopsis of the processes used to develop objectives
  - Outline of the company's mission and vision
  - Crafted with the business audience in mind
- **Scope / Current Situation(s)**
  - Results of gap analysis identifying strengths and weaknesses in operations, procedures, and planning
  - Results of security assessments and penetration tests
  - Industry analysis of changing landscapes and need for metrics to measure

- **Business Context**
  - Business drivers that informed plan
  - Strategic Business objectives and priorities
  - A roadmap visualizing these goals
  - Metrics describing the IT organization's present and target state
- **Strategic Initiatives**
  - List of IT initiatives and projects needed to achieve target end state
  - Statements of purpose to guide decision making
- **Review**
  - Assess organizational progress in meeting goals of previous plan
  - Identify which goals were met
  - Highlight challenges to meeting goals

IT Goals, Objectives & Strategic Initiatives

The purpose of the update to the Information Technology (IT) strategic plan is to outline the IT approach, and its efforts to align with and ensure the success of CCWA's business strategies, as well as providing a method for the Business to engage IT as a strategic internal partner. The plan outlines the IT mission, vision, goals and guiding principles. This information is more "descriptive" in nature and is to be used as a guideline for more detail planning, which will be required for most of the initiatives in the plan. The IT plan should also include metrics for measuring current state against desired state, and contain the guiding principles needed to make decisions aligned with organizational goals.

Portions of the strategy, as well as more detailed activities and plans are further broken out into the key components of IT – Applications, Infrastructure, Governance & Operations and Organizational. The plan reflects a "point in time" alignment with business goals and will be reviewed and updated through governance activities, as well as through an annual strategic planning process.

Operational

Today, current technology and dependable systems are a base requirement for business. Through the planning and forecasting process, IT has developed a 5-year technology plan based on input from its internal customers concerning the initiatives that are required to maintain and achieve key business capabilities.

Customer

As a service organization, the IT work purpose is to facilitate and support the needs of the business. The requirements of internal customers often exceed the capacity of the IT function, therefore, decisions must be made to prioritize needs and requests based on CCWA utility wide needs and business value. To ensure value and manage rising IT costs, IT will continue to engage in process improvement and competitive sourcing activities to help the business balance requirements and meet objectives of keeping rates low and provide excellent service.

Project Scope

The Clayton County Water Authority (CCWA) originally developed an Information Technology Master Plan (IT Master Plan) to guide operations for a 5-year period. Development of the Plan was guided by a Technology Steering Committee (TSC), comprised of representatives from various Departments within CCWA. Project prioritization was performed by a larger group of an approximately 20-member IT Master Plan Committee, comprised of representatives from the same representative Departments.

The goal of developing an IT Master Plan is to establish a vision and plan for how information technology can best be utilized to support CCWA while performing routine business processes. The objectives to be achieved through the development of the IT Master Plan, as defined by the TSC, include the following:

- To improve the effectiveness of CCWA's use of information technology
- To establish and maintain governance mechanisms
- To align the various enterprise architectures (business, systems, and technology) with the CCWA master plan and objectives
- To separately perform an efficiency assessment of systems and controls to limit deficiencies

Technology Mission and Vision

CCWA established the following technology mission and vision to guide its IT master planning efforts:

Mission Statement:

The CCWA TSC was established to make decisions on how information technology is to be used by CCWA in the achievement of its mission, vision, and business objectives. The TSC was also established to make decisions on technology investments, which support the Technology Vision, and integrate new projects resulting from investment decisions into the ITMP's portfolio of projects by applying the accepted evaluation and ranking criteria. Also, periodic ITMP project portfolio analysis and reevaluation will be performed, especially when the evaluation and ranking criteria change. Finally, the TSC is to be an approval body for policies that affect the organization as a whole.

Vision Statement:

CCWA utilizes technology to help our customers effectively use our services and to make our work efficient and safe.

CCWA will:

- Leverage proven, stable, and dependable technology
- Make technology investments that consider both tangible and intangible benefits
- Strive to maximize efficiency in its use of technology

Project Approach

The Master Plan development was divided into the eight phases as listed below:

Task 100 – Project Management

Task 200 – Establish Technology Governance Approach

Task 300 – Establish Technology Vision

Task 400 – Assess Current State

Task 500 – Determine Future State

Task 600 – Critical Controls Assessment results

Task 700 – IT Systems Penetration Tests Results

Task 800 – Develop IT Master Plan

The inventorying and information gathering activities included documentation gathering and review, interviews, and workshops with representatives from the various functional areas of the CCWA. During these activities the relevant business drivers, service levels, and Strengths-Weaknesses-Opportunities-Threats (SWOTs) were identified. The update of the strategic plan identified "gaps" between the current and future state into "Gap Closure Action Plans" or "projects." The projects were subsequently scored and prioritized using the same set of criteria and weights as those used to score and rank projects included in CCWA's 2020 update to the Strategic Master Plan. The identified projects will provide for both "Quick Wins" and long-term systems and integration improvements at CCWA.

A critical success factor during development of the IT Master Plan was to establish an ongoing project review and prioritization process. As future additional IT needs are identified, the TSC intends to follow the same process that they followed to prioritize and rank the IT projects described in this IT Master Plan.

Summary of Findings

Information technology will be an increasingly important enabler to help CCWA meet its organizational mission and vision. Information, reporting, support, and resources must be available at the right time, in the right place, and in the right format to empower CCWA to make properly informed decisions. Staff will need to be properly trained to maximize the benefit of using the technology.

A very high level summary follows, with supporting information and data contained in other parts of this document. Major findings from the analysis included:

- Develop reporting metrics to regularly measure progress and compliance with business goals.
- Systems integration and implementation of a Business Intelligence (BI) dashboard solution would substantially improve communications and would eliminate both manual data management and the entry and storage of duplicate data throughout the organization.
- The JDE system was configured primarily to support the CCWA financial activities.
- The configurations of the current IT systems are not fully capable of meeting performance tracking and reporting requirements.
- Where possible, standardization among software (e.g., SCADA systems) can facilitate data management.
- Expansion of administrative licenses and training of additional staff to manage the supporting IT systems will reduce risk of the software issues to CCWA.

Cybersecurity controls around the environment are at a low level of maturity (<1 on a scale of 1-5, with 3 as the target).

- Implement an Enterprise Asset Management Program including automated patch management to reduce overall risk by implementing a process for identifying critical assets, assess the risk to those assets, and put in place controls appropriate to the business to manage risk. Will also provide complete visibility of hardware and software assets across all sites.
- Implement Network Access Control Solution at all sites for Wired & Wireless Network Assess Control to allow for endpoint posture assessment before devices are allowed on to the corporate networks.
- Adopt a secure imaging and hardening standard for servers and workstation deployment so a system's security configurations are appropriately set given the job it needs to do, in order to ensure operating system software, firmware and applications are updated to stay ahead of exploits that attack flaws in the underlying code. This also assures that the process runs continually, leveraging and employing as much automation as possible.
- Deploy Passive Vulnerability Scanners and Scanning Agents on critical servers to reduce risk of threat agents exploiting known vulnerabilities to compromise the confidentiality, integrity, and/or availability of critical IT assets.
- Implement Multifactor Authentication to all Critical servers and Infrastructure Devices that will compensate for the weakness of the other factors.
- Implement least privileged principle (i.e. separate logons for admins) for all admin accounts to give a user account or process only those privileges which are essential to perform its intended function.
- Deploy Advanced Endpoint Protection to all workstations and Servers. Enable Web Content, Application Control, File Integrity Monitoring, Intercept X and DLP features to build a more effective endpoint security program - one that proactively detects known and unknown endpoints, helps identify what is critically vulnerable to attacks, what weaknesses exist in your environment, and how effective you are at identifying threats and remediating them.
- Develop a Security-Driven Software Development Life Cycle program to ensure that security assurance activities such as penetration testing, code review, and architecture analysis are an integral part of the development effort.
- Develop an Incident Response Program to reduce risk associated with lack of coordinated response to cybersecurity events.

A network and systems penetration test was performed with found CCWA which found the vulnerability threats to the environment to be HIGH. Several fixes need to be implemented (although due to the nature of the work the activities could likely be managed as a single effort).

- Disable insecure TLS/SSL protocol support
- Fix the subject's Common Name (CN) field in the certificate
- Obtain a new certificate from your CA and ensure the server configuration is correct
- Disable SSLv2, SSLv3, and TLS 1.0. The best solution is to only have TLS 1.2 enabled
- Replace TLS/SSL server X.509 certificate
- Disable TLS/SSL support for RC4 ciphers
- Disable TLS/SSL support for static key cipher suites
- END, CCWA, 2016 Report, Rev 1.0, 5/20/2016
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- Remove the default page or stop/disable the IIS server
- MS15-034: Security Update for Windows Server 2012 R2 (KB3042553)
- MS15-034: Security Update for Windows Server 2012 (KB3042553)

- Disable TLS/SSL support for weak ciphers
- Disable SSLv2 protocol support in Microsoft Windows
- Edit the crossdomain.xml file to be less permissive Address Leak
- Replace TLS/SSL self-signed certificate
- Stop Using SHA-1
- Disable TCP timestamp responses on Cisco
- Disable ICMP timestamp responses
- Disable TCP timestamp responses on OpenBSD
- Enable TLS/SSL support for strong ciphers
- Disable TCP timestamp responses on Linux
- Disable TLS/SSL support for 3DES cipher suite
- Disable TCP timestamp responses on Windows versions before Vista
- Disable TCP timestamp responses on Windows versions since Vista
- Disable ICMP timestamp responses on Linux

In addition to an IT Master Plan, the filling of large gaps in the policy and process documentation should be fixed. At a minimum, policies and processes should developed for

- Access Control
- Awareness and Training
- Audit and Accountability
- Configuration Management
- Identification and Authentication
- Incident Response
- Maintenance
- Media Protection
- Personnel Security
- Physical Protection
- Risk Assessment
- Security Assessment
- System and Communications Protection
- System and Information Integrity

Summary of Recommendations

A list of projects was identified to help CCWA reach its desired future state. The projects were scored and prioritized by the IT Master Plan Committee. Table ES-1 below lists these in order of execution. Where appropriate, project dependencies are noted.

Table 7-1. IT Master Plan Project List

Order	Project #	Ranking Score	Project Name	Estimated Cost	Dependencies
	150	53.20	Business Intelligence (BI) Strategy	$250,000	

Table 7-1. IT Master Plan Project List					
Order	Project #	Ranking Score	Project Name	Estimated Cost	Dependencies
	151	42.80	IT Services Catalog	$50,000	
	152	71.40	Mobility Strategy	$100,000	
	153	30.40	RACI Development	$50,000	
	154	42.20	Develop and Implement a Collaboration Strategy	$100,000	
	155	61.00	Software Application Upgrade & Technology Refresh	$6,000,000	
	156	51.80	JDE Upgrade	$500,000	
	158	31.20	Review/Develop Architecture Standards	$100,000	
	159	35.00	Application Portfolio Rationalization	$50,000	
	160	69.40	Evaluate and Implement System Integration Strategy	$1,000,000	
	161	72.00	Refresh Disaster Recovery - Data Center & Cyber Security Strategy	$250,000	
	162	37.00	Establish Data Governance & Stewardship Program	$100,000	
	164	26.00	Sourcing Strategy-Cloud	$100,000	
	165		Develop reporting metrics		
	166		Enterprise Asset Management Program		
	167		Network Access Control		
	168		Secure imaging and hardening standards		
	169		Deploy Passive Vulnerability Scanners		
	170		Multifactor Authentication		
	171		Advanced Endpoint Protection		

Table 7-1. IT Master Plan Project List					
Order	Project #	Ranking Score	Project Name	Estimated Cost	Dependencies
	172		Security-Driven Software Development Life Cycle program		
	173		Incident Response Program		
	174		Patching of penetration test findings		
	175		Operational Policy Suite		
	176		Implement quality cycle for governance		

Clayton County Water Authority
IT Master Plan – 2020 Update

March 24, 2020

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Section 1 CCWA Technology Governance

According to the Information Technology Governance Institute (ITGI):

> "IT governance is the responsibility of executives and the board of directors, and consists of the leadership, organizational structures, and processes that ensure that the enterprise's IT sustains and extends the organization's strategies and objectives."

History

Previous versions of the IT Master Plan attempted to organize a six-member Technology Steering Committee, which was intended to become the authority on technology governance. This was driven by an IT Master Plan Committee comprised of 20 members.

Functionally, for an organization the size of CCWA, the end-result was a group that experienced systemic issues with scheduling, and found decision making to be unwieldy.

A smaller, more focused governance group is being proposed, which will require IT leadership to take a more assertive role when including the business is required, and a more assertive role by the business when it needs to engage IT to accomplish business goals.

1.1 Mission of the Technology Steering Committee

The CCWA TSC has been established to make decisions on how information technology is used by CCWA in the achievement of its mission, vision, and business objectives. The TSC also makes recommendations on technology investments that support the Technology Vision and integrates new projects resulting from investment decisions into the ITMP's portfolio of projects by applying the accepted evaluation and ranking criteria, including review of departmental projects that have technology components. Also, periodic ITMP project portfolio analysis and reevaluation will be performed, especially when business conditions, evaluation and/or ranking criteria change.

In addition, the TSC can address topics and make recommendations not primarily focused on Technology, but that have impacts needing to be considered. These would include topics such as Project Management, Change Management, Business Process Review and Improvement, etc.

1.2 Technology Vision

"CCWA utilizes technology to help our customers effectively use our services and to make our work efficient and safe."

CCWA will:

- Utilize technology that relies on a Common Operating Environment
- Leverage proven, stable, and dependable technology
- Make wise technology investments that consider both tangible and intangible benefits
- Strive to be innovative and efficient in its use of technology
- Focus on and execution of work priorities as referenced in the IT Master Plan

1.3 TSC Scope of Authority

The CCWA TSC will make recommendations in the following areas:

- Technology Vision and Principles
- Technology Standards and Policies
- Technology Infrastructure
- Business Applications
- Technology Investments
- Project Management
- Change Management
- Business Process Improvement

The CCWA TSC has the authority to review proposed technology investments and make recommendations to the General Manager for final approval. The General Manager has final authority to commit resources (money, people, etc.) to implement technology related investments.

1.4 TSC Membership

The following CCWA employees are members of the TSC. The rotation period is planned to cover at least 2 years, and the rotations should be on an alternating year basis.

Table 2-1. TSC Roles

Name	TSC Role	Timing
Derek Doss	TSC Chairman	Permanent
Dan Holverson	Director IT	Permanent
	General Manager or Delegate	Permanent
	Business Units	As Needed
	Legal / Risk Management	As Needed
	HR / Business Support	As Needed

Membership/representation will be reviewed and revised as needed by the TSC.

Assistant General Manager(s) will be invited as optional, and General Manager will be invited to these meetings as needed.

1.5 TSC Operating Procedures & Decision-Making Process

The following table defines the types of decisions and the level of responsibility for the various groups.

Table 2-2. TSC Decisions

Group	Vision & Principles	Standards & Policies	IT Infrastructure	Business Applications	Investment Decisions
TSC	A	A	C	A	C
IT	C	A	A	A	C
Executive	A	A	C	C	A
Departments	C	I	I	C	C

Legend: A – Accountable; C – Consulted; I - Informed

A Stage-Gate process will be used by CCWA to gather ideas for technology investments and develop those ideas into viable projects where appropriate. The following list of activities illustrates this process:

Stage 1 – Idea Generation (Social Innovation)

- Idea Generation
- Idea Submission (Idea Template)
- Directly through IT, based on needs

- Gate 1 – Idea Review

Stage 2 – Business Case (Pitch) – as necessary

- Business Case Development
- Business Case Submission (Business Case Template)
- Preliminary Project Objectives and stakeholder identification
- Gate 2 – Business Case Review (Approval Criteria)

Stage 3 – Project Launch (Project)

- Project Plan Development
- Project Plan Submission (Project Plan Template)
- Project Management and Change Management Planning
- Gate 3 – Project Plan Review (Approval Criteria)

Stage 4 – Project Implementation

Stage 5 – Confirmation of Solution Effectiveness

1.6 TSC Communications

The TSC will be available virtually on a regular basis to review ideas, business cases, and/or project plans for technology investments, and how these fit into the overall CCWA operating environment. Also, project activities and dependencies can be reviewed for timing and impacts to affected business units. The TSC should meet quarterly, or more often when needed.

An agenda will be developed and provided to attendees prior to each meeting. CCWA employees who have submitted a request to the TSC will be invited to the meeting where their request will be reviewed. Decision results will be communicated to all stakeholders following each TSC meeting. All TSC requests will be documented using the standard templates for each Stage of the process. The Idea Template and Business Case Template are included in Appendix A – Technology Governance Templates. Preliminary Project Plan will be completed via Excel Template. Project prioritization will be performed IT and Business Leadership.

There will be an Update to Managers on a quarterly basis in the form of a presentation. The presentations will take place as part of normal activities – Fall-Managers Planning Session, Winter-Project Prioritization, Spring – Budget Retreat, Summer – at a weekly Managers Meeting. Written summaries will also be supplied via email, as well as being stored on the TSC SharePoint site.

1.7 Approval of Policies and Procedures

In addition to approval of projects and other IT activities, the TSC should also serve as the final approval authority for all technology-related policies. CCWA bases its governance model on NIST 800-171A (Handling of Unclassified Data) and NIST 800-30 (Risk Management), and adherence to these frameworks requires specific policies and procedures be created, distributed, and reviewed. Employees must also be given periodic training. In order to comply with NIST the following must be addressed via policy:

- Access Control
- Awareness and Training

- Audit and Accountability
- Configuration Management
- Identification and Authentication
- Incident Response
- Media Protection
- Personnel Security
- Physical Protection
- Risk Assessment
- Systems and Communications Protection
- System and Information Integrity

1.8 Review Cycle

Once a policy or project set is created, a review cycle must be set up to ensure the policy remains current with business needs and is being enforced. The TSC should be responsible for ensuring the policies are reviewed at least annually, and documentation of review is generated and preserved.

Section 2 Business Architecture Plan

The Business Architecture Plan details how the implementation of the recommended IT solutions will impact the primary business processes and identifies the required changes to those processes to facilitate the effective deployment and acceptance of the recommended projects. A business process is a sequence of work activities performed by staff to achieve a specific goal.

The business architecture is a fundamental component of Enterprise Architecture and in determining CCWA's Application strategy.

The business architecture plan helps establish a program that determines the management of current applications, processes, data and infrastructure architecture and guides the implementation of new IT systems for CCWA. Some of these elements and the benefits from establishing the business architecture plan as a direct component to an enterprise architecture strategy are as follow's;

Define requirements and scope for a common operating environment,

Evaluate and adopt an appropriate industry standard framework. Alternatively, CCWA can develop a hybrid framework.

Conduct the current state assessment, future state definition and mapping exercises with IT and business stakeholders.

Establish and communicate CCWA-wide IT Governance model

Develop Enterprise Architecture artifacts to define the technology, architecture and process standards.

Manage, measure and report the effectiveness of the program

Grow scope of Enterprise Architecture and CCWA's common operating environment and update its components and standards to keep it up with the changing business needs over time

2.1 Business Functions

Twelve (12) key CCWA business processes were identified by the Technology Steering Committee and selected for analysis as part of the IT Master Plan project. Please note that these twelve (12) business processes are only a subset of the entire set of business processes in place at CCWA. Other processes will be addressed over time and as directed by CCWA leadership and dictated by performance improvement needs. The following diagram provides a high-level business architecture view of the relationships between the twelve (12) identified processes addressed by this ITMP:

This section has been updated as part of the IT strategy update however each of the 12 business process that were originally identified in the original plan have not been replaced - rather the projects that tied to these processes have been updated. As part of the update to the IT strategy plan there are some projects that were previously listed as part of the IT plan which now exist in either utility-wide or another business area. Even though not specifically owned by the IT strategic plan these projects are likely to require support from IT and if they support one of the key functions the attempt has been made to indicate these projects in this section.

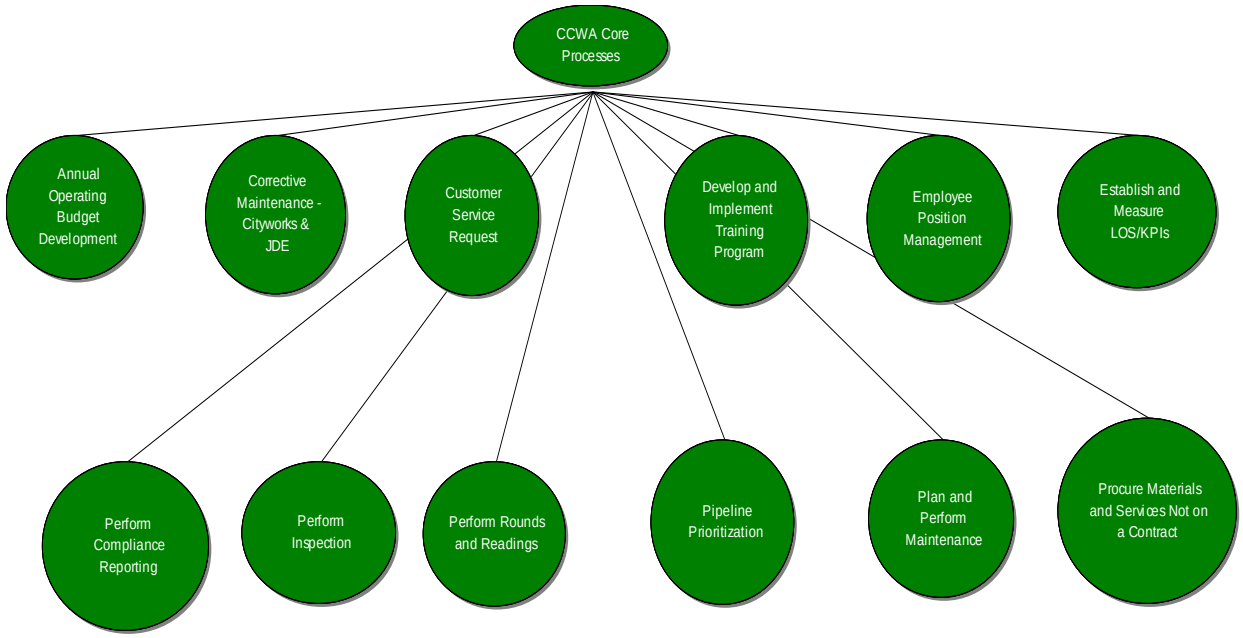


Figure 2-1. CCWA Business Process Model

Table 3-1. CCWA Business Processes Reviewed

Process Name	Description
Annual Operating Budget Development	Gather and consolidate information to develop the annual CCWA operating budget, along with appropriate reviews and approvals
Corrective Maintenance – Cityworks & JDE	Perform corrective maintenance for plant and distributed CCWA assets
Customer Service Request	Handle, process, and resolve a CCWA customer's request for service
Develop and Implement Training Program	Develop the training program for CCWA employees and implement it
Employee Position Management	Manage the processes to request and fill CCWA job positions
Establish and Measure LOS/KPIs	Set targets, gather data, and measure CCWA's performance in meeting levels of service and key performance indicator targets
Perform Compliance Reporting	Gather data and report on CCWA's compliance with regulations and permits
Perform Inspection	Perform inspections on D&C and Stormwater assets as directed by regulatory guidelines
Perform Rounds and Readings	Perform operations rounds and record readings at CCWA facilities
Pipeline Prioritization	Gather information on CCWA's pipelines and develop prioritizations for repair, rehab, and replacement
Plan and Perform Maintenance	Perform planned and preventive maintenance for plant and distributed CCWA assets
Procure Materials and Services Not on a Contract	Procure materials, parts, and services required to perform maintenance on CCWA assets and equipment

2.2 Process Affected

During implementation of the IT Master Plan project, the identified twelve (12) business processes were reviewed and discussed to identify how staff was currently using software to support each business process and where improvements could be made. While many of the existing business processes were well defined, some processes had evolved to compensate for insufficient IT system implementation, functionality, training, or data management issues. Improvements were identified to address issues of manual data entry/extraction, duplicate data entry, and hardcopy manipulation. Each of the twelve (12) business processes and improvement opportunities is summarized in Sections 3.2.1 – 3.2.11 along with the affected projects (e.g., Gap Closure Action Plans in section 7) that will provide the new functionality and the systems affected. Workflow models of the "To-Be" business processes are located in Appendix B.

2.3 Annual Operating Budget Development

The Annual Operating Budget Development process is a key business process at CCWA. The primary opportunities for improvement to this business process are in how budget information is submitted, viewed, and managed by Department Managers.

The data and information submitted by Department Managers to the General Manager every 6 months can be in a consistent format and entered directly into JDE. Individual Department budgets can be viewed by assigned Users and supporting narratives can be linked. If edits are made to a budget by a User (e.g., an edit is made to a Department budget by the Budget Office), JDE could send a notification to subscribed Users that an edit has been made, giving Department Managers an opportunity to update narratives.

A business intelligence tool can assist with viewing the data and information used to prepare the Department budgets and identify at any time, including the budget spent and budget remaining. A dashboard view could be configured to present budget information to the CCWA Board.

2.4 Customer Service Request

The Customer Service Request process is CCWA's primary way of interacting with Customers who have contacted CCWA to report an issue that needs to be addressed. The data and information gathered during this process provides information to determine if CCWA is meeting its customer service goals. The primary opportunities for improving this business process are by providing better access to information contained in the JDE and Cityworks work order systems to Customer Service staff through system integration with the Northstar Customer Information System (CIS) and by providing the views to needed data. Improvements to phone and IVR systems (outbound calling and problem resolution follow-up) can also enable Customer Service staff to respond more efficiently and effectively to Customers. Expanding the ability to support instant messaging among Customer Service staff can speed up internal communication and response to Customers.

2.5 Develop and Implement Training Program

The Develop and Implement Training Program process involves managing CCWA staff training needs and certifications. It is important to track and manage training and certifications to ensure that staff is in compliance with state requirements. The Human Resources Department is responsible for tracking and providing training to CCWA staff. The primary opportunities for improving this process include facilitating communication between Department Managers and the Human Resources

Department about staff training needs in a timely fashion, and in communicating available training opportunities and materials to staff.

Establishing a business rule that the Human Resources Department is the "system of record" for needed trainings will facilitate communication among Department Managers and the Human Resources Department. The Human Resources Department, using Compliance Suite, could send triggers to Department Managers and affected staff when training and recertification is needed. The training and certification results can be tracked in Compliance Suite to confirm compliance. Annually, the Human Resources Department can work with Department Managers to review job categories and confirm that the training offered is appropriate to support core competencies and specialty areas. The training courses can be advertised on SharePoint and through internal emails and publications.

2.6 Employee Position Management

The Employee Position Management process is managed by the Human Resources Department in response to Department Manager's needs for new staff (replacement or additional). The primary opportunities for improving this process are limited due to the requirement to use the established Employee Request and Job Reclassification forms which are generated in Adobe and passed between Department Managers and the Human Resources Department to track requests. JDE is updated with staff details manually by the Human Resources Department as positions are created and eliminated. No major improvement opportunities were subsequently identified.

2.7 Establish and Measure LOS/KPIs

The Establish and Measure LOS/KPI process is the main process by which Department Managers and the General Manager can understand how CCWA is performing and progressing toward identified business goals. The primary opportunities for improving this process are in how data is gathered, submitted, consolidated, shared, and used by staff.

Standardizing data entry by Department Managers can improve this process and cut down on time spent consolidating data. A standard form or business intelligence tool could assist with gathering identified data from different supporting software systems, performing calculations on the data so that identified key performance indicators can be reported on, and reporting on the data using specified indicators that are in alignment with CCWA Strategic Goals.

2.8 Perform Compliance Reporting

The Perform Compliance Reporting process is important to CCWA for meeting regulatory compliance reporting requirements. It is critical that CCWA submit required reports as scheduled. The primary improvement opportunities associated with this process are in how data is gathered, viewed, and in how reports are generated and submitted to the State.

Having software systems configured to report on needed data can help eliminate much of the manual entry of data from one system into the State's report form. Integrating certain systems to extract and view needed data can also streamline the compliance report development process. A business intelligence tool could assist in pulling needed data from various software systems into a report format that mimics the State reporting form to facilitate either a direct transfer of data into the State's form or copying the data into the State format which is accessed through the State's website. Storing copies of the reports submitted to the State in a distribution management system (DMS) could facilitate access to all previously submitted reports in a single location.

2.9 Perform Inspection

The Perform Inspection process is important to CCWA for meeting regulatory requirements. It is critical that CCWA perform the required numbers of inspections on Distribution and Collection system and Stormwater system assets as scheduled. This is a relatively new business process for CCWA that was begun near the beginning of the IT master planning project. No improvements were identified from the current to future state at this time but an expansion of the types of assets included in the inspection process will be considered (e.g., IU, dams, and FOG).

The inspection work orders are created in the Cityworks Inspection module to coordinate planning, performance, and reporting on the condition of D&C and Stormwater assets. Not only are planned inspections performed by CCWA staff but, when the opportunity is available during other planned maintenance activities, inspections are performed on targeted assets. This allows CCWA to make the most of their onsite resources.

2.10 Perform Rounds and Readings

The Perform Rounds and Readings process is one of CCWA's primary preventive maintenance activities at the plants. As part of this process, CCWA staff routinely assesses the plant assets to confirm operational integrity and general condition. The primary improvement opportunities associated with this process include documenting results in JDE instead of paper checklists and in gathering samples using a LIMS system, as opposed to an Excel-based tracking system.

Preventive maintenance work orders can be set up in JDE and scheduled to be distributed on a daily basis to operations staff for performing daily rounds. Operations staff could create a work request for any maintenance needs identified as a result. A LIMS system could facilitate scheduling sampling work activities and help with tracking results and submitting information to the State.

2.11 Pipeline Prioritization

The Pipeline Prioritization process allows CCWA to use asset condition data gathered while performing work in the field to identify the most critical pipes to inspect and maintain. This is a relatively new business process that is still being defined and which is supported by a custom-designed pipeline prioritization tool. As this process becomes more refined, using pipeline condition and performance data to prioritize work and reduce overall risk to CCWA will be simplified.

With the assistance of the pipeline prioritization tool, the Distribution and Collection System Department Manager and Stormwater Department Manager can better prioritize inspection and pipe condition assessment work by using a set of weighted criteria. The tool can import asset condition data from Granite XP and prioritize work based on its current condition or likelihood of failure. An R&R schedule can subsequently be developed.

2.12 Plan and Perform Maintenance

The Plan and Perform Maintenance process is the primary process followed by CCWA to perform preventive or corrective maintenance on assets. Staff uses Cityworks to plan and perform maintenance on the liner systems and use JDE to plan and perform maintenance on above-ground assets. The primary improvement opportunities associated with this process include preparing maintenance strategies for individual asset categories and populating Cityworks and JDE with Preventive Maintenance Work Orders that are issued at specified intervals, and facilitating communication among staff involved in execution. Because materials and equipment are maintained in JDE, integrating Cityworks and JDE will allow for better tracking of all costs associated with a particular work order.

2.13 Procure Materials and Services Not on a Contract

The Procure Materials and Services Not on a Contract process is the process followed by CCWA staff to obtain materials needed to complete a Work Order that are not kept in stock, and services from outside contractors and consultants that are not on contract. This process is supported by the procurement module in JDE and several business improvement opportunities were identified to eliminate manual tasks currently performed by CCWA staff that could be done automatically within JDE.

Section 3 Systems Architecture Plan

The Systems Architecture Plan section defines the existing systems architecture (applications, interfaces, and data), and the resulting systems architecture once the technology plan's recommendations are implemented. The objective of the plan is to provide the systems necessary to support the recommended changes to the business architecture.

The IT Master Planning project modeled twelve (12) distinct CCWA business processes. CCWA has over fifty-three (53) IT systems. In the update of the IT strategy plan these 53 IT systems and 12 processes have been included as they remain relevant to having a connected and integrated business. With that said the update to the IT strategy plan directive was to focus on the creation of integration strategies focusing on 3 core enterprise systems. JDE, Cltyworks, and Northstar (note that a potential for replacement of Northstar could significantly impact the systems architecture plan.

It is important to ensure ongoing alignment between IT efforts and establishing and reviewing proposed changes and approving changes to technical standards to be used for IT assets. The IT Steering committee should have responsibility to determine the "Run, Grow, Transform, and SUNSET" aspects for software environments that make up infrastructure, operating system, telephony, and applications.

> RUN category will identify those technical standards that should be maintained in the next period of time for the standard, the default will be one year.
>
> GROW category will indicate the next standard that CCWA IT will migrate to from an existing standard
>
> TRANSFORM category will identify the new products that are to be considered for a new standard and are assigned for consideration of adoption. A timetable for the review and certification and testing prior to adoption will be set and captured in the IT Steering committee meeting minutes.
>
> SUNSET category of standards that have been dropped as approved standards and should no longer be implemented in new environments.

CCWA continues the process of addressing strategic and tactical application needs to support becoming an integrated organization. The key focus will be ongoing analysis across applications to identify opportunities for upgrade, consolidation, or to address key gaps. The IT governance processes will also serve to keep up to date Application Lists, Application Roadmaps, and Application Architectures as key communication vehicles with the business units.

An initial inventory of these applications should be created for synergies and to identify cost savings. IT management team and representatives from the IT Steering committee should review and discuss the consolidated list of applications classifying the future state approach for each application into three (3) distinct categories: strategic, tactical, or sunset.

To ensure ongoing alignment with CCWA's business strategies, address identified gaps, and to continue overall growth and "evolution", IT will define specific future state focus areas in each IT component: Applications, Infrastructure, Governance & Operations, and Organization. The purpose of this section is to emphasize needs in each component – not to provide detailed plans and timelines.

These focus areas will be inputs to the overall Integration strategy and will plan to serve as input to ongoing IT planning.

CCWA's application strategy is to stay current with strategic applications and to provide the functionality needed to meet the business needs. Continued rationalization of the application listing, IT Technology application roadmap, and application architectures will ensure alignment with the business strategies. The creation of operational application roadmaps should be initiated as part of the development of an application portfolio rationalization process. This process will reflect the approved and budgeted projects for strategic applications. The roadmaps are a key tool in IT governance and should be reviewed and updated annually as part of the budget and planning process.

The IT technology application roadmap is intended to maximize the return on investment and achieve the most value for each dollar spent by providing transparency to organization-wide initiatives for strategic applications. This transparency will assist in prioritization of IT initiatives in alignment with the needs of the business and reasonable allocation of or sourcing of, if necessary, IT resources. Additionally, the application roadmap provides visibility to avoid redundant initiatives and focus on cross-departmental improvements versus one-off enhancements.

The result pf the application roadmaps will provide significant input to the creation of a more detailed integration plan and will serve to define the existing systems architecture (applications, interfaces, and data), and the resulting systems architecture once the technology plan's recommendations are implemented. The objective of the plan is to provide the systems necessary to support the recommended changes to the business architecture and is a core component of CCWA's common operating environment.

3.1 Current State Systems Architecture

The current state systems architecture maps out the systems currently in place at CCWA and provides an overview of how each system fits into overall enterprise operations. Also included is an overview of the fitness of each system as defined by interviews with business and technical support staff.

3.2 Current Systems to Workflow Mapping

A current network topology map with associated systems and applications should be maintained as a separate document. This data should be considered very confidential and access limited to those with a need to know.

Section 4 Technology Architecture Plan

The Technology Architecture Plan addresses the underlying technology that must support the systems and data within the systems architecture.

IT Environment Background and Characteristics

- The IT environment at CCWA has evolved in a siloed manner to each functional business area without a formal IT architecture approach. Within the current IT environment, there is very little application-to-application integration or automated data integration between applications.
- There is no framework or tools for adding application or data integration to the current IT environment.
- Departments will obtain technology or services that require the support of IT; however, IT was not asked for input prior to the technology acquisition.
- There are three main CCWA categories and applications that if integrated would provide significant benefit.
    - Customer Management (Northstar)
    - Financial Management (JDE)
    - Maintenance and Work Order (Cityworks)
- These categories reflect an analysis of the current CCWA environment and do not represent an organized architectural approach.
- In addition to these three main applications there is a number of other applications which are standalone in nature and don't provide for an integrated enterprise.
- The applications grouped under Customer, Financial, and Maintenance Systems reflect past and ongoing efforts by business users to overcome limitations in the IT environment.
- The vast majority of CCWA systems are hosted locally in a data center environment located on a virtualized server environment that is managed by IT
- Application Management) for CCWA applications is not an organized function. Application management is provided for individual support for applications rather than having an integrated approach.
- Currently there is limited visibility across core systems JDE, Cityworks, Northstar, as they each have their respective support and knowledgeable business users.

4.1 Current State Technology Architecture

The diagram below describes the technology architecture that is supporting the CCWA systems today.

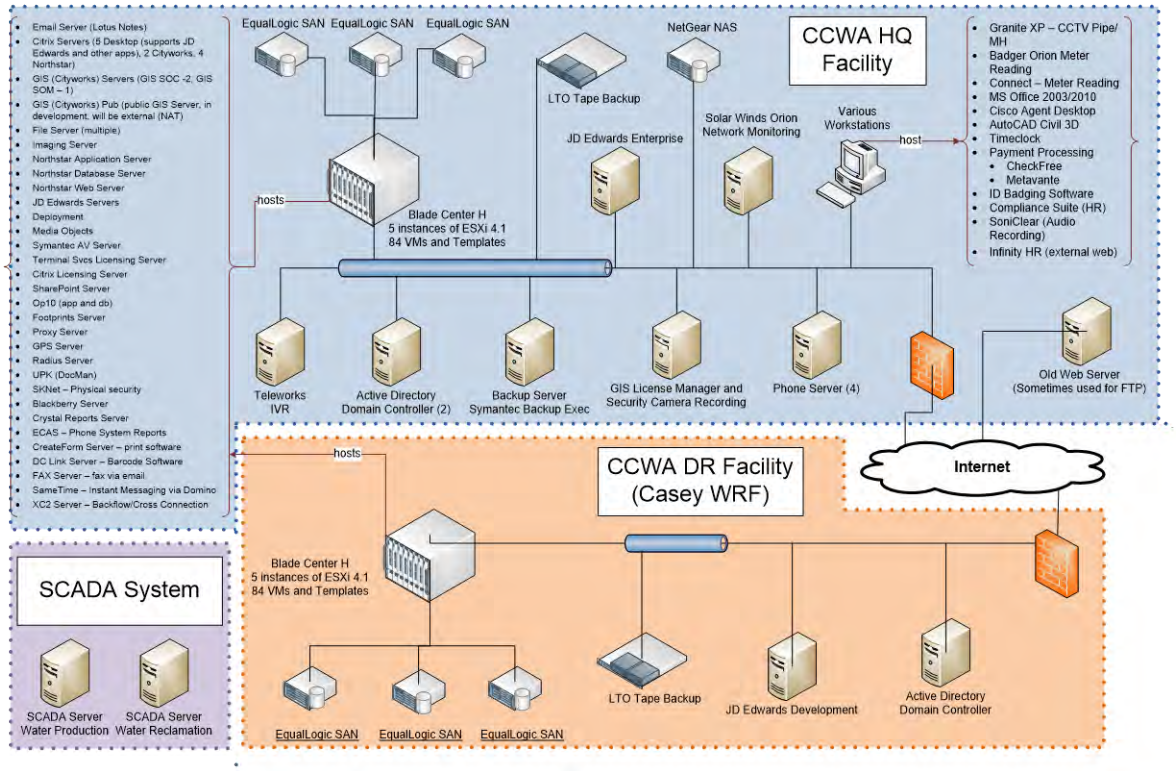


Figure 4-1. Current State Technology Diagram

4.2 Future State Technology Architecture

The technology in place at CCWA is currently sufficient for the utility's needs. However, the future state has a significant change that will be dependent on the decisions for a Northstar replacement.

It depicts key enterprise integrations from an interface perspective, not a technology perspective. – portraying key applications and their relationships. This architecture serves the Utility in several different ways:

- Provides strategic context for investments to support CCWA's common operating environment strategy
- Defines the components and alignment of core business applications and data
- Offers a model for which strategies can be developed, products procured, systems developed, improvements measured, and investments tracked.

The architecture guides IT workload (now and over the next several years - e.g., Application Roadmaps and initiative identification/tracking). As updates are made IT will ensure alignment between ongoing

application analyses, application roadmaps, and desired future state direction of core business processes.

IT Architecture Recommendations

- IT solutions need to create an integrated business environment that allows CCWA to avoid adding staff as business operations expands.
- IT solutions need to allow CCWA to improve the quality of business operations with better controls, automate process steps and provide the ability to collect data for automated analysis of business activities.
- IT solutions should be leveraged across business functional areas without function-overloading.
- IT solutions should support all current and future CCWA business processes based on Priority Ranking:

Core and Non-Core Architectural Models

The Insight recommendations includes four core architectural models that would be shared by the other architectural models in the development of CCWA's common operating environment. Core architecture models:

- Application Integration Framework (AIF)
- Business Collaboration System (BCS)
- Business Intelligence (BI)
- Mobility

Regardless of the sequence of implementation of the remaining architectural models, NTT DATA recommends that the first implementation includes the core architecture

Application Integration Framework (AIF)

CCWA should develop an Application Integration Framework (AIF). The AIF should have the following characteristics.

- Supports Common Operating Environment
- Supports real time and batch integration
- Supports both data exchange and messaging exchange
- Supports all public application integration standards
- Includes robust error handling
- Includes configurable scheduler for control of work assignments
- Initial priority to JDE, Cityworks, and replacement of Northstar
- All application to application integration passes through the Application Integration Framework.
- ERP (JDE) is the system of record for all finance impacting transaction. Master data reference system for most data elements should be based on JDE and extended to work order systems (City Works) and customer service (NorthStar replacement). Peripheral systems communicate only to the AIF
- Engineering System city works system of record for all work order related data and history. Provides master data reference data to JDE. Interfaced to other applications through AIF. Interfaced to Engineering Tools.
- Customer support system of record for all customer support requests. Receives reference data from ERP (JDE). Communicates thru the AIF to other applications. Accessible from Business Collaboration System Customer Portal for CCWA customers.

- Business Intelligence will include Data storage for all corporate detailed data that analytics would be required for. Receives data from JDE, Cityworks, and NorthStar replacement via AIF. Vendor supplied interface to Business Analytics tools. Allows users to download data sets to Excel applications for further analysis.
- Business collaboration (SharePoint) system for all functional areas. Portal for Internal CCWA, Customers and Suppliers. Interfaced to other applications through AIF. Can be directly interfaced to Outlook. Workflow engine interfaced to workflow engines in other applications through AIF. Structured file storage for all functional areas. Interfaced to File Server environment for access to legacy files. CCWA users from all functional areas, customers and suppliers.
- Accessible all by applications in the IT environment.

Business Intelligence (BI)

- Data Warehouse provides storage for all data types in which a BI tool may pull analytics
- Data Warehouse integrated with Business Analytics tool-set
- Business Analytics tool-set able to generate multiple output formats and output types
- Business Analytic tools provides a self-service facility to run parameterized reports
- Meets CCWA access and data security standards
- Can be integrated to Application Integration Framework

Business Collaboration System (BCS)

- Provides a platform for customizable, configurable portal deployments for CCWA Internal, Customer and Supplier requirements
- Provides document management storage, coding and search functionality
- Provides a configurable workflow engine (SharePoint)that can integrate through the AIF to workflow tools in the Future State IT environment
- Integrates with CCWA corporate email solution (Outlook)
- Meets CCWA access and data security standards
- Can be integrated to Application Integration Framework

Mobility

- The CCWA IT environment does not currently support mobile platforms.
- NTT DATA recommends that any new software selected for use by CCWA include functionality that allows user transactions and data retrieval to take place on or via the web interface of a mobile device.
- Mobility solutions are enabled with a combination of software and hardware. A single mobility solution standard should be defined and all applications in the Future State IT environment should be able to support the mobility solution standard.
- CCWA should define what mobile device platforms and operating systems should be supported in the Future State IT environment.

Common Architecture Components: Key Requirements

- Commercial software is available to meet the CCWA business requirements for each of the architectural models and any customization should be limited.
- NTT DATA recommends, that if possible, only a single software stack from a single vendor be used for each architectural model.
- In instances where the software stack contains multiple modules, the stack should include configurable integration provided by and supported by the software vendor.
- Process integration at the boundary of each architectural model should utilize software vendor provided integration points and be managed through the Application Integration Framework.
- NTT DATA does not recommend any specific software products as part of this IT Strategy recommendation. CCWA should conduct a software search and functional fit analysis to determine the software that best meets their needs.

Sequencing Considerations

- In undertaking a major IT Modernization, and integration strategy the sequence in which new software is introduced into the business and IT environments can have differing impacts.
  - Availability of key resources
  - Other simultaneous business and IT initiatives that compete for project resources or are dependent on systems being replaced
  - Difficulty of integration and data migration in multi-phase implementations
  - The decisions on sequencing and high-level project planning for multi-phase implementations should be undertaken before the initiation of the IT Modernization A sequence that may be easier for IT to implement, might be more difficult for the business and vice versa.
  - Sequencing will have fewer impacts in a single phase (Big Bang) implementation.
- The types of factors to consider in making sequencing decisions include:
  - Ability to manage organizational change
  - Impact on business operations including customers, suppliers, and financial management
- Impact on IT support operations and should consider the impact if the project must be suspended with one or more phase not completed.

Organizational Change Management

- IT Modernization activities are as much or more about implementing business change than IT change. As a result of introducing new technology and the integration of business process into end-to-end chains of activities, business and the staffs are required to change business practices, of business communication policies, data management practices, security authorization policies and process governance practices amongst other aspects operations.
- The introduction new architectural models to the CCWA business is expected to have a major organizational change impact. In a world in which commercial package software can be expected to perform as configured, the key variable in the success of an IT integration and modernization effort is the ability to change the mind-set and practices of the CCWA business users.
- Preparing for, planning, managing, implementing and reinforcing organizational change is a difficult and time-consuming process that requires an understanding of business culture, inter-department and intra-department dynamics, leadership styles, personal and group incentives and rewards and motivational psychology.
- NTT DATA recommends that CCWA engage support for Organizational Change Management activities as a key part of the IT integration and modernization implementation.

Section 5 IT System Assessment

5.1 Introduction

Information Technology (IT) has become an essential element in the effective management and operations of CCWA. CCWA has contracted with Brown and Caldwell to perform an assessment of the current state of their IT system and to provide recommendations on how to improve the IT system's effectiveness. This section documents the findings of the evaluation and provides specific technical, operational, and managerial recommendations that, if implemented properly, will improve the effectiveness of IT for CCWA.

5.2 Section Contents

This section is comprised of the following four major sections:

Introduction

This section introduces the report, describes the report objectives, describes the reporting methodology, and summarizes major findings.

Threat Definition

The threat definition section describes the character and qualities of the threats that are considered when evaluating operational risks in the following section.

Operational Risks

This section documents the operational risks that apply to the IT system on a regular basis. The discussion of each risk includes a description, the vulnerability that exists, threats which can exploit the vulnerability and the impact on the organization if the risk is realized. Additionally, each risk has a risk score to provide guidance on its relative criticality.

Recommended Controls

This section provides specific, actionable recommendations on how to address the risks presented in the previous section.

5.3 Methodology

The methodology for this report was based on the National Institute of Standards and Technology (NIST) Special Publication 800-30 "Risk Management Guide for Information Technology Systems," which provides specific guidelines on how to quantify and address the security risks faced by IT systems. This guidance has been adapted by Brown and Caldwell to address operational risks in addition to security risks.

The information in this section is the result of a number of user interviews with CCWA staff. The conclusions in this report are based on the experience and expertise of Brown and Caldwell with additional guidance from CCWA staff.

5.4 Strategic Plan Update Methodology to Current State

This approach taken to update this section was to leave the initial findings in place and to add a section to indicate when a major finding or significant section required updating. The updates in this section are indicated by Update to the specific category. It should be noted that although the methodology of updating the IT strategic plan required involved a current state assessment the assessment was not a detailed review of each of the components indicated in this section. As such there is the possibility that certain risks and threats that are defined in this section may not exist as well as the potential that additional risks may not be fully documented.

5.5 Major Findings

Overall, the IT system supports CCWA effectively. CCWA staff members find the IT staff to be well intentioned, polite, and easy to work with. Most users feel that the majority of their needs are being met or exceeded by the services provided by the IT department. However, some specific

opportunities for improvement were identified in the course of the evaluation. These opportunities include:

Improved IT Staffing

There are critical system maintenance activities that have not been performed. MIS staff have indicated that they do not have the resources available to perform these activities. Training and hiring additional staff will enable a more consistent level of service, support the development of natural communication channels, and allow IT staff to develop expertise tailored to CCWA's specific needs.

Improved IT and Business Staffing

The same resources are often used for management roles and daily execution of projects. This is consistent across both IT and business departments at CCWA. This type of business staffing leads to a shifting of priorities and the result is difficulty in executing and meeting project deadlines. A separation of management oversight in implementation of project managers rather than "working" managers would enhance the ability for CCWA to meet the ongoing demands of projects and to execute without the shifting priorities of the same resources being accountable for day to day management of going operations as well as acting as project leads for projects. Consideration should be given to when a resource is required on a project that this person is dedicated for the respective project or projects.

Improved Ticketing System Use

The ticketing system should be the primary point of contact with IT. While users indicated a satisfaction with the IT staff members as individuals, they also expressed a great deal of frustration with specific aspects of IT operating procedures. IT operations can be improved with simple modifications to the use of the ticketing system and the related operating procedures. This will also help IT define and communicate the capacity of the staff to respond to customer requests.

Improved IT Policies

While several documented policies exist, the majority of IT tasks are not informed and guided by the wealth of specific policies needed to cover all aspects of proper IT operations management. Implementing an IT governance process and establishing policies for every major IT task will increase IT staff process awareness and readiness and pave the way for sustained hardware availability and software effectiveness, efficiency, and reliability.

Update of Major Findings

There have been some notable changes in the IT organization and improvement in many ways over the past couple years, Most notable was the hiring of a new IT Director which has had a positive impact on the focus and management of IT. The organization will need to continue to evolve to support the business with an emphasis on the "Plan" function, and continued improvement around project management. The following are the high-level findings that require a focus for improvement.

- Currently the absence of Project Management Skills across IT and CCWA has impacted ability to execute
- Appears to be overall loose governance (business and IT)
- Priorities seem to shift effecting abilities to complete projects on time with limited resources
- Lack of Data collaboration. Documents saved to the shared drive and SharePoint creates lack of business collaboration and sharing of information across departments

- Technology and applications have historically been developed as point solutions to meet department needs and lack of enterprise view
- Lack of data integration (Northstar, JDE, Cityworks) creates significant data issues and risks

There appears to be some confusion about what IT is responsible for in supporting the CCWA department needs

5.6 Threat Definition

5.6.1 Major Threat Sources

Information systems face a wide variety of potential threats. These threats stem from one of four major threat sources:

1. Human threats are enabled or caused by a person. Human threats are classified by three criteria:

- The degree of authorized access possessed, ranging from outsider to trusted insider
- The nature of the act, ranging from unintentional acts to deliberate and direct targeting
- The tools and knowledge possessed used to cause damage, ranging from none to an attacker with access to sophisticated tools and advanced knowledge

2. Natural/Environmental threats that are not caused or enabled by a person. They include entropic threats such as hardware failure, natural disasters, and power failures.

3. Operational threats stem from the manner in which the organization operates which can result in operational inefficiencies, such as ineffective channels of communications and flawed incentive structures.

4. Infrastructure threats comprise potential inefficiencies stemming from the logical or physical configuration of the information system. Examples include hardware that is no longer supported by the vendor, insufficient network capacity, and insufficient hardware capacity.

5.6.2 Threats Assessed

Because this report focuses on day-to-day operations, the scope of the threats considered is limited to those that occur during regular operations. While threats from major events such as natural disasters and long-term power failures are possible, they are best addressed in a formal emergency response plan and are outside of the scope of this report. The following specific threats have been identified as pertinent to the CCU and will be considered in this report:

Human Threats

- Unintentional to malicious opportunistic acts from insiders using tools and knowledge ranging from none to those available to a skilled computer user.
- Malicious opportunistic acts from outside attackers using software tools available to a casual attacker such as a person looking to compromise random vulnerable computers for the purpose of sending unsolicited E-mail or attacking other computer networks.

Natural/Environmental

- Entropic threats such as hardware failure
- Loss of network connectivity

Operational

- Insufficient system and process documentation
- Inconsistent system support policies and procedures
- Insufficient support for software lifecycle
- Knowledge loss due to employee attrition

Infrastructure

- Capacity of backup and failover systems
- Configuration of virtual servers

Update of Major Findings

Cybersecurity controls around the environment are at a low level of maturity (<1 on a scale of 1-5, with 3 as the target).

- Implement an Enterprise Asset Management Program including automated patch management to reduce overall risk by implementing a process for identifying critical assets, assess the risk to those assets, and put in place controls appropriate to the business to manage risk. Will also provide complete visibility of hardware and software assets across all sites.
- Implement Network Access Control Solution at all sites for Wired & Wireless Network Assess Control to allow for endpoint posture assessment before devices are allowed on to the corporate networks.
- Adopt a secure imaging and hardening standard for servers and workstation deployment so a system's security configurations are appropriately set given the job it needs to do, in order to ensure operating system software, firmware and applications are updated to stay ahead of exploits that attack flaws in the underlying code. This also assures that the process runs continually, leveraging and employing as much automation as possible.
- Deploy Passive Vulnerability Scanners and Scanning Agents on critical servers to reduce risk of threat agents exploiting known vulnerabilities to compromise the confidentiality, integrity, and/or availability of critical IT assets.
- Implement Multifactor Authentication to all Critical servers and Infrastructure Devices that will compensate for the weakness of the other factors.
- Implement least privileged principle (i.e. separate logons for admins) for all admin accounts to give a user account or process only those privileges which are essential to perform its intended function.
- Deploy Advanced Endpoint Protection to all workstations and Servers. Enable Web Content, Application Control, File Integrity Monitoring, Intercept X and DLP features to build a more effective endpoint security program - one that proactively detects known and unknown endpoints, helps identify what is critically vulnerable to attacks, what weaknesses exist in your environment, and how effective you are at identifying threats and remediating them.
- Develop a Security-Driven Software Development Life Cycle program to ensure that security assurance activities such as penetration testing, code review, and architecture analysis are an integral part of the development effort.
- Develop an Incident Response Program to reduce risk associated with lack of coordinated response to cybersecurity events.

5.7 Operational Risks

5.7.1 Introduction

A risk is a combination of a threat being exercised on a given vulnerability. A threat is the potential for an intentional or accidental exploitation of vulnerability. A vulnerability is a flaw or weakness in system procedures, design, implementation, or internal controls.

The impact of a risk is the adverse effect that results from the successful threat exercise of a vulnerability. Existing controls are the technical, management, or operational efforts in place to minimize or eliminate the probability or impact of realizing a given risk.

The risk score is determined by combining the threat probability with the risk impact to derive an overall risk criticality. The risk matrix below illustrates the risk scoring methodology.

Table 6-1. IT Systems Assessment Risk Matrix

Threat Probability	Impact			
	High	**Moderate**		**Low**
Occurring	High	High	Moderate	Low
High	High	Moderate		Low
Moderate	Moderate	Moderate		Low
Low	Low	Low		Low

5.7.2 Identified Risks

A network and systems penetration test was performed with found CCWA which found the vulnerability threats to the environment to be HIGH. Several fixes need to be implemented (although due to the nature of the work, the activities could likely be managed as a single effort).

- Disable insecure TLS/SSL protocol support
- Fix the subject's Common Name (CN) field in the certificate
- Obtain a new certificate from your CA and ensure the server configuration is correct
- Disable SSLv2, SSLv3, and TLS 1.0. The best solution is to only have TLS 1.2 enabled
- Replace TLS/SSL server X.509 certificate
- Disable TLS/SSL support for RC4 ciphers
- Disable TLS/SSL support for static key cipher suites
- END, CCWA, 2016 Report, Rev 1.0, 5/20/2016
- Page 9 of 40
- Remove the default page or stop/disable the IIS server
- MS15-034: Security Update for Windows Server 2012 R2 (KB3042553)
- MS15-034: Security Update for Windows Server 2012 (KB3042553)
- Disable TLS/SSL support for weak ciphers
- Disable SSLv2 protocol support in Microsoft Windows
- Edit the crossdomain.xml file to be less permissive Address Leak
- Replace TLS/SSL self-signed certificate
- Stop Using SHA-1
- Disable TCP timestamp responses on Cisco

- Disable ICMP timestamp responses
- Disable TCP timestamp responses on OpenBSD
- Enable TLS/SSL support for strong ciphers
- Disable TCP timestamp responses on Linux
- Disable TLS/SSL support for 3DES cipher suite
- Disable TCP timestamp responses on Windows versions before Vista
- Disable TCP timestamp responses on Windows versions since Vista
- Disable ICMP timestamp responses on Linux

5.8 Recommended Controls

5.8.1 Introduction

This section contains specific recommendations and control strategies. The recommendations indicate specific operational, technical, and managerial controls that can be implemented to reduce the overall operational risks. Each specific recommendation addresses one or more operational risks as identified in the previous section. The recommendations are listed by expected benefit level in descending order.

5.8.2 Recommendations

Create a set of controls which address the specific domains called out in NIST 800-53A.

5.9 Operational Policies

The following minimum policy set should be created.

- Access Control
- Awareness and Training
- Audit and Accountability
- Configuration Management
- Identification and Authentication
- Incident Response
- Media Protection
- Personnel Security
- Physical Protection
- Risk Assessment
- Systems and Communications Protection
- System and Information Integrity

Section 6 Program Management Plan

The intent of an IT strategy plan is not to identify all defined or potential work for an IT department over a specified period of time, the following does provide visibility into major projects and key departmental initiatives that IT has planned for the next 5 years.

The programs and projects in the IT strategic plan are created following 3 main themes to enable IT to best support CCWA goals

- Enhance CCWA Business Processes
- Standardize and Improve IT Infrastructure
- Improve Information Management

Major Projects

Major projects are high-level, strategic projects that may or not be part of the IT budget but will involve IT resources. They are either large-scale or enterprise-wide or have a significant impact and will call on all IT areas to focus on successful execution.

The IT Master Planning project identified fourteen (14) projects that should be implemented in order to realize the future state enterprise architecture described above. This section will define each project and discuss the criteria used to prioritize projects in order of their importance to CCWA, leveraging the same criteria used for the Strategic Master Plan (SMP) projects in the past.

6.1.1 Project Summary Listing

See Appendix 1. The projects should be maintained in a separate appendix so the primary plan can be edited and altered on a less frequent basis.

6.1.2 Project Details

Each strategic initiative listed in the IT Strategic Plan has a planned IT project(s) or initiative(s) and is listed in the Appendix 1. Note that for each project/initiative listed there is or will be a project plan, schedule with milestones, allocated resources, and deliverables

These initiatives are controlled activities within the IT department. While the impact of their outcomes may have enterprise-reaching implications, the resources will be primarily if not entirely from the IT pool and in some cases will require the use of outside consultants.

6.2 Project Weighting Criteria

The weighting of projects is the use of business goals to measure various projects and efforts against one another in order to establish a sequential value to the company, based on economic impact. The goal is to establish a process that is repeatable, and measures efforts against goals in a uniform way.

The recommended method for CCWA is to establish the top 3 criteria and their importance to the business goals by percentage, and then weight each project. Determine the percentage each project satisfies a goal and divide by the weight% (weight % is the goals measured against each other) For example:

	Criteria 1		**Criteria 2**		**Criteria 3**		
	Sub1-1	*Sub1-2*	*Sub 2-1*	*Sub 2-2*	*Sub 3-1*	*Sub 3-2*	***Score***
Weight %	10%	12%	30%	11%	16%	21%	
Project 1	50	100	60	80	19	50	57.34
Project 2	10	23	100	100	15	45	56.61
Project 3	66	21	19	76	12	18	28.88
Project 4	18	88	90	5	30	21	49.12

Section 7 Operational Quality

7.1 Goals and objectives

The purpose of quality improvement, according to the CDC, is to improve outcomes. “Quality improvement is part of a performance management system, which uses data for decisions to improve policies, programs, and outcomes. It manages change”.

This definition is an excellent description of why quality is important to any organization, and why we implement quality control measures into the governance structure of mature organizations.

7.2 Policies and Procedures

CCWA should implement a quality control policy which requires the review of the master plan and all governance policies on a regularly scheduled basis, with the intent of initiation a Plan-Do-Check-Act cycle of quality control and governance.

7.3 Metrics

The Quality Control policy should list the metrics by which quality will be measured so leadership can measure current state against desired state. These data may include metrics such as response time to malware, case closure time, exceeded or failed timelines, project failure or early completion, and certainly budgetary data. The metrics should be maintained in a separate appendix so the primary plan can be edited and altered on a less frequent basis.

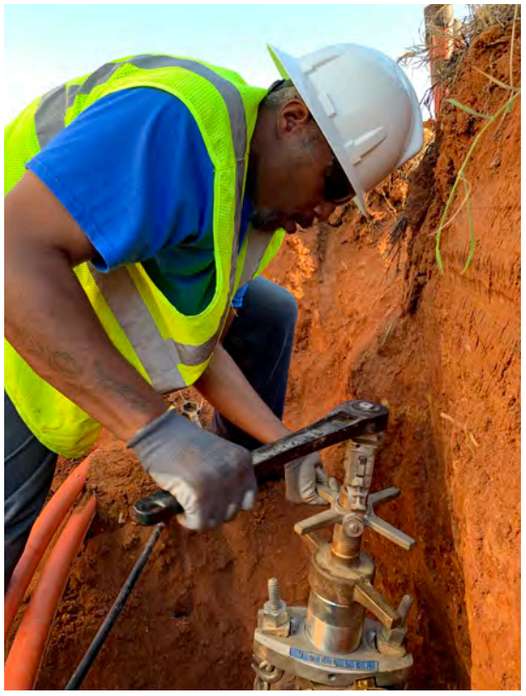
The quality control policy should include:

- A requirement for Plan-Do-Check-Act Quality Control
- Required Documentation
- Regulatory Frameworks for which compliance is a goal
- Processes to review data and keep it current
- Project Reviews for continued need
- Best Practices which are a goal
- Industry Trend Awareness

Appendix 1

Table 7-1. IT Master Plan Project List					
Order	Project #	Ranking Score	Project Name	Estimated Cost	Dependencies
	150	53.20	Business Intelligence (BI) Strategy	$250,000	
	151	42.80	IT Services Catalog	$50,000	
	152	71.40	Mobility Strategy	$100,000	
	153	30.40	RACI Development	$50,000	
	154	42.20	Develop and Implement a Collaboration Strategy	$100,000	
	155	61.00	Software Application Upgrade & Technology Refresh	$6,000,000	
	156	51.80	JDE Upgrade	$500,000	
	158	31.20	Review/Develop Architecture Standards	$100,000	
	159	35.00	Application Portfolio Rationalization	$50,000	
	160	69.40	Evaluate and Implement System Integration Strategy	$1,000,000	
	161	72.00	Refresh Disaster Recovery - Data Center & Cyber Security Strategy	$250,000	
	162	37.00	Establish Data Governance & Stewardship Program	$100,000	
	164	26.00	Sourcing Strategy-Cloud	$100,000	
	165		Develop reporting metrics		
	166		Enterprise Asset Management Program		
	167		Network Access Control		
	168		Secure imaging and hardening standards		
	169		Deploy Passive Vulnerability Scanners		
	170		Multifactor Authentication		

Table 7-1. IT Master Plan Project List					
Order	Project #	Ranking Score	Project Name	Estimated Cost	Dependencies
	171		Advanced Endpoint Protection		
	172		Security-Driven Software Development Life Cycle program		
	173		Incident Response Program		
	174		Patching of penetration test findings		
	175		Operational Policy Suite		
	176		Implement quality cycle for governance		



CLAYTON COUNTY
Water
AUTHORITY